STATEMENT OF BASIS

Applicant:	City of Canton
Permit Number:	SD0022489
Contact Person:	Sandi Lundstrom, Mayor Bill Winters, Director of Utilities 210 North Dakota Street Canton, SD 57103
Phone:	(605) 987-2881
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 and emergency discharge sampling requirements have been removed.
- Whole Effluent Toxicity (WET) tests have been added as a quarterly monitoring requirement with an effluent limit. See permit **Sections 3.8 and 3.9**.
- Effluent limits for ammonia are more stringent in some months. See permit **Section 3.8**.
- Monitoring units for water temperature have changed to °F. See permit **Section 3.8**.
- Monitoring for total nitrogen (as N) and total phosphorus (as P) once per discharge has been added. See permit **Section 3.8**.
- Influent and effluent monitoring, monitoring frequencies, and effluent limits for some metals have changed. See permit **Section 3.8**.
- An industrial waste survey must be submitted within 90 days of the effective date of this permit. See permit **Section 6.1**.
- BOD_5 and TSS effluent limits have changed from a mass-basis to a concentration-basis. See permit **Section 3.8**.

DESCRIPTION

The city of Canton operates a wastewater treatment facility located approximately ¾ mile east of the city in the North ½ of Section 19, Township 98 North, Range 48 West, in Lincoln County, South Dakota (Latitude 43.298551°, Longitude -96.564847°, Satellite Image Interpolation).

Canton's facility began operation in 1956. In 1980, the system was rebuilt and two additional cells were added. A new force main, main lift station, blowers, chlorine contact basin, and two aeration basins were added in 2010. The wastewater treatment facility consists of four area lift stations, one

main lift station, two aeration basins, a three-stage stabilization pond system containing four cells, and a chlorine contact chamber, with an average design flow of 0.4 million gallons per day (MGD).

Wastewater flows by gravity with assistance from 4 area lift stations to a main lift station which pumps wastewater through a 12-inch force main to two aeration basins with fine bubble diffusers that are each 0.4 acres. The wastewater then enters either Cell 1a or Cell 1b (both 15 acres in size) which can be run in parallel but in normal operation are run in series. Water can bypass Cell 1a and enter Cell 1b. Under normal operation, the water proceeds from Cell 1a to Cell 1b to Cell 2 and then Cell 3 (10.7 and 10.3 acres, respectively). Water is released from Cell 3 from two butterfly valves, flows through an ultrasonic flow meter and a weir and is discharged into the Big Sioux River through approximately 1500 feet of 24-inch pipe (Outfall 002).

Outfall 001 was an emergency bypass for the main lift station. This bypass is no longer used and has been permanently plugged. Outfall 001 will be removed from the draft permit.

This wastewater treatment facility serves a population of 3,066 persons (2020 census), with one significant industrial user contributing approximately 10-15% of the POTW's influent flow. Adam's Thermal is a metal finisher and has a pretreatment permit through SDDANR (SDPG00007). Because of the reasonable potential for the industry to discharge toxic amounts of metals, a reasonable potential analysis has been completed (Attachment 7).

RECEIVING WATERS

Any discharge from this facility will enter the Big Sioux River which is classified by the South Dakota Surface Water Quality Standards (SDSWQS), Administrative Rules of South Dakota (ARSD), Sections 74:51:03:01 and 74:51:03:07 for the following beneficial uses:

(5) Warmwater semipermanent fish life propagation waters;
(7) Immersion recreation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

The proposed discharge location is at the South Dakota-Iowa border. The Big Sioux River is classified by the Iowa Department of Natural Resources *Surface Water Classification, Water Quality Monitoring and Assessment* (7/24/2019) for the following water use designations:

(A1) Primary contact recreation uses;
(B-WW-1) Warmwater type 1; and
(HH) Human health.

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 been identified as being impaired for total suspended solids (TSS), pH, and *Escherichia coli* (*E. coli*) but a TMDL has not been completed yet and no wasteload allocation has been assigned to the city of Canton. The permit will be reopened, if necessary, to address the facility's wasteload allocation once the TMDL is completed.

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 Canton has been submitting Discharge Monitoring Reports (DMRs) as required under the current permit. As shown in Attachment 2, this facility has had one daily maximum total residual chlorine violation, one daily maximum pH violation, two 30-day average ammonia nitrogen violations, one daily maximum ammonia nitrogen violation, three daily maximum *Escherichia coli* (*E. coli*) violations, and two 30-day geometric mean *E. coli* violations since January 1, 2019. No discharge was reported for the months not included in the table.

One of the 30-day geometric mean *E. coli* violations is most likely reported incorrectly. During the March 2019 discharge, the duration reported was only 7 days. The 30-day geometric mean *E. coli* should have been reported as NODI 9, for not required.

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 Canton's wastewater treatment facility on June 13, 2024. The following comments and corrective actions were required

in order to come into compliance with the city of Canton's Surface Water Discharge (SWD) permit:

COMMENTS	REQUIRED CORRECTIVE ACTIONS
The permittee is inspecting their lift stations at least weekly and keeping records of their inspections. However, their inspection records lack some information as required by the permit. The field indicating whether an SSO is occurring is missing from the current inspection log. ***NOTE:*** *This was also noted in a previous inspection and was not corrected.*	According to **Section 3.4** of the SWD permit, at a minimum, the lift station notebook shall include the following: 1. Date and time of the inspection; 2. Name of the inspector(s); 3. Whether a sanitary sewer overflow is occurring or has occurred; 4. Identification of operational problems and/or maintenance problems; 5. Cleaning of screenings, if applicable; 6. Testing of alarms, if applicable; 7. Hour meter readings; 8. Recommendations, as appropriate, to remedy identified problems; 9. A brief description of any actions taken with regard to problems identified; and, Other information, as appropriate.
The permittee is not using the correct NODI code for reporting when monitoring is not required for a parameter. For 04/2024 and 03/2019 NR was not reported for *E. coli's* geometric mean. 5 samples are needed to take a geometric mean, but only 4 samples of *E. coli* were analyzed for 04/2024 and 03/2019.	If a parameter does not need to be monitored during a reporting period, "NR - Conditional Monitoring - Not Required" shall be reported on the DMR.
Calculation errors were found on the 04/2024 DMR. The following parameters were reported incorrectly: April 2024: *E. coli* (30-day geometric mean), BOD_5 (maximum 7