

STATEMENT OF BASIS

Applicant: City of Beresford
Permit Number: SD0020079
Contact Person: Eli Seeley, Mayor
Keith Kropuenske, Operator
101 North 3rd Street
Beresford, SD 57004
Phone: (605) 763-2008 (city)
(605) 751-9056 (operator)
Permit Type: Minor Municipal - Renewal

This document is intended to explain the basis for the requirements contained in the draft Surface Water Discharge Permit. This document provides guidance to aid in complying with the permit requirements. This guidance is not a substitute for reading the draft permit and understanding its requirements.

SUMMARY OF DRAFT PERMIT CHANGES

- Pre-discharge sampling requirements have been removed.
- SSO sampling requirements have been removed.
- Facility inspection requirements have changed. See permit **Section 3.5**.
- Monitoring units for water temperature have changed to °F. See permit **Section 3.7**.
- Effluent limits for ammonia-nitrogen and *Escherichia coli* (*E. coli*) have been added. See permit **Section 3.7**.
- Effluent limits for total suspended solids have become more stringent. See permit **Section 3.7**.
- Effluent limits for total recoverable copper have been added. See permit **Section 3.7**.
- Effluent monitoring requirements for total hardness (as CaCO₃) have been added. See permit **Section 3.7**.
- Influent monitoring requirements have been added for total recoverable copper, BOD₅, and TSS. See permit **Section 3.7**.
- An industrial waste survey must be submitted within 90 days of the effective date of this permit. See permit **Section 6.1**.

DESCRIPTION

The city of Beresford operates a wastewater treatment facility located ½ mile north of the city in the Northwest ¼ of Section 32, Township 96 North, Range 50 West, in Lincoln County, South Dakota (Latitude 43.096357°, Longitude -96.777966°, Navigational Quality GPS). The city of Beresford lies in both Lincoln and Union counties.

The wastewater treatment facility consists of a gravity flow collection system aided by four city owned area lift stations. Lift station 1 is located on North 16th and pumps to Lift Station 2. Lift Station 2 is located behind Jet Service Center and pumps directly to the wastewater treatment facility. Lift Station 3 is located by Quality Park Products and pumps to Lift Station 2. Lift Station 4 is located by K&M tire warehouse, off Dakota Street, which pumps to Lift Station 1.

Wastewater flows to a three-cell stabilization pond system operated in series. Cells 1, 2, and 3 have surface areas of 19.4 acres, 8.2 acres, and 8.1 acres, respectively. Following Cell 3, the wastewater is directed to a SAGR system. The SAGR consists of 4 Cells. According to the application, the facility has an average design flow of 0.64 million gallons per day (MGD) and began operation in 1987, with a facility upgrade ending in 2025.

This wastewater treatment facility serves a population of 2,180 persons (2020 census). Several industries are located in the city of Beresford. The 2025 inspection report states that 3 industrial users (Quality Park Products, Tendaire Industries, and Portable Lift Equipment) only discharge domestic wastewater to the city of Beresford. Sioux Steam Cleaners discharges non-domestic wastewater when equipment is cleaned. Hendrix Genetics, a turkey hatchery, started operations in 2018 and discharges wash water to the city of Beresford and is permitted by SDDANR as a pretreatment industrial user (permit SDP000137).

In September 2018, the South Dakota Department of Agriculture and Natural Resources (SDDANR) was notified by the city of Beresford of an industry that potentially discharged high concentrations of metals to the sanitary sewer. After further investigation, SDDANR believes that high levels of metals were discharged in the sanitary sewer. During the previous permit cycle, the industry has shut down and is no longer sending wastewater to the POTW. A reasonable potential analysis was conducted to see if the POTW has potential to violate the applicable water quality standards. All metals monitoring, other than total recoverable copper and total recoverable selenium has been removed.

RECEIVING WATERS

Any discharge from this facility will enter Blind Creek which is classified by the South Dakota Surface Water Quality Standards (SDSWQS), Administrative Rules of South Dakota (ARSD), Section 74:51:03:01 for the following beneficial uses:

- (9) Fish and wildlife propagation, recreation, and stock watering waters; and
- (10) Irrigation waters.

Blind Creek flows approximately 6.5 miles before it is classified by the SDSWQS, ARSD Sections 74:51:03:01 and 74:51:03:25 for the following beneficial uses:

- (6) Warmwater marginal fish life propagation waters;
- (8) Limited contact recreation waters;
- (9) Fish and wildlife propagation, recreation, and stock watering waters; and
- (10) Irrigation waters.

Since the receiving waterbody has only the minimum fishery beneficial use classification of (9), the SDSWQS (ARSD Section 74:51:01:02.01) require that an analysis of the receiving stream be conducted to determine whether the waterbody deserves a higher beneficial use designation. The South Dakota Department of Agriculture and Natural Resources (SDDANR) has conducted an analysis for Blind Creek near the discharge location. SDDANR personnel have determined that the beneficial use classifications for Blind Creek are appropriate and will remain unchanged.

The SDSWQS (ARSD Section 74:51:01:04) allow application of criteria to protect downstream waterbodies which are impacted by discharges. Based on the proximity of the discharge location to the segment of Blind Creek classified for the 6, 8, 9, 10 beneficial uses, the city of Beresford's discharge is expected to impact the downstream segment of Blind Creek. The effluent limits will be drafted to be protective of the higher beneficial use classifications of the downstream segment of Blind Creek, in accordance with ARSD Section 74:51:01:04.

TOTAL MAXIMUM DAILY LOAD

Section 303(d) of the federal Clean Water Act requires states to develop Total Maximum Daily Loads (TMDLs) for waters at levels necessary to achieve and maintain water quality standards. TMDLs are calculations of the amount of pollution a waterbody can receive and still maintain applicable water quality standards. According to the federal Clean Water Act, the state must develop TMDLs for all waters identified on their Section 303(d) list of impaired waters, according to their priority ranking on that list. Every two years, the state assesses its water quality and publishes the list of impaired water bodies as part of its Integrated Report.

TMDLs address specific waterbodies, segments of waterbodies, or even entire watersheds, and are pollutant specific. TMDLs must allow for seasonal variations and a margin of safety, which accounts for any lack of knowledge concerning the relationship between pollutant loads and water quality. A wasteload allocation is developed for any point sources that cause or contribute to the water quality impairment.

This segment of the receiving waterbody has not been identified as being impaired; therefore, a TMDL is not needed.

ANTIDEGRADATION

SDDANR has fulfilled the antidegradation review requirements for this permit. In accordance with South Dakota's *Antidegradation Implementation Procedures* (SDDANR, October 1998) and the SDSWQS, it was determined that the discharge at the draft permit limits will cause an insignificant change in water quality. The results of SDDANR's review are included in Attachment 1 (Antidegradation Review). The antidegradation review and conclusions will be public noticed for public comment at the same time as the draft permit.

MONITORING DATA

The city of Beresford has been submitting Discharge Monitoring Reports (DMRs) as required under the current permit. As shown in Attachment 2, this facility has had 13 violations of daily

maximum pH, two violations of maximum 7-day average Five-Day Biochemical Oxygen Demand (BOD₅), and one violation of 30-day average BOD₅ since July 1, 2020. No discharge was reported for the months not included in the table.

Public access to facility’s monitoring data is available at EPA’s Enforcement and Compliance History Online (ECHO) website: <https://echo.epa.gov/>.

INSPECTIONS

Personnel from SDDANR conducted a Compliance Inspection of the city of Beresford’s wastewater treatment facility on August 6, 2025. The following comments and corrective actions were required in order to come into compliance with the city of Beresford’s Surface Water Discharge (SWD) permit:

COMMENTS		REQUIRED CORRECTIVE ACTIONS																																												
<p>The permittee experienced the effluent violations on the following dates:</p> <table border="1"> <thead> <tr> <th></th> <th>DMR</th> <th>Statistical Base</th> <th>Code</th> <th>Parameter Desc</th> <th>DMR Value</th> <th>Unit</th> <th>Limit</th> <th># EX</th> </tr> </thead> <tbody> <tr> <td>001</td> <td>05/31/2024</td> <td>DAILY MX</td> <td>00400</td> <td>pH</td> <td>9.13</td> <td>SU</td> <td>9</td> <td>2</td> </tr> <tr> <td>001</td> <td>04/30/2024</td> <td>DAILY MX</td> <td>00400</td> <td>pH</td> <td>9.87</td> <td>SU</td> <td>9</td> <td>3</td> </tr> <tr> <td>001</td> <td>01/31/2024</td> <td>DAILY MX</td> <td>00400</td> <td>pH</td> <td>9.2</td> <td>SU</td> <td>9</td> <td>4</td> </tr> <tr> <td>001</td> <td>04/30/2023</td> <td>30DA AVG</td> <td>00310</td> <td>BOD5</td> <td>39.25</td> <td>ma/L</td> <td>30</td> <td>1</td> </tr> </tbody> </table>		DMR	Statistical Base	Code	Parameter Desc	DMR Value	Unit	Limit	# EX	001	05/31/2024	DAILY MX	00400	pH	9.13	SU	9	2	001	04/30/2024	DAILY MX	00400	pH	9.87	SU	9	3	001	01/31/2024	DAILY MX	00400	pH	9.2	SU	9	4	001	04/30/2023	30DA AVG	00310	BOD5	39.25	ma/L	30	1	<p>These violations are not acceptable and can lead to enforcement actions which can include fines and penalties. The permittee must meet the effluent limits set forth in Section 3.6 of the SWD permit.</p>
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001	05/31/2024	DAILY MX	00400	pH	9.13	SU	9	2																																						
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<p>The permittee did not notify SDDANR of an effluent violation or submit a written report to SDDANR of the circumstances regarding some of the effluent violations that occurred on since the last inspection, as required by the SWD permit.</p> <p><i>Note: Some of the violations have been reported as required. Some of these violations happened during an emergency discharge, or a discharge allowed for maintenance. DANR acknowledges some confusion might have occurred due to this.</i></p>	<p>According to Section 4.2 of the SWD permit, the permittee shall report an effluent violation, bypass, emergency discharge, or sanitary sewer overflow within 24 hours from the time the permittee becomes aware of the circumstances.</p> <p>According to Section 4.2 of the SWD permit, “In addition to verbal notification, the permittee shall submit a written report of the circumstances regarding the effluent violation, bypass, sanitary sewer overflow, or emergency discharge to the Secretary.”</p> <p>According to Section 4.2 of the SWD permit, the written submission shall contain:</p> <ol style="list-style-type: none"> i. A description of the event and its cause; ii. The period of the event, including exact dates and times; iii. Where the wastewater was discharged; iv. The estimated time the event is 																																													

COMMENTS	REQUIRED CORRECTIVE ACTIONS
	<p>expected to continue if it has not been corrected;</p> <ul style="list-style-type: none"> v. Any adverse effects, such as fish kills; vi. If public notification was required, describe how the public was notified of the discharge; and vii. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the event. <p>According to Section 4.2 of the SWD permit, the written report shall be submitted by the 28th day of the following month.</p>

EFFLUENT LIMITS

Outfall 002 – Any discharge to waters of the state from the SAGR wastewater treatment system (Latitude 43.097667°, Longitude -96.781500°, Satellite Map Estimation).

During any discharge, the permittee shall comply with the effluent limits specified below which are based on the Secondary Treatment Standards (ARSD Section 74:52:06:03), the SDSWQS, permit writer’s judgment, and the current permit limits.

1. The Five-Day Biochemical Oxygen Demand (BOD₅) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on the Secondary Treatment Standards and are being included because SDDANR has determined there is a reasonable potential for BOD₅ to be present in the discharge at levels that may violate the Secondary Treatment Standards.
2. The Total Suspended Solids (TSS) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on Secondary Treatment Standards and are being included because SDDANR has determined there is a reasonable potential for TSS to be present in the discharge at levels that may violate the Secondary Treatment Standards.

If analytical results for BOD₅ show compliance with the permit limits, the permittee may request the permit issuing authority to change the TSS permit limits to 90 mg/L (30-day average) and 135 mg/L (7-day average). This change shall be based on ARSD Section 74:52:06:04 and the SDDANR policy for discharges from stabilization ponds to waters classified for warmwater marginal fish life propagation. **The permit issuing authority may approve the change without additional public notice.**

3. The pH shall not be less than 6.0 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on the Secondary Treatment

Standards and are being included because SDDANR has determined there is a reasonable potential for the pH of the effluent to violate the SDSWQS.

Note: SDDANR specifies that pH analyses are to be conducted within 15 minutes of sample collection with a pH meter. Therefore, the permittee must have the ability to conduct onsite pH analyses. The pH meter used must be capable of simultaneous calibration to two points on the pH scale that bracket the expected pH and are approximately three standard units apart. The pH meter must read to 0.01 standard units and be equipped with temperature compensation adjustment. Readings shall be reported to the nearest 0.1 standard units.

4. The *Escherichia coli* (*E. coli*) organisms shall not exceed a concentration of 630 per 100 milliliters as a geometric mean based on a minimum of five samples obtained during separate 24-hour periods for any calendar month. *This limit is only applicable if five or more samples are taken and is only effective from May 1 to September 30.*

In addition, the *E. coli* organisms shall not exceed 1,178 per 100 milliliters in any one sample from May 1 to September 30. These limits are based on the limited-contact recreation beneficial use classification of Blind Creek and the SDSWQS (ARSD Section 74:51:01:51) and are being included because SDDANR has determined there is a reasonable potential for *E. coli* to be present in the discharge at levels that may violate the SDSWQS.

5. The ammonia-nitrogen (as N) concentration shall not exceed the limits specified in the table below. These limits are based on the warmwater marginal fish life propagation waters classification of Blind Creek, the SDSWQS (ARSD Section 74:51:01:49), and permit writer’s professional judgment and are being included because SDDANR has determined there is a reasonable potential for ammonia-nitrogen to be present in the discharge at levels that may violate the SDSWQS. See Attachment 3 for more detail.

Season	Ammonia-Nitrogen (as N) Limits	
	30-Day Average (mg/L)	Daily Maximum (mg/L) ¹
January 1 – January 31	4.1	Report
February 1 – February 29	4.1	Report
March 1 – March 31	3.0	14.5
April 1 – April 30	1.9	10.8
May 1 – May 31	1.4	7.0
June 1 – June 30	1.2	6.0
July 1 – July 31	0.9	4.2
August 1 – August 31	1.0	4.6
September 1 – September 30	1.1	5.4
October 1 – October 31	3.0	18.3
November 1 – November 30	3.1	14.5
December 1 – December 31	3.6	17.6

¹ The ammonia daily maximum limits calculated for January and February were calculated to be above 20 mg/L, which is the highest ammonia concentration typically observed in municipal influent. For those months, the permittee shall report the ammonia concentration and will not have a numerical limit.

6. The total recoverable copper concentration shall not exceed 30.5 µg/L (30-day average) or 51.7 µg/L (daily maximum). These limits are based on the fish and wildlife propagation, recreation, and stock watering waters classification of Blind Creek and the SDSWQS (ARSD Sections 74:51:01:52, 74:51:01:55, and Appendix B).

The water quality criteria for copper in the SDSWQS are based on dissolved copper, which is the form of copper that is bioavailable and known for its toxic effect on organisms. The total recoverable method of analyzing copper provides a conservative estimate of toxicity as it recovers both dissolved copper and weakly-bonded copper complexes that might become bioavailable.

When the USEPA recommends water quality criteria, the criteria are developed based on the total recoverable analysis method. As noted above, the SDSWQS for most metals, including copper, are based on the dissolved metals analysis. To convert the USEPA copper criteria from total recoverable to dissolved metals, SDDANR used USEPA's recommended conversion factor to convert the total recoverable criterion to dissolved for the SDSWQS. The water quality criteria for copper in the SDSWQS are the following hardness-based equations:

$$\text{Chronic} = (\text{CF})e^{(0.8545[\ln(\text{hardness})]-1.702)}$$
$$\text{Acute} = (\text{CF})e^{(0.9422[\ln(\text{hardness})]-1.700)}$$

Where CF is a hardness-based conversion factor

However, the SDSWQS (Appendix B) and ARSD Section 74:52:03:16 require permit effluent limits to be expressed in terms of total recoverable metals. To convert the SDSWQS's water quality criteria back to total recoverable limits for the draft permit, SDDANR simply removed the conversion factors from the equation. The acute standard was applied as the daily maximum limit and the chronic standard was applied as the 30-day average.

The toxicity of copper increases as the hardness of the water decreases. To develop a protective limit, SDDANR reviewed the existing water quality data at WQM 4 and calculated the 20th percentile of the hardness data (see Attachment 5). For the purpose of effluent limit development, SDDANR used a hardness value of 400 mg/L.

SDDANR has determined through a statistical analysis of the water quality data, there is a reasonable potential for copper to be present in the discharge at levels that may violate the SDSWQS (see Attachment 6). Therefore, limits for copper are included in the draft permit to ensure the discharge does not cause or contribute to a violation of the SDSWQS.

7. No chemicals, such as chlorine, shall be used without prior written permission. This limit is based on permit writer's professional judgment.

SDDANR does not believe there is a reasonable potential for other pollutants to violate the SDSWQS. The limits and monitoring in the draft permit will be sufficient to ensure the protection of the water quality near the city of Beresford's discharge.

SELF MONITORING REQUIREMENTS

The draft permit requires the permittee to monitor all discharges for BOD₅ (mg/L), TSS (mg/L), pH (su), ammonia-nitrogen (as N, mg/L), total recoverable copper (as Cu, µg/L), and *E. coli* (#/100mL). These monitoring requirements are based on the limits in the draft permit for these parameters. Effluent water temperature (°F), total nitrogen (as N, mg/L), total phosphorus (as P, mg/L), total flow (million gallons), flow rate (MGD), influent BOD₅ (mg/L), influent TSS (mg/L), influent total recoverable copper (as Cu, µg/L), total recoverable selenium (as Se, µg/L), influent total recoverable selenium (as Se, µg/L), total hardness (as CaCO₃, mg/L), and duration of discharge (days) shall be monitored, but will not have a limit. These monitoring requirements are based on the need to fully characterize the discharge.

The facility is currently designed to be a continuous discharger. Duration of discharge shall be included as a monitoring requirement in this permit cycle to establish if the facility has the ability to discharge continuously. This may be removed in the next permit cycle if the facility does discharge continuously.

Effluent and influent monitoring results shall be summarized for each month (002A) and quarter (002M) and recorded on a DMR to be submitted via NetDMR to SDDANR on a **monthly (002A)** and **quarterly (002M)** basis. If no discharge occurs during a month, it shall be stated as such on the DMR.

Monitoring shall consist of **weekly** inspections of the facility and the outfall to verify that proper operation and maintenance procedures are being practiced and whether or not there is a discharge occurring from this facility. Each lift station shall be inspected on at least a **weekly** basis, although **daily** inspections are recommended. The frequency of on-site inspection may be reduced at the Secretary's discretion with reasonable justification. During any sanitary overflow, the lift stations shall be inspected on a **daily** basis. Documentation of each of these visits shall be kept in a log in either paper or electronic format to be reviewed by SDDANR or EPA personnel when an inspection occurs.

WHOLE EFFLUENT TOXICITY

The SDDANR *Reasonable Potential Implementation Procedure for SWD Permits* was reviewed to determine if Whole Effluent Toxicity (WET) testing is applicable to the city of Beresford. Following the guidance document, the city of Beresford is not believed to have reasonable potential to cause or contribute to an exceedance of the SDSWQS for toxicity.

The draft permit will not include WET monitoring or limits. SDDANR has determined that due to the facility's minor discharge status and the lack of significant industrial contributions to the wastewater treatment facility, there is no reasonable potential for WET. SDDANR has the

authority to reopen the permit to add WET effluent limits, compliance schedules, monitoring, or other appropriate requirements.

PRETREATMENT

Publicly Owned Treatment Works (POTWs) with a 5 MGD or greater design flow which receive wastewater from a significant industrial user are required under 40 CFR 403.8 to develop a pretreatment program. The state may also require a POTW with a lower design flow to develop a program to prevent Pass Through or Interference with the POTW, including biosolids.

The city of Beresford has a design flow of less than 5.0 MGD. However, industries may have an impact on the POTW. The draft permit requires the city to conduct an Industrial Waste Survey within 90 days of the effective date of the permit. Each industrial user must be identified as to qualitative and quantitative characteristics of the discharge, as well as production data. In addition, the city of Beresford shall notify SDDANR of any new introductions by new or existing industrial users or any substantial change in pollutants from any industrial user no later than 60 days following introduction or change. Such notice must contain the information described in **Section 6.0** of the permit.

SLUDGE

Based on the city of Beresford’s permit application, SDDANR does not anticipate sludge will be removed or disposed of during the life of the permit. Therefore, the draft Surface Water Discharge permit shall not contain sludge disposal requirements. However, if sludge disposal is necessary, the city of Beresford is required to submit to SDDANR a sludge disposal plan for review and approval **prior** to the removal and disposal of sludge.

ENDANGERED SPECIES

This is a renewal of an existing permit. No listed endangered species are expected to be impacted by activities related to this permit. However, the table below shows the species that may be present in the city of Beresford’s geographic area.

COUNTY	GROUP	SPECIES
Lincoln	Mammals	Northern Long-eared Bat
	Fishes	Topeka Shiner

This information was accessible at the following US Fish and Wildlife Service website as of November 6, 2025: <https://ipac.ecosphere.fws.gov/>.

PERMIT EXPIRATION

A five-year permit is recommended.

PERMIT CONTACT

This statement of basis and the draft permit were developed by Tom Anderson, Environmental Engineer for the Water Quality Program. Any questions pertaining to this statement of basis or the draft permit can be directed to the Water Quality Program, at (605) 773-3351.

December 15, 2025

ATTACHMENT 1
Antidegradation Review

Permit Type: Minor Municipal - Renewal Applicant: City of Beresford
 Date Received: 5/14/2025 Permit #: SD0020079
 County: Lincoln Legal Description: NW ¼ of Sec 32, T96N, R50W
 Receiving Stream: Blind Creek Classification: 9, 10
 If the discharge affects a downstream waterbody with a higher use classification, list its name and uses: Blind Creek (approx. 6.5 miles downstream) (6, 8, 9, 10)

APPLICABILITY

1. Is the permit or the stream segment exempt from the antidegradation review process under ARSD 74:51:01? Yes No If no, go to question #2. If yes, check those reasons why the review is not required:
 - Existing facility covered under a surface water discharge permit is operating at or below design flows and pollutant loadings;
 - Existing effluent quality from a surface water discharge permitted facility is in compliance with all discharge permit limits;
 - Existing surface water discharge permittee was discharging to the current stream segment prior to March 27, 1973, and the quality and quantity of the discharge has not degraded the water quality of that segment as it existed on March 27, 1973;
 - The existing surface water discharge permittee, with DANR approval, has upgraded or built new wastewater treatment facilities between March 27, 1973, and July 1, 1988;
 - The existing surface water discharge permittee discharges to a receiving water assigned only the beneficial uses of (9) and (10); the discharge is not expected to contain toxic pollutants in concentrations that may cause an impact to the receiving stream; and DANR has documented that the stream cannot attain a higher use classification. This exemption does not apply to discharges that may cause impacts to downstream segments that are of higher quality;
 - Receiving water meets Tier 1 waters criteria. Any permitted discharge must meet water quality standards;
 - The permitted discharge will be authorized by a Section 404 Corps of Engineers Permit, will undergo a similar review process in the issuance of that permit, and will be issued a 401 certification by the department, indicating compliance with the state's antidegradation provisions; or
 - Other: _____

FORMAL REVIEW

2. Is the stream segment classified as an OSRW? Yes No If no, go to question #3. **If yes, no change in water quality allowed. No further review required.**
3. Will there be an insignificant change in water quality? Yes No If no, go to question #4. **If yes, no further review required. List reason why discharge is insignificant**
- Only temporary change in water quality will result from the discharge;
 - Resulting change in water quality from the discharge will only affect a water quality parameter that is only regulated by a narrative standard and the discharge will not adversely impact the stream's beneficial uses;
 - Volume of the proposed discharge is small compared to the flow in the stream. The ratio of the average stream flow to discharge flow is greater than 50:1;
 - The increase in pollutant loading at critical low flow is expected to be less than 20% of the stream's assimilative capacity;
 - The resulting change in water quality from the discharge is less than one standard deviation of the mean concentration of the ambient water quality; or
 - Other: **This permit does not authorize an increase in effluent limits.**
-
4. Are existing, regulated point or nonpoint sources located in the area in compliance with required controls or has a compliance schedule been established for these sources? Yes No If no, establish an appropriate compliance schedule prior to approving, as proposed, the activity under review.
5. Based on available information, are there existing uses that are better than the currently designated uses? Yes No If yes, use protection of the higher existing use(s) as the basis for antidegradation decision-making and arrange to upgrade the currently designated 05/05/use(s).
6. Will existing uses be fully maintained and protected? Yes No If no, recommend denial of the activity as proposed.

PERMIT APPLICATION

7. Has the applicant submitted all information listed in the antidegradation implementation Procedure? Yes No If no, why not? _____
-
-
-

PUBLIC NOTICE AND OPPORTUNITY FOR HEARING

8. Has the application been properly public noticed? Yes No Date notice occurred
In paper: _____ Paper notice appeared in: _____
9. Has anyone petitioned the department for a public hearing on the application? Yes No
If no, no further review required. Proceed with writing permit based on outcome of antidegradation review. If yes, schedule time before the Water Management Board for public hearing on application.
Date and time of hearing: _____
Location of hearing: _____
10. Did the Board of Water Management approve the application? Yes No Attach a copy of the board minutes to this worksheet.

ANTIDEGRADATION REVIEW SUMMARY

11. The outcome of the review is:
- A formal antidegradation review was not required for reasons stated in this worksheet. Any permitted discharge must ensure water quality standards will not be violated.
 - The review has determined that degradation of water quality should not be allowed. Any permitted discharge would have to meet effluent limits or conditions that would not result in any degradation estimated through appropriate modeling techniques based on ambient water quality in the receiving stream, or pursue an alternative to discharging to the waterbody.
 - The review has determined that the discharge will cause an insignificant change in water quality in the receiving stream. The appropriate agency may proceed with permit issuance with the appropriate conditions to ensure water quality standards are met.
 - The review has determined, with public input, that the permitted discharge is allowed to discharge effluent at concentrations determined through a total maximum daily load (TMDL). The TMDL will determine the appropriate effluent limits based on the upstream ambient water quality and the water quality standard(s) of the receiving stream.
 - The review has determined that the discharge is allowed. However, the full assimilative capacity of the receiving stream cannot be used in developing the permit effluent limits or conditions. In this case, a TMDL must be completed based on the upstream ambient water quality and the assimilative capacity allowed by the antidegradation review.
 - Other: _____

12. Describe any other requirements to implement antidegradation or any special conditions
That are required as a result of this antidegradation review: _____

Tom Anderson
Permit Writer

11/7/2025
Date

Kyle Doerr
Reviewer

03/18/2026
Date

ATTACHMENT 2

Monitoring Data

MONITORING DATA
SD0020079, City of Beresford

The monitoring data was obtained from the facility’s DMRs and retrieved through the ICIS database, accessed November 7, 2025. The period of the data is from July 1, 2020 through September 30, 2025. Public access to the facility’s monitoring data is available at EPA’s Enforcement and Compliance History Online (ECHO) website: <https://echo.epa.gov/>

NR is Not Required. No sample was required for this parameter during the monitoring period.
Violations are bolded, shaded, and larger font.

	BOD ₅		Duration of discharge	E. coli		Flow Rate	
	30-Day Average	Maximum 7-Day Average	Month Total	30-Day Geometric Mean	Daily Maximum	30-Day Average	Daily Maximum
	30 mg/L	45 mg/L	Days	#/100mL	#/100mL	MGD	MGD
Nov 2020	2	2	3	NR	NR	3.98	4.81
Dec 2020	6.33	6.33	3	NR	NR	2.723	4.01
Mar 2021	19.33	19.33	4	NR	NR	2.965	4.78
Apr 2021	23	23	5	NR	NR	2.2186	4.73
Jun 2021	22.66	22.66	5	NR	32.7	2.3432	4.73
Oct 2021	17.75	21	10	NR	NR	1.967	5.44
Dec 2021	13.33	13.33	4	NR	NR	2.4425	4.66
Mar 2022	7.66	7.66	6	NR	NR	2.536	5.5
May 2022	8	8	4	NR	12.2	3.12	4.78
Oct 2022	22.33	22.33	4	NR	NR	2.775	4.73
Dec 2022	20	20	4	NR	NR	2.45	4.7
Mar 2023	16.33	16.33	5	NR	NR	2.9	4.81
Apr 2023	39.25	39.25	4	NR	NR	2.77325	4.07
Jun 2023	29	29	5	NR	33.2	2.342	4.73
Aug 2023	22.33	22.33	5	NR	326	2.754	4.8
Oct 2023	28.33	28.33	5	NR	NR	2.892	5.48
Jan 2024	12.25	12.25	4	NR	NR	3.29	5.46
Mar 2024	30	30	5	NR	NR	2.81	4.8
Apr 2024	27.66	27.66	5	NR	NR	3.43	4.73
May 2024	21.66	21.66	5	NR	62	3.732	4.8
Jun 2024	24.5	32	10	NR	84.2	1.895	4.76
Oct 2024	19.67	19.67	5	NR	NR	2.051	3.33
Dec 2024	7	7	5	NR	NR	1.8086	3.34
Feb 2025	15	15	6	NR	NR	1.772	3.35
Apr 2025	18.33	18.33	4	NR	NR	2.79	3.42
Jun 2025	19.67	46	29	2.2	10.9	.42	2.23

	BOD ₅		Duration of discharge	E. coli		Flow Rate	
	30-Day Average	Maximum 7-Day Average	Month Total	30-Day Geometric Mean	Daily Maximum	30-Day Average	Daily Maximum
	30 mg/L	45 mg/L	Days	#/100mL	#/100mL	MGD	MGD
Jul 2025	24.4	56	31	1	1	.537	1.18
Aug 2025	12.5	23	31	1	1	.391	.619
Sep 2025	5	7	30	1	1	.163	.194

	Total Flow	Ammonia-Nitrogen (as N)		Total Nitrogen (as N)	pH	
	Month Total	30-Day Average	Daily Maximum	Daily Maximum	Daily Minimum	Daily Maximum
	Mgal	mg/L	mg/L	mg/L	6 SU	9 SU
Nov 2020	11.94	.38	.96	2.7	9.2	9.79
Dec 2020	8.17	.09	.11	3.8	8.75	8.88
Mar 2021	11.86	2.56	2.8	7.9	8.8	9.15
Apr 2021	11.093	8.23	8.73	14.2	8.24	8.87
Jun 2021	11.716	5.14	5.29	11.7	8.16	8.25
Oct 2021	19.67	1.5075	2.04	7.7	8	8.65
Dec 2021	9.77	.066	.08	4.1	8.75	8.89
Mar 2022	15.22	6.403	7.36	8.8	8.5	8.71
May 2022	12.473	3.2	3.74	7.3	8.51	8.9
Oct 2022	11.1	1.38	1.53	9.7	8.53	8.69
Dec 2022	9.8	.716	.77	6.5	8.82	8.95
Mar 2023	14.5	14.13	14.9	17	8	8.07
Apr 2023	11.093	22.55	26.5	22.8	8.25	8.42
Jun 2023	11.71	1.28	1.77	7.5	8.88	9
Aug 2023	13.77	6.28	7.21	11.2	7.87	7.97
Oct 2023	14.46	1.55	1.68	10.3	8.38	8.59
Jan 2024	13.153	2.465	4.1	6.5	9.14	9.2
Mar 2024	14.05	7.52	8.73	14.2	8.98	9
Apr 2024	17.16	.56	.56	8.6	9.78	9.87
May 2024	18.66	1.16	1.43	6	9.03	9.13
Jun 2024	18.95	2.43	3.43	10.8	7.97	8.45
Oct 2024	10.254	3.66	3.82	10.8	8.23	8.4
Dec 2024	9.043	3.29	3.48	7.2	8.87	8.89
Feb 2025	10.633	5.96	6.7	12.5	8.89	8.98
Apr 2025	11.17	17.3	18.8	23.3	8.23	8.52
Jun 2025	12.18	2.63	5.7	8.2	7.89	8.2

	Total Flow	Ammonia-Nitrogen (as N)		Total Nitrogen (as N)	pH	
	Month Total	30-Day Average	Daily Maximum	Daily Maximum	Daily Minimum	Daily Maximum
	Mgal	mg/L	mg/L	mg/L	6 SU	9 SU
Jul 2025	16.65	.098	.18	8.8	7.92	8.29
Aug 2025	12.11	.055	.06	3.9	8.24	8.48
Sep 2025	4.88	.08	.12	4.9	8.15	8.4

	TSS		Water Temperature	
	30-Day Average	Maximum 7-Day Average	30-Day Average	Daily Maximum
	90 mg/L	135 mg/L	deg C	deg C
Nov 2020	3	3	9.96	11.3
Dec 2020	13.66	13.66	7.2	7.4
Mar 2021	30.66	30.66	6.06	6.6
Apr 2021	18	18	9.63	10.5
Jun 2021	22	22	23.66	24.3
Oct 2021	33	34	18.9	19.4
Dec 2021	22.66	22.66	3.53	4.2
Mar 2022	5.33	5.33	4.53	5.4
May 2022	10.33	10.33	15.36	15.8
Oct 2022	51	51	16.67	17.2
Dec 2022	34.66	34.66	5.33	5.9
Mar 2023	11.33	11.33	5.37	5.6
Apr 2023	19.5	19.5	12.5	15.2
Jun 2023	57	57	22.96	23.3
Aug 2023	24	24	22.87	23
Oct 2023	49.33	49.33	13.53	13.7
Jan 2024	13.25	13.25	2.3	2.9
Mar 2024	45	45	6.16	6.8
Apr 2024	60.66	60.66	13.3	14.4
May 2024	32.33	32.33	17.63	18.6
Jun 2024	65	84	21.6	23.1
Oct 2024	48.67	48.67	14.16	14.7
Dec 2024	11.67	11.67	3.53	4.8
Feb 2025	26.67	26.67	1.43	1.6
Apr 2025	44.66	44.66	7.76	9
Jun 2025	5.83	8	18.57	21.2
Jul 2025	11	16	24.6	26.3
Aug 2025	9.5	19	24.1	24.9

	TSS		Water Temperature	
	30-Day Average	Maximum 7-Day Average	30-Day Average	Daily Maximum
	90 mg/L	135 mg/L	deg C	deg C
Sep 2025	7.75	10	21.62	23.2

	Total Recoverable Aluminum	Total Recoverable Antimony	Total Recoverable Arsenic	Total Recoverable Beryllium	Total Recoverable Cadmium	Total Recoverable Chromium
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2020	5	1	.005	1	1	1
Mar 2021	18	1	.005	1	1	3.6
Jun 2021	1	1	2.5	1	1	1
Dec 2021	5	1	2.5	1	1	1
Mar 2022	11.1	1	2.5	1	1	1
Jun 2022	66.8	1	2.8	1	1	1
Dec 2022	5	1	2.9	1	1	1
Mar 2023	11.4	1	3.8	1	1	1
Jun 2023	32.7	1	3	1	1	1
Sep 2023	13.1	1	2.5	1	1	1
Dec 2023	7	1	2.5	1	1	2.8
Mar 2024	5	1.5	2.8	1	1	2.4
Jun 2024	20	1.7	2.5	1	1	1.7
Dec 2024	8.3	1	2.7	1	1	2
Mar 2025	127	1	2.5	1	1	1.5
Jun 2025	21.6	1	1	1	1	1.9
Sep 2025	17.5	1	5.5	1	1	1

	Total Recoverable Copper	Total Recoverable Lead	Total Recoverable Mercury	Total Recoverable Molybdenum	Total Recoverable Nickel
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2020	.1	.5	.2	5.8	4.9
Mar 2021	.02	.5	.35	6.7	5.6
Jun 2021	10	.5	.1	5.3	6.5
Dec 2021	10	.5	.2	2.5	3.9
Mar 2022	10	.5	.2	6.2	3

	Total Recoverable Copper	Total Recoverable Lead	Total Recoverable Mercury	Total Recoverable Molybdenum	Total Recoverable Nickel
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	ug/L	ug/L	ug/L	ug/L	ug/L
Jun 2022	13.4	.5	.2	4.2	4.9
Dec 2022	10	.5	.2	3.5	4.3
Mar 2023	17	.5	.2	6	16.6
Jun 2023	30.9	.5	.2	4.4	4.9
Sep 2023	10	.5	.2	1.5	5.2
Dec 2023	10	1	.2	1.9	6.3
Mar 2024	10	.5	.2	2.7	6.9
Jun 2024	10	.5	.2	4.2	7.4
Dec 2024	10	.5	.2	1.7	8.6
Mar 2025	10	.64	.1	2.9	19.8
Jun 2025	10	.5	.1	1.9	7.8
Sep 2025	10.1	.5	.1	7.6	9.3

	Phenols	Total Recoverable Selenium	Total Recoverable Silver	Total Recoverable Thallium	Total Recoverable Zinc
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	mg/L	ug/L	ug/L	ug/L	ug/L
Dec 2020	.05	2.5	1	.5	15
Mar 2021	.05	2.5	1	.5	15
Jun 2021	.05	2.5	1	.5	7.3
Dec 2021	.05	2.5	1	.5	5
Mar 2022	.05	2.5	1	.5	5
Jun 2022	.05	2.5	1	.5	5
Dec 2022	.05	2.5	1	.5	5
Mar 2023	.05	2.5	1	.5	13
Jun 2023	.05	2.5	1	.5	16.4
Sep 2023	.05	2.5	1	.5	5
Dec 2023	.05	2.5	1	1.5	5
Mar 2024	.05	2.5	1	.5	5
Jun 2024	.05	2.5	1	.5	6.2
Dec 2024	.05	2.5	1	.5	5
Mar 2025	.05	2.5	1	.5	19
Jun 2025	.05	2.5	1	.5	7.7
Sep 2025	.05	2.7	1	.5	25.1

ATTACHMENT 3

**Ammonia Limits Development
for the
Beresford Treatment Facility**

**in Blind Creek
near
Beresford, South Dakota**

Prepared by

South Dakota Department of Agriculture and Natural Resources

November 2025

INTRODUCTION

Under Section 303(c) of the federal Clean Water Act, states have been required to develop water quality standards to protect public health and enhance water quality. In accordance with the Clean Water Act, the state of South Dakota has assigned beneficial uses to all waters of the state and developed water quality criteria to protect those uses. South Dakota's surface water quality standards and assigned beneficial uses are found in the Administrative Rules of South Dakota (ARSD) Article 74:51.

To ensure the protection of the state's surface water quality standards, the Clean Water Act authorized a permitting program for point source discharges of pollutants. The U.S. Environmental Protection Agency delegated this permitting program to the South Dakota Department of Agriculture and Natural Resources on December 30, 1993.

The department issues Surface Water Discharge permits containing, at a minimum, technology-based effluent limits. However, these limits are not always adequate to protect South Dakota's water quality. In those cases, the Department of Agriculture and Natural Resources develops water quality-based effluent limits. In accordance with the procedures and requirements outlined below, water quality-based effluent limits for ammonia will be developed for the city of Beresford's wastewater treatment facility (WWTF). These limits will ensure the surface water quality standards for Blind Creek near Beresford are maintained and protected.

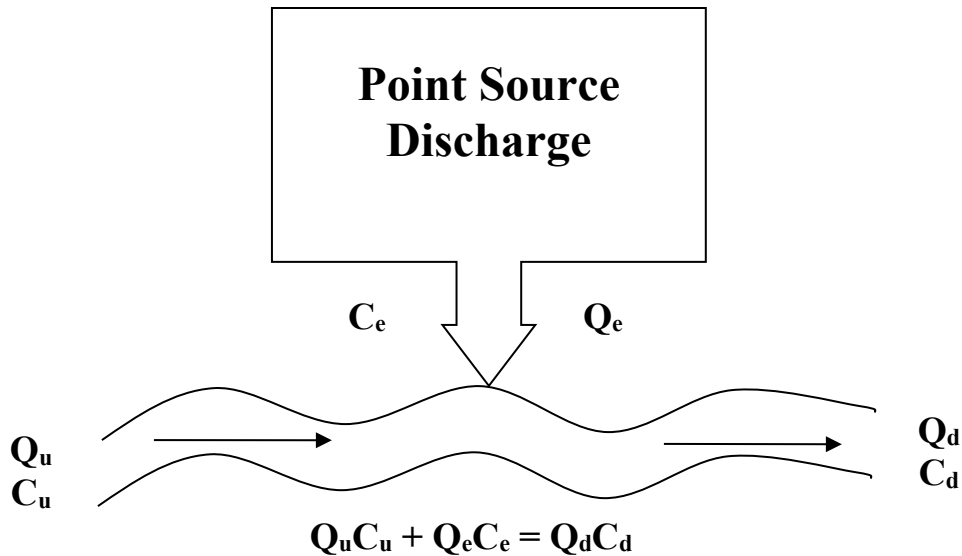
Developing the ammonia limits for the city of Beresford is a matter of determining the maximum level of ammonia that can be present in Blind Creek without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) for ammonia to be exceeded.

The effluent limits for ammonia are developed for critical conditions to be conservative, thereby assuring water quality standards are maintained under less critical conditions. Critical conditions are those at which the surface water quality standards are most likely to be violated. Critical conditions can be defined by several factors, including, but not limited to the following:

- stream flow (e.g., high, low);
- storm event occurrence and intensity;
- ambient water quality conditions (e.g., pH, temperature, etc.);
- diurnal variations in water column conditions;
- temporal occurrence of pollutant loadings from natural and human-induced activities; and
- the presence or absence of salmonids.

The following mass balance equation will be used to determine the ammonia limits for the city of Beresford:

Figure 1: Mass Balance of Receiving Stream



Where:

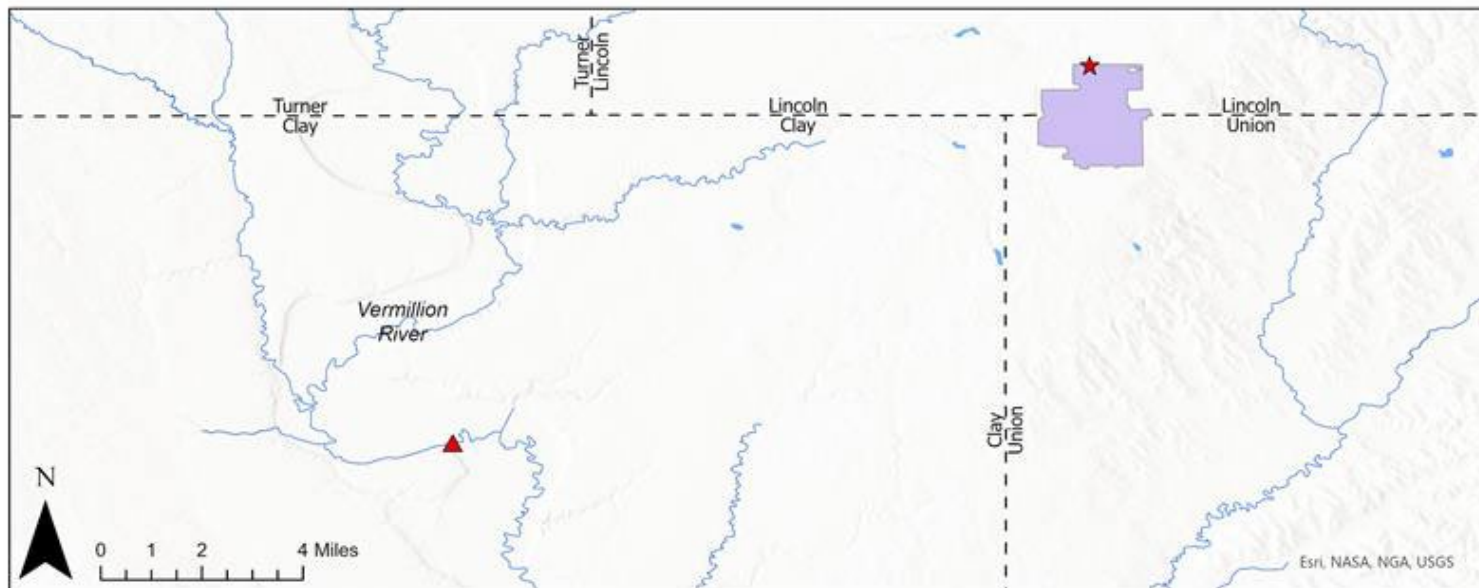
- Q_u = Receiving stream flow, in cubic feet per second (cfs);
- C_u = Ambient upstream ammonia concentration, in milligrams per liter (mg/L);
- Q_e = Effluent discharge flow rate, in cfs;
- C_e = Water quality based effluent limit for ammonia in mg/L;
- Q_d = Downstream flow (equal to $Q_u + Q_e$), in cfs; and
- C_d = Allowable instream ammonia concentration (based on the SD Surface Water Quality Standards), in mg/L.

Using the mass balance equation and the following information, the water quality-based effluent limits for ammonia can be determined for the city of Beresford's discharge into Blind Creek.

GEOGRAPHICAL EXTENT

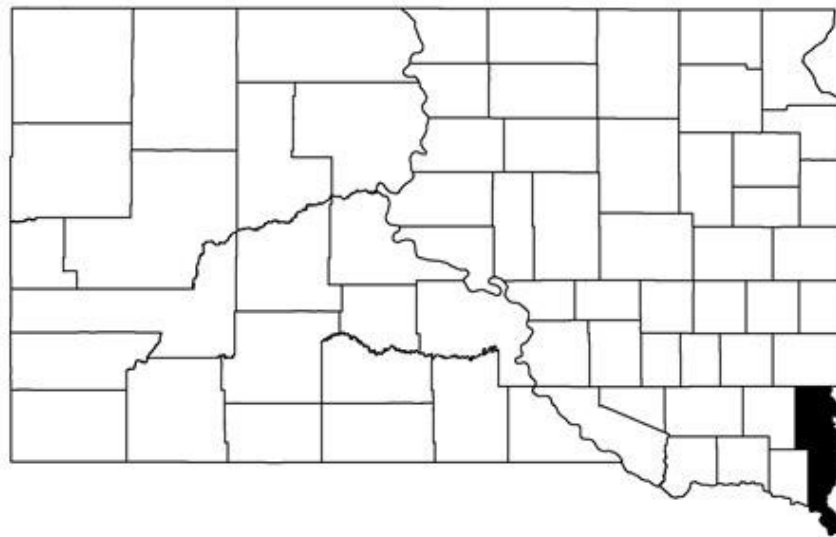
Blind Creek is located in the Vermillion River Basin in the southeastern portion of the state. The Vermillion River Basin drains approximately 2,673 square miles of land, which is comprised largely of cropland. Figure 2 shows Blind Creek near Beresford.

Figure 2: The city of Beresford in the Vermillion River Basin



Legend

- Mean annual flow ≤ 100 cfs
- - - County Borders - 2020 Census
- Beresford
- ★ Outfall 001
- ▲ WQM 4



Past experience has shown that, due to the decay and transformation of organic pollutants such as ammonia, most adverse effects are generally exhibited within 10 miles of pollutant loading. While this rule of thumb can certainly vary depending on the source of the pollutant, fate and transport characteristics, hydrologic conditions, and other factors, it has generally held true in past instances. Therefore, the development of the ammonia limits for the city of Beresford's discharge into Blind Creek will be relatively narrow in spatial extent.

ALLOWABLE INSTREAM AMMONIA CONCENTRATION (C_d)

South Dakota Surface Water Quality Standards

The SDSWQS specify the beneficial uses assigned to specific water bodies. The SDSWQS also contain specific narrative and numeric criteria that must be met to ensure the protection of each beneficial use. Blind Creek is classified for the following beneficial uses:

- (9) Fish and wildlife propagation, recreation, and stock watering waters; and
- (10) Irrigation waters.

Blind Creek flows approximately 6.5 miles before it is classified for the following beneficial uses:

- (6) Warmwater marginal fish life propagation waters;
- (8) Limited contact recreation waters;
- (9) Fish and wildlife propagation, recreation, and stock watering waters; and
- (10) Irrigation waters.

Waterbodies designated in the SDSWQS with the beneficial use classification of either coldwater permanent or coldwater marginal fish life propagation are suitable for supporting salmonids. Waterbodies with the beneficial use classifications of warmwater permanent, warmwater semipermanent, or warmwater marginal fish life propagation will likely not have salmonids. Salmonids are not expected to be present in Blind Creek.

Allowable Instream Ammonia Levels

New ammonia-nitrogen (as N) criteria have been adopted as part of SDDANR's 2021 triennial review of the SDSWQS. Previous ammonia-nitrogen (as N) permit effluent limits were calculated based on the U.S. Environmental Protection Agency's (US EPA) 1999 criteria. The updated criteria, which are to be utilized for permits with an effective date on or after July 1, 2021, are based on EPA's 2013 criteria. For more information about the development of these ammonia-nitrogen (as N) criteria, see *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013* (US EPA, April 2013).

Based on the beneficial uses of Blind Creek, the following equations can be used to determine the total allowable ammonia concentration in the receiving stream (SDSWQS, ARSD Chapter 74:51:01, Appendix A):

Equation 1: Daily Maximum (Salmonids present)

$$Cd = \text{MIN} \left(\left(\frac{0.275}{1 + 10^{7.204 - pH}} + \frac{39.0}{1 + 10^{pH - 7.204}} \right), \left(0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204 - pH}} + \frac{1.6181}{1 + 10^{pH - 7.204}} \right) \times (23.12 \times 10^{0.036 \times (20 - T)}) \right) \right)$$

Equation 2: Daily Maximum (Salmonids NOT present)

$$Cd = 0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204 - pH}} + \frac{1.6181}{1 + 10^{pH - 7.204}} \right) \times \text{MIN} (51.93, 23.12 \times 10^{0.036 \times (20 - T)})$$

Equation 3: 30-day Average

$$Cd = 0.8876 \times \left(\frac{0.0278}{1 + 10^{7.688 - pH}} + \frac{1.1994}{1 + 10^{pH - 7.688}} \right) \times (2.126 \times 10^{0.028 \times (20 - \text{MAX}(T, 7))})$$

Where:

- pH = the pH of the water quality sample in standard units
- T = the water temperature of the sample in degrees Centigrade
- MIN = use either 51.93 or the value of $23.12 \times 10^{0.036 \times (20 - T)}$, whichever is the smaller value
- MAX = use either the water temperature (T) for the sample or 7, whichever is the greater value

To develop the ammonia limits for the city of Beresford, equations 2 and 3 will be used to determine the instream ammonia concentration, C_d , allowed in Blind Creek. C_d will be expressed as both 30-day average and daily maximum concentrations. The seasons have been determined based on the availability of instream water quality monitoring data.

Instream Water Quality Monitoring

The department maintains a statewide network of fixed monitoring stations to gain a historic record of water quality for various streams around the state. This water quality monitoring (WQM) network consists of 154 monitoring stations, which are sampled at monthly, quarterly, or seasonal intervals. The goal of this sampling is to collect reliable water quality data that reflects actual stream conditions; to collect data to determine the effectiveness of controls on point and nonpoint sources of pollution; and to collect data to evaluate the appropriateness of current beneficial use designations.

Water quality samples are collected at a WQM station on the Vermillion River. There is no WQM station on Blind Creek. A description of the station is listed below. Figure 2 denotes the location of WQM 4.

- WQM 4 Seven miles east of Wakonda and 1.4 miles South on SD Hwy 19 at North-South Bridge on the Vermillion River (Latitude 42.988889, Longitude -96.963889).

Ambient water temperature, pH, and ammonia data at WQM 4 were obtained to represent instream conditions. The water quality information obtained from WQM 4 is presented in Attachment 3. The pH and temperature data are summarized in Table 1 below.

Calculation of Allowable Instream Ammonia Concentration (C_d)

The SDSWQS specify the total ammonia concentration that is allowed at a given pH and temperature. The 50th percentile of the pH and temperature at WQM 4 was determined to ensure the ammonia standards are maintained during critical conditions. This information was used to calculate the allowable instream ammonia concentrations for each month. Table 1 summarizes the allowable instream ammonia (C_d) for Blind Creek.

Table 1: Allowable Instream Total Ammonia Concentrations for Blind Creek

Season	Temperature (°C)	pH (s.u.)	C_d , Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January 1 – January 31	1.00	7.90	2.07	10.57
February 1 – February 29	1.00	7.90	2.07	10.57
March 1 – March 31	3.00	8.10	1.55	7.25
April 1 – April 30	11.50	8.20	0.99	5.38
May 1 – May 31	16.60	8.20	0.71	3.53
June 1 – June 30	22.00	8.05	0.63	3.01
July 1 – July 31	26.30	8.05	0.48	2.11
August 1 – August 31	24.00	8.10	0.52	2.32
September 1 – September 30	22.00	8.10	0.59	2.73
October 1 – October 31	12.00	7.90	1.50	9.13
November 1 – November 30	6.00	8.10	1.55	7.25
December 1 – December 31	1.00	8.00	1.80	8.77

AMBIENT AMMONIA CONCENTRATION (C_u)

The ammonia data at WQM 4 was reviewed to determine the ambient water quality in Blind Creek. The 50th percentile of the ammonia data was determined to ensure the ammonia standards are maintained during critical conditions. The ammonia data from WQM 4 is presented in Attachment 3. Table 2 below summarizes the 50th percentile ammonia data for each season. This data represents the ambient ammonia concentration for Blind Creek (C_u).

Table 2: Ambient Ammonia Data for Blind Creek

Season	Ammonia (mg/L)
January 1 – January 31	0.05

Season	Ammonia (mg/L)
February 1 – February 29	0.10
March 1 – March 31	0.07
April 1 – April 30	0.05
May 1 – May 31	0.05
June 1 – June 30	0.05
July 1 – July 31	0.05
August 1 – August 31	0.05
September 1 – September 30	0.05
October 1 – October 31	0.05
November 1 – November 30	0.05
December 1 – December 31	0.05

EFFLUENT DISCHARGE FLOW RATE (Q_e)

The effluent discharge flow rate, Q_e , can be determined in several different ways. If effluent data is available for the discharger, the 50th or 80th percentile of the daily flow can be used. The effluent design flow rate of the wastewater treatment facility may be used as the expected effluent flow rate in the absence of actual discharge data. Alternatively, for stabilization pond systems, it may be appropriate to develop an effluent flow rate based on expected performance.

For the purposes of developing ammonia limits for the city of Beresford, 0.99 cfs was used for Q_e based on the upgraded facility's average design flow. This will ensure the ammonia standards are maintained during critical conditions.

Table 3 summarizes the effluent flow rate used in these calculations.

RECEIVING STREAM FLOW (Q_u)

The United States Geological Survey (USGS) maintains hundreds of flow monitoring sites in South Dakota. The receiving stream flow rate, Q_u , is determined from an analysis of stream flow data available, incorporating the flow considerations required by *South Dakota's Mixing Zone and Dilution Implementation Procedures*.

Critical conditions for ammonia presumably occur when stream flows are relatively low. Therefore, the ammonia limits will be developed for low stream flow conditions. Should it be determined that water quality standards are violated at other flow conditions, the permit would be reopened and new limits would be developed.

ARSD Section 74:51:01:30 specifies that surface water quality standards apply to low quality fishery waters when flows meet or exceed the minimum 7-day average low flow that can be expected to occur once every 5 years (7Q5), or 1.0 cfs, whichever is greater. The 7Q5 is therefore the minimum, or critical, flow for which the SDSWQS must be maintained, although all Surface Water Discharge permit limits remain in force below this minimum flow.

South Dakota’s water quality standards allow a zone of mixing for discharges. In accordance with the SDSWQS, chronic and acute ammonia water quality criteria must be met at the end of the mixing zone. The mixing zone is therefore a limited portion of a water body where mixing of the effluent and receiving stream is in progress, but not complete. In some cases, the discharge will not completely mix with the entire receiving stream. There are many factors that influence the rate of mixing in a stream. A few of these factors are the flow and velocity of the receiving stream, the flow and velocity of the effluent, the slope of the stream, and other stream characteristics.

The *South Dakota Mixing Zone and Dilution Implementation Procedures* outlines an approach for modeling the mixing zone. Using these procedures, the 7Q5 is adjusted to account for the allowable ratio of flow available in the receiving stream. This adjusted flow represents the receiving stream flow rate (Q_u).

Table 3 summarizes the flow data and the determination of Q_u for Blind Creek.

Table 3: Critical Low Flow Values for Blind Creek

Season	7Q5 Low Flow (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q5	Allowable Ratio of 7Q5	Critical Low Flow Q_u (cfs)
January 1 – January 31	1.00	0.99	0.99	1.00	1.00
February 1 – February 29	1.00	0.99	0.99	1.00	1.00
March 1 – March 31	1.00	0.99	0.99	1.00	1.00
April 1 – April 30	1.00	0.99	0.99	1.00	1.00
May 1 – May 31	1.00	0.99	0.99	1.00	1.00
June 1 – June 30	1.00	0.99	0.99	1.00	1.00
July 1 – July 31	1.00	0.99	0.99	1.00	1.00
August 1 – August 31	1.00	0.99	0.99	1.00	1.00
September 1 – September 30	1.00	0.99	0.99	1.00	1.00
October 1 – October 31	1.00	0.99	0.99	1.00	1.00
November 1 – November 30	1.00	0.99	0.99	1.00	1.00
December 1 – December 31	1.00	0.99	0.99	1.00	1.00

There is no USGS station gage on the receiving stream, 1.0 cfs will be used as the critical low flow for all months in accordance with ARSD Section 74:51:01:30.

Topeka Shiners have been found in South Dakota’s James River, Missouri River, and Vermillion River watersheds. At this facility’s discharge location, the receiving stream has been identified as having a moderate probability of Topeka Shiners (U.S. Fish and Wildlife Service’s Topeka Shiner Probability Data GIS Layer, 2014), (U.S. Fish and Wildlife Service’s Topeka Shiner Range Map, 2023). Based on this information, Topeka Shiners are expected to be present in proximity of the discharge. The critical low flows proposed for effluent limits development in

this draft permit are protective of this endangered species, as the updated ammonia criteria (EPA 2013) were developed to protect a more sensitive mussel species.

DOWNSTREAM FLOW RATE (Q_d)

The downstream flow rate, Q_d, is simply the sum of the upstream flow rate (Q_u) and the effluent flow rate (Q_e). The downstream flow rate used for the calculation of the ammonia limits for the city of Beresford’s discharge into Blind Creek is summarized in Table 4 below.

CALCULATION OF AMMONIA LIMIT (C_e)

Each of the variables determined above is summarized in Table 4. Using the mass balance equation, the ammonia limits for the city of Beresford’s discharge into Blind Creek can be calculated as follows:

Equation 4: Mass Balance Equation

$$C_e = \frac{(Q_d * C_d) - (Q_u * C_u)}{Q_e}$$

The water quality-based effluent limits for ammonia for the city of Beresford’s discharge into Blind Creek are presented in Table 4.

Table 4: Variables Calculated for Mass Balance Equation

Season	C _u , mg/L	C _d , mg/L		Q _e , cfs	Q _d , cfs	C _e , mg/L	
		30-day Average	Daily Maximum			30-Day Average	Daily Maximum
January 1 – January 31	0.05	2.07	10.57	0.99	1.99	4.1	21.2
February 1 – February 29	0.10	2.07	10.57	0.99	1.99	4.1	21.1
March 1 – March 31	0.07	1.55	7.25	0.99	1.99	3.0	14.5
April 1 – April 30	0.05	0.99	5.38	0.99	1.99	1.9	10.8
May 1 – May 31	0.05	0.71	3.53	0.99	1.99	1.4	7.0
June 1 – June 30	0.05	0.63	3.01	0.99	1.99	1.2	6.0
July 1 – July 31	0.05	0.48	2.11	0.99	1.99	0.9	4.2
August 1 – August 31	0.05	0.52	2.32	0.99	1.99	1.0	4.6
September 1 – September 30	0.05	0.59	2.73	0.99	1.99	1.1	5.4
October 1 – October 31	0.05	1.50	9.13	0.99	1.99	3.0	18.3
November 1 – November 30	0.05	1.55	7.25	0.99	1.99	3.1	14.5
December 1 – December 31	0.05	1.80	8.77	0.99	1.99	3.6	17.6

The values in Table 5 indicate the limits that will be included for the city of Beresford.

Table 5: Draft Effluent Limits

Month	Calculated Effluent Limits	
	30-Day Average (mg/L)	Daily Maximum (mg/L)
January 1 – January 31	4.1	Report
February 1 – February 29	4.1	Report
March 1 – March 31	3.0	14.5
April 1 – April 30	1.9	10.8
May 1 – May 31	1.4	7.0
June 1 – June 30	1.2	6.0
July 1 – July 31	0.9	4.2
August 1 – August 31	1.0	4.6
September 1 – September 30	1.1	5.4
October 1 – October 31	3.0	18.3
November 1 – November 30	3.1	14.5
December 1 – December 31	3.6	17.6

ATTACHMENT 4

Water Quality Data

**WATER QUALITY DATA
WQM 4**

WQM data was obtained from the water quality monitoring station WQM 4. The period of the data is from January 13, 2010 through September 23, 2025. This data can be obtained at <https://www.waterqualitydata.us/portal/>.

SDDANR considers ammonia-nitrogen (as N) to have a reporting limit of 0.05 mg/L. For ammonia nitrogen values reported as “Below Detection,” “Present Below Quantification Limit,” or less than 0.05 mg/L, 0.05 mg/L was used calculations.

WQM 4 Data

January			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
01/13/2010	0.20	1.00	7.50
01/19/2011	0.11	1.00	7.80
01/05/2012	0.05	1.00	7.90
01/08/2013	0.05	1.00	8.00
01/14/2014	0.05	1.00	6.10
01/21/2015	0.05	1.00	7.90
01/06/2016	0.05	1.00	7.90
01/18/2017	0.14	1.00	7.90
01/10/2018	0.08	1.00	7.70
01/09/2019	0.15	1.00	7.60
01/08/2020	0.05	1.00	7.80
01/13/2021	0.05	1.00	7.90
01/04/2022	0.05	0.10	8.62
01/03/2024	0.05	0.20	9.30
01/06/2025	0.05	0.00	8.42
Average	0.08	0.82	7.89
50th Percentile	0.05	1.00	7.90
80th Percentile	0.12	1.00	8.08

February			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
02/17/2010	0.18	1.00	7.40
02/08/2011	0.14	1.00	7.50
02/14/2012	0.05	1.00	8.00
02/05/2013	0.05	1.00	7.80
02/11/2014	0.05	1.00	7.30
02/10/2015	0.05	1.00	7.90

February			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
02/09/2016	0.10	1.00	7.90
02/09/2017	0.43	1.00	7.80
02/07/2018	0.07	1.00	7.60
02/19/2019	0.10	1.00	7.80
02/10/2020	0.14	1.00	7.90
02/09/2021	0.05	1.00	7.90
02/16/2022	0.05	0.00	9.04
02/13/2024	0.57	0.20	7.99
02/25/2025	0.16	0.20	7.99
Average	0.15	0.83	7.85
50th Percentile	0.10	1.00	7.90
80 th Percentile	0.16	1.00	7.99

March			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
03/25/2010	0.15	7.00	7.60
03/15/2011	0.68	1.00	7.70
03/20/2012	0.05	16.00	8.00
03/12/2013	0.76	1.00	7.10
03/18/2014	0.71	1.00	7.10
03/10/2015	0.05	1.00	8.30
03/08/2016	0.07	10.00	8.10
03/07/2017	0.05	8.00	8.20
03/13/2018	0.91	1.00	7.90
03/20/2019	0.91	3.00	8.10
03/10/2021	0.05	8.00	8.50
03/14/2022	0.05	0.40	9.63
03/15/2023	0.78	0.70	7.89
03/05/2024	0.05	6.70	8.84
03/18/2025	0.05	10.60	8.64
Average	0.35	5.03	8.11
50th Percentile	0.07	3.00	8.10
80 th Percentile	0.76	8.40	8.53

April			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
04/13/2010	0.05	15.00	8.10
04/13/2011	0.05	12.00	8.10

April			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
04/03/2012	0.05	17.00	8.10
04/09/2013	0.05	9.00	8.50
04/08/2014	0.05	9.00	8.40
04/14/2015	0.05	13.00	8.20
04/05/2016	0.05	10.00	8.20
04/05/2017	0.05	11.00	8.40
04/24/2018	0.05	11.00	8.10
04/08/2019	0.12	13.00	7.90
04/08/2020	0.05	12.00	8.10
04/14/2021	0.05	8.00	8.60
04/12/2022	0.05	14.00	8.20
04/11/2023	0.94	8.50	7.88
04/08/2024	0.05	10.60	8.65
04/14/2025	0.05	13.90	8.37
Average	0.11	11.69	8.24
50th Percentile	0.05	11.50	8.20
80 th Percentile	0.05	13.90	8.40

May			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
05/19/2010	0.05	18.00	8.10
05/10/2011	0.05	19.00	8.00
05/08/2012	0.30	17.00	NS
05/14/2013	0.05	19.00	8.20
05/06/2014	0.05	15.00	8.20
05/13/2015	0.05	14.00	8.30
05/10/2016	0.05	17.00	8.10
05/03/2017	0.25	10.00	7.90
05/15/2018	0.05	15.00	8.20
05/09/2019	0.05	9.00	8.20
05/11/2020	0.05	11.00	8.20
05/04/2021	0.05	16.00	8.20
05/16/2022	0.05	22.40	8.66
05/23/2023	0.05	20.90	8.30
05/08/2024	0.05	16.20	8.14
05/12/2025	0.05	25.90	8.34
Average	0.08	16.59	8.20
50th Percentile	0.05	16.60	8.20
80 th Percentile	0.05	19.00	8.30

June			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
06/15/2010	0.05	20.00	7.40
06/14/2011	0.16	21.00	8.00
06/04/2012	0.05	22.00	8.00
06/11/2013	0.05	19.00	7.60
06/03/2014	0.05	22.00	8.00
06/10/2015	0.09	24.00	7.80
06/14/2016	0.05	24.00	8.20
06/06/2017	0.05	23.00	8.20
06/05/2018	0.05	22.00	8.10
06/04/2019	0.05	20.00	8.10
06/09/2020	0.05	24.00	8.00
06/02/2021	0.05	20.00	8.10
06/07/2022	0.05	21.50	8.47
06/06/2023	0.05	30.80	8.39
06/03/2024	0.10	22.90	7.78
06/09/2025	0.05	19.60	8.52
Average	0.06	22.24	8.04
50th Percentile	0.05	22.00	8.05
80 th Percentile	0.05	24.00	8.20

July			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
07/13/2010	0.05	25.00	7.70
07/12/2011	0.05	27.00	8.00
07/03/2012	0.05	27.00	8.10
07/09/2013	0.05	27.00	7.90
07/15/2014	0.05	20.00	8.00
07/13/2015	0.06	28.00	7.80
07/13/2016	0.05	24.00	7.90
07/11/2017	0.05	26.00	8.00
07/19/2018	0.05	25.00	8.10
07/23/2019	0.05	24.00	8.10
07/15/2020	0.05	24.00	8.00
07/06/2021	0.05	29.50	8.39
07/11/2022	0.05	30.00	8.39
07/06/2023	0.05	26.60	8.31
07/16/2024	0.05	25.60	8.22
07/07/2025	0.05	30.20	8.84
Average	0.05	26.18	8.11

July			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
50 th Percentile	0.05	26.30	8.05
80 th Percentile	0.05	28.00	8.31

August			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
08/10/2010	0.05	27.00	7.60
08/02/2011	0.05	30.00	8.30
08/07/2012	0.05	26.00	8.10
08/06/2013	0.05	23.00	8.00
08/12/2014	0.05	21.00	8.20
08/11/2015	0.05	24.00	8.10
08/09/2016	0.05	24.00	8.10
08/08/2017	0.05	21.00	8.10
08/07/2018	0.05	23.00	8.20
08/13/2019	0.05	25.00	8.10
08/11/2020	0.05	24.00	8.10
08/03/2021	0.05	22.30	8.30
08/02/2022	0.05	33.50	NS
08/08/2023	0.05	24.30	8.60
08/07/2024	0.05	23.80	8.28
08/05/2025	0.05	23.50	8.46
Average	0.05	24.71	8.17
50 th Percentile	0.05	24.00	8.10
80 th Percentile	0.05	26.00	8.30

September			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
09/08/2010	0.05	18.00	7.90
09/13/2011	0.05	20.00	8.30
09/11/2012	0.05	20.00	8.00
09/10/2013	0.05	25.00	NS
09/09/2014	0.05	20.00	8.00
09/09/2015	0.05	21.00	8.10
09/06/2016	0.05	23.00	8.00
09/13/2017	0.05	22.00	8.10
09/18/2018	0.05	23.00	8.10
09/11/2019	0.05	22.00	8.10
09/02/2020	0.05	20.00	8.00

September			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
09/15/2021	0.05	20.20	8.23
09/06/2023	0.05	24.70	8.33
09/18/2024	0.05	23.00	8.34
09/23/2025	0.05	23.20	8.50
Average	0.05	21.67	8.14
50th Percentile	0.05	22.00	8.10
80 th Percentile	0.05	23.04	8.31

October			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
10/13/2010	0.05	13.00	7.90
10/18/2011	0.05	9.00	8.20
10/17/2012	0.05	12.00	7.70
10/08/2013	0.05	12.00	8.10
10/07/2014	0.05	11.00	7.70
10/14/2015	0.05	12.00	8.00
10/11/2016	0.05	13.00	7.80
10/17/2017	0.05	10.00	7.50
10/03/2018	0.05	13.00	7.90
10/22/2019	0.05	8.00	8.20
10/14/2020	0.05	14.00	7.80
10/07/2021	0.05	19.10	9.00
10/15/2024	0.05	11.00	7.99
Average	0.05	12.08	7.98
50th Percentile	0.05	12.00	7.90
80 th Percentile	0.05	13.00	8.16

November			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
11/10/2010	0.05	9.00	8.30
11/08/2011	0.05	5.00	8.10
11/06/2012	0.05	5.00	8.00
11/13/2013	0.05	1.00	7.90
11/05/2014	0.05	7.00	NS
11/03/2015	0.05	9.00	8.10
11/14/2016	0.05	7.00	8.10
11/27/2017	0.05	4.00	8.30
11/08/2018	0.05	2.00	8.00

November			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
11/07/2019	0.05	1.00	8.00
11/19/2020	0.05	4.00	8.60
11/08/2021	0.05	8.40	8.90
11/07/2023	0.05	8.40	8.29
11/19/2024	0.05	7.10	8.28
Average	0.05	5.56	8.22
50th Percentile	0.05	6.00	8.10
80 th Percentile	0.05	8.40	8.30

December			
Date	Ammonia Nitrogen (as N) mg/L	Water Temperature °C	pH (s.u.)
12/07/2010	0.05	1.00	8.00
12/13/2011	0.05	1.00	8.00
12/04/2012	0.05	1.00	7.70
12/10/2013	0.05	1.00	7.90
12/09/2014	0.05	1.00	NS
12/08/2015	0.05	1.00	8.10
12/13/2016	0.05	1.00	8.00
12/07/2017	0.05	1.00	8.20
12/06/2018	0.05	1.00	8.00
12/12/2019	0.05	1.00	8.00
12/17/2020	0.05	1.00	8.40
12/13/2021	0.05	0.20	9.93
12/20/2023	0.05	1.30	8.70
12/09/2024	0.05	0.10	8.28
Average	0.05	0.90	8.25
50th Percentile	0.05	1.00	8.00
80 th Percentile	0.05	1.00	8.35

ATTACHMENT 5

Instream Hardness Data

Instream Hardness Data

WQM data was obtained from the water quality monitoring station WQM 4. The period of the data is from January 27, 2000 through April 14, 2015. This data can be obtained at <https://www.waterqualitydata.us/portal/>.

Sample Date	Hardness (as CaCO₃)
04/14/2015	1140
03/10/2015	860
02/10/2015	1200
01/21/2015	1000
12/09/2014	1020
11/05/2014	760
10/07/2014	880
09/09/2014	830
08/12/2014	827
07/15/2014	844
06/03/2014	991
05/06/2014	1010
04/08/2014	740
03/18/2014	360
02/11/2014	1100
01/14/2014	1000
12/10/2013	1220
11/13/2013	840
10/08/2013	760
09/10/2013	740
08/06/2013	805
07/09/2013	918
06/11/2013	621
05/14/2013	877
04/09/2013	620
03/12/2013	560
02/05/2013	1080
01/08/2013	1140
12/04/2012	970
11/06/2012	960
10/17/2012	880
09/11/2012	820
08/07/2012	802
07/03/2012	833
06/04/2012	925
05/08/2012	748

Sample Date	Hardness (as CaCO₃)
04/03/2012	840
03/20/2012	1000
02/14/2012	1100
01/05/2012	960
12/13/2011	1000
11/08/2011	840
10/18/2011	860
09/13/2011	780
08/02/2011	774
07/12/2011	767
06/14/2011	929
05/10/2011	855
04/13/2011	920
03/15/2011	640
02/08/2011	1220
01/19/2011	1260
12/07/2010	1180
11/10/2010	1200
10/13/2010	920
09/08/2010	860
08/10/2010	552
07/13/2010	658
06/15/2010	623
05/19/2010	1290
04/13/2010	1000
03/25/2010	580
02/17/2010	1020
01/13/2010	1190
12/16/2009	1380
11/17/2009	1180
10/20/2009	1020
09/14/2009	860
08/11/2009	887
07/21/2009	872
06/23/2009	1140
05/05/2009	1190
04/14/2009	1080
03/17/2009	800
02/11/2009	620
01/22/2009	1480
12/18/2008	1220

Sample Date	Hardness (as CaCO₃)
11/18/2008	1200
10/15/2008	860
09/23/2008	800
08/12/2008	839
07/16/2008	794
06/17/2008	727
05/20/2008	939
04/15/2008	1060
03/25/2008	680
02/20/2008	1140
01/08/2008	800
12/04/2007	1120
11/07/2007	920
10/10/2007	690
09/18/2007	940
08/21/2007	676
07/10/2007	781
06/05/2007	920
05/15/2007	667
04/12/2007	900
03/20/2007	480
02/21/2007	1080
01/09/2007	740
12/14/2006	1150
10/11/2006	890
09/26/2006	790
08/15/2006	862
07/18/2006	825
06/13/2006	887
05/09/2006	1020
04/11/2006	730
03/29/2006	1280
02/14/2006	1000
01/10/2006	1090
12/13/2005	920
11/22/2005	820
09/20/2005	750
08/30/2005	771
07/21/2005	749
06/14/2005	580
05/17/2005	1090

Sample Date	Hardness (as CaCO₃)
04/12/2005	1120
03/22/2005	1020
02/15/2005	720
01/12/2005	920
12/08/2004	960
11/08/2004	860
10/12/2004	720
09/07/2004	690
08/10/2004	704
07/13/2004	695
06/14/2004	867
05/19/2004	892
04/13/2004	1020
03/29/2004	1200
02/10/2004	940
01/21/2004	1090
12/02/2003	1000
11/18/2003	1010
10/06/2003	830
09/15/2003	810
08/20/2003	762
07/08/2003	377
06/11/2003	227
05/12/2003	1060
04/15/2003	960
03/18/2003	320
02/12/2003	1170
01/07/2003	930
12/10/2002	1100
10/16/2002	580
09/04/2002	610
08/05/2002	564
07/10/2002	645
06/18/2002	663
05/15/2002	857
04/08/2002	640
03/26/2002	980
02/11/2002	800
01/09/2002	980
12/18/2001	840
11/19/2001	660

Sample Date	Hardness (as CaCO₃)
10/11/2001	540
09/10/2001	660
08/13/2001	600
07/16/2001	650
06/11/2001	690
05/09/2001	430
04/23/2001	600
03/26/2001	240
02/20/2001	740
01/09/2001	740
12/04/2000	860
11/27/2000	940
08/23/2000	740
07/27/2000	723
06/27/2000	895
05/25/2000	746
04/24/2000	910
03/28/2000	820
01/27/2000	1020

Hardness Statistics	
Average	868.10
20th Percentile	698.60
50 th Percentile	860.00
80 th Percentile	1020.00

ATTACHMENT 6

Reasonable Potential Analysis

INTRODUCTION

The following reasonable potential analyses were completed to determine if parameters found in the city of Beresford's effluent have reasonable potential to violate the SDSWQS. SDDANR's reasonable potential analysis methodology is documented in *Reasonable Potential Implementation Procedure for SWD Permits* (2013). The following three criteria were used to determine the effluent limits and monitoring requirements.

Situation A:

- **If** the maximum value in the data set or the projected receiving water concentration is *greater* than the water quality standard,
- **Then** the permit writer determines there is reasonable potential for the water quality standards to be exceeded and an effluent limit is placed in the permit. No further calculations or analysis is needed.
- **Else**, go to Situation B.

Situation B:

- **If** the maximum value in the data set or the projected receiving water concentration is *greater than 50%* of the water quality standard,
- **Then** the permit writer determines there is no reasonable potential for the water quality standards to be exceeded and no effluent limit is needed, unless a need is indicated by the qualitative analysis. Routine monitoring requirements should be placed in the permit at a frequency commensurate with the size of the discharge.
- **Else**, go to Situation C.

Situation C:

- **If:** The maximum value in the data set or the projected receiving water concentration are *less than 50%* of the water quality standard,
- **Then:** The permit writer determines there is no reasonable potential for the water quality standards to be exceeded and no effluent limit or routine monitoring requirements should be placed in the permit unless a need for monitoring is indicated by the qualitative analysis.

REASONABLE POTENTIAL ANALYSIS METHODS

Metals

For metal analysis, all representative metals data was used for the analysis, in accordance with the *Reasonable Potential Implementation Procedure for SWD Permits*. The data submitted on the city of Beresford's DMRs from December 2020 to September 2025 were used.

The metals standards are stated in the SDSWQS, Appendix B of ARSD Chapter 74:51:01. The facility currently monitors the effluent for total recoverable aluminum [as Al], total recoverable antimony [as Sb], total recoverable arsenic [as As], total recoverable beryllium [as Be], total recoverable cadmium [as Cd], total recoverable chromium [as Cr], total recoverable copper [as Cu], total recoverable lead [as Pb], total mercury [as Hg], total recoverable molybdenum [as Mo], total recoverable nickel [as Ni], phenols, total recoverable selenium [as Se], total recoverable silver [as Ag], total recoverable thallium [as Tl], and total recoverable zinc [as Zn].

The SDSWQS does not have freshwater aquatic life criteria for aluminum, antimony, beryllium, molybdenum, phenols, and thallium. A reasonable potential analysis was not done for these parameters. The SDSWQS has freshwater aquatic life criteria for arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc. A reasonable potential analysis was done for these parameters.

In the SDSWQS, the aquatic life criteria for arsenic, cadmium, chromium (III), chromium (VI), copper, lead, mercury (acute), nickel, selenium, silver and zinc refer to the dissolved amount of each substance. However, the facility monitors these metals in the total recoverable form, in accordance with ARSD Section 74:52:03:16. To evaluate reasonable potential, the total dissolved criteria must be converted to the total recoverable criteria. The conversion factors used are provided in Appendix B of ARSD Chapter 74:51:01. The equations and conversion factors used are shown in Table 2.

Cadmium, chromium (III), copper, lead, nickel, silver, and zinc have hardness-dependent criteria. As hardness increases, the criteria become less stringent. The equations to calculate the criteria for hardness-dependent metals are provided in Appendix B of ARSD Chapter 74:51:01. The hardness value used was the 20th percentile of hardness at WQM 4 on the Vermillion River to ensure that the water quality standards are maintained during critical conditions. See Attachment 5 for more information. The calculations are shown in Table 2.

The acute selenium criterion is based on the fraction of total selenium that is selenite and selenate. To be conservative, 12.82 µg/L was used to evaluate reasonable potential for total recoverable selenium.

Receiving Stream Flow and Allowable Mixing

ARSD Section 74:51:01:30 specifies that surface water quality standards apply to low quality fishery waters when flows meet or exceed the minimum 7-day average low flow that can be expected to occur once every 5 years (7Q5).

South Dakota's water quality standards allow a zone of mixing for discharges. In accordance with the SDSWQS, chronic and acute ammonia water quality criteria must be met at the end of

the mixing zone. For other parameters, chronic water quality criteria must be met at the end of the mixing zone, and acute water quality criteria must be met at the point of discharge. The *South Dakota Mixing Zone and Dilution Implementation Procedures* outlines an approach for modeling the mixing zone. Using these procedures, the 7Q5 is adjusted to account for the allowable ratio of flow available in the receiving stream. This adjusted flow represents the receiving stream flow rate.

For the acute reasonable potential analysis, zero mixing was allowed. The acute criteria for metals must be met at the point of discharge.

For the chronic reasonable potential analysis, mixing was allowed based on the *South Dakota Mixing Zone and Dilution Implementation Procedures*. There was no USGS station on Blind Creek. Thus, 1.00 cfs was used as the critical receiving stream flow rate for the chronic reasonable potential analysis.

Instream Water Quality

Due to the lack of metals data at WQM 4, the instream water quality was assumed to be at the metals’ detection levels. The detection levels used were EPA Method 200.8, EPA Method 420.4, and Kelada 01. Table 1 below summarizes the detection levels used for metals.

Table 1: Assumed Detection Levels for Metals

Parameter	Assumed Method	Assumed Detection Level (µg/L)
Arsenic, total recoverable [as As]	EPA 420.4	0.005
Cadmium, total recoverable [as Cd]	EPA 200.8	1.0
Chromium, total recoverable [as Cr]	EPA 200.8	1.0
Copper, total recoverable [as Cu]	EPA 200.8	5.0
Cyanide, total [as CN]	EPA 200.8	10.0
Cyanide, weak acid, dissociable	Kelada 01	10.0
Lead, total recoverable [as Pb]	EPA 200.8	1.0
Mercury, total recoverable [as Hg]	EPA 200.8	0.2
Nickel, total recoverable [as Ni]	EPA 200.8	5.0
Selenium, total recoverable [as Se]	EPA 200.8	2.5
Silver, total recoverable [as Ag]	EPA 200.8	1.0
Zinc, total recoverable [as Zn]	EPA 200.8	5.0

Effluent Flow Rate

For the chronic reasonable potential analysis, 0.99 cfs was used for the effluent flow rate based on the projected average design flow for the city of Beresford’s upgraded WWTF. This value was determined to ensure that the water quality standards are maintained during critical conditions.

REASONABLE POTENTIAL ANALYSIS RESULTS

Situation A

The following parameters’ maximum value in the data set or highest reasonable potential concentration were greater than the SDSWQS. The metals listed below refer to the total recoverable form.

- Chronic
 - Total Recoverable Copper
- Acute
 - None

Effluent limits were developed for total recoverable copper in accordance with South Dakota’s *Reasonable Potential Implementation Procedure for SWD Permits*.

Situation B

The following parameter highest reasonable potential concentration was greater than 50% of the SDSWQS.

- Chronic
 - Total Recoverable Selenium
- Acute
 - Total Recoverable Copper

Situation C

The following parameters’ highest reasonable potential concentration were less than 50% of the SDSWQS. The metals listed below refer to the total recoverable form.

- Chronic
 - Total Recoverable Arsenic
 - Total Recoverable Cadmium
 - Total Recoverable Chromium
 - Total Recoverable Lead
 - Total Recoverable Mercury
 - Total Recoverable Nickel
 - Total Recoverable Zinc
- Acute
 - Total Recoverable Arsenic
 - Total Recoverable Cadmium
 - Total Recoverable Chromium
 - Total Recoverable Lead
 - Total Recoverable Mercury
 - Total Recoverable Nickel
 - Total Recoverable Selenium
 - Total Recoverable Silver
 - Total Recoverable Zinc

The current permit contains quarterly monitoring for the metals listed above. Monitoring for these metals will be removed in the draft permit.

REASONABLE POTENTIAL ANALYSIS CALCULATIONS

The equations used to convert between total dissolved and total recoverable criteria are shown below and were obtained from Appendix B of ARSD Chapter 74:51:01.

$$CCC = CF_c \times e^{mC[\ln(\text{hardness})-bc]}$$

$$CMC = CF_a \times e^{mA[\ln(\text{hardness})-bA]}$$

Where:

CCC = Criteria continuous concentration (chronic criteria)

CMC = Criteria maximum concentration (acute criteria)

CF_c = Conversion factor for chronic criteria from Appendix B of ARSD Chapter 74:51:01

CF_a = Conversion factor for acute criteria from Appendix B of ARSD Chapter 74:51:01

Hardness = 400 mg/L (See Attachment 4)

Table 2. Metals Criteria

Parameter	Conversion Factors		Total Dissolved Criteria		Total Recoverable Criteria	
	CF _c	CF _a	Chronic (CCC), µg/L	Acute (CMC), µg/L	Chronic (CCC), µg/L	Acute (CMC), µg/L
Arsenic [as As]	1.000	1.000	150	340	150	340
Cadmium [as Cd]	0.851	0.886	2.03	6.54	2.39	7.38
Chromium (III) [as Cr]	0.860	0.316	230.67	1773.30	268.22	5611.70
Chromium (VI) [as Cr]	0.962	0.982	11.00	16.00	11.43	16.29
Copper [as Cu]	0.960	0.960	29.28	49.62	30.50	51.68
Lead [as Pb]	0.589	0.589	10.94	280.85	18.58	476.82
Mercury [as Hg]	0.85	0.85	0.65	1.4	0.77	1.65
Nickel [as Ni]	0.997	0.998	168.04	1512.89	168.54	1515.92
Selenium [as Se]					5.0	12.82
Silver [as Ag]		0.85		34.91		41.07
Zinc [as Zn]	0.986	0.978	382.40	379.30	387.83	387.83

Table 3. Chronic Standards Reasonable Potential Analysis (RPA) for Metals

Statistics	Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Lead	Total Mercury	Total Nickel	Total Selenium	Total Zinc
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Number of Samples (n)	17	17	17	16	17	17	17	17	17
Mean	2.47	1.00	1.52	12.59	0.54	0.19	7.41	2.51	9.69
Variance	1.63	0.00	0.62	32.68	0.02	0.00	19.62	0.00	39.65
Standard Deviation	1.27	0.00	0.78	5.72	0.12	0.06	4.43	0.05	6.30
Minimum	0.01	1.00	1.00	10.00	0.50	0.10	3.00	2.50	5.00
Maximum	5.50	1.00	3.60	30.90	1.00	0.35	19.80	2.70	25.10
Coefficient of Variation	0.52	0.00	0.52	0.45	0.23	0.33	0.60	0.02	0.65
Multiplying factor	1.38	1.00	1.38	1.35	1.16	1.23	1.44	1.01	1.48
Calculations									
80 th Percentile Upstream Concentration	0.005	1.0	1.0	5.000	1.00	0.2	5.0	2.5	5.0
Is Mixing Granted for Parameter?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maximum Instream Concentration	2.74	1.00	2.29	17.88	1.00	0.27	12.36	2.60	15.00
Highest RP Concentration	3.77	1.00	3.15	24.15	1.16	0.34	17.78	2.63	22.15
SDSWQ Standard	150	2.39	11.43	30.5	18.58	0.77	168.54	5.00	387.83
Tests									
Is the Maximum Value > the SDSWQS?	No	No	No	No	No	No	No	No	No
Is the Highest RP Concentration > the SDSWQS?	No	No	No	No	No	No	No	No	No
Is the Maximum Value > 50% of SDSWQS?	No	No	No	Yes, RP	No	No	No	Yes, RP	No
Is the Highest RP Concentration > 50% of SDSWQS?	No	No	No	Yes	No	No	No	Yes	No
Decisions									
Current Chronic Limit	None	None	None	None	None	None	None	None	None
Proposed Chronic Limit	None	None	None	30.50	None	None	None	None	None
Current Monitoring Frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly
Proposed Monitoring Frequency	None	None	None	Quarterly	None	None	None	Quarterly	None
Limit & Monitoring Justification	RPA	RPA	RPA	RPA	RPA	RPA	RPA	RPA	RPA

Situation A: Maximum value or Highest RP concentration is > SDSWQS

Situation B: Highest RP concentration is > 50% of SDSWQS

Situation C: Highest RP concentration is <= 50% of SDSWQS

Table 4. Acute Standards Reasonable Potential Analysis (RPA) for Metals

Statistics	Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Lead	Total Mercury	Total Nickel	Total Selenium	Total Silver	Total Zinc
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Number of Samples (n)	17	17	17	16	17	17	17	17	17	17
Mean	2.47	1.00	1.52	12.59	0.54	0.19	7.41	2.51	1.00	9.69
Variance	1.63	0.00	0.62	32.68	0.02	0.00	19.62	0.00	0.00	39.65
Standard Deviation	1.27	0.00	0.78	5.72	0.12	0.06	4.43	0.05	0.00	6.30
Minimum	0.01	1.00	1.00	10.00	0.50	0.10	3.00	2.50	1.00	5.00
Maximum	5.50	1.00	3.60	30.90	1.00	0.35	19.80	2.70	1.00	25.10
Coefficient of Variation	0.52	0.00	0.52	0.45	0.23	0.33	0.60	0.02	0.00	0.65
Multiplying factor	1.38	1.00	1.38	1.35	1.16	1.23	1.44	1.01	1.00	1.48
Calculations										
Highest RP Concentration	7.57	1.00	4.95	41.73	1.16	0.43	28.47	2.73	1.00	37.07
SDSWQ Standard	340.00	7.38	16.29	51.68	476.82	1.65	1515.92	12.82	41.07	387.83
Tests										
Is the Maximum Value > the SDSWQS?	No	No	No	No	No	No	No	No	No	No
Is the Highest RP Concentration > the SDSWQS?	No	No	No	No	No	No	No	No	No	No
Is the Maximum Value > 50% of SDSWQS?	No	No	No	Yes	No	No	No	No	No	No
Is the Highest RP Concentration > 50% of SDSWQS?	No	No	No	Yes	No	No	No	No	No	No
Decisions										
Current Acute Limit	None	None	None	None	None	None	None	None	None	None
Proposed Acute Limit	None	None	None	51.70	None	None	None	None	None	None
Current Monitoring Frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly
Proposed Monitoring Frequency	None	None	None	Quarterly	None	None	None	Quarterly	None	None
Limit & Monitoring Justification	RPA	RPA	RPA	RPA	RPA	RPA	RPA	RPA	RPA	RPA

Situation A: Maximum value or Highest RP concentration is > SDSWQS

Situation B: Highest RP concentration is > 50% of SDSWQS

Situation C: Highest RP concentration is <= 50% of SDSWQS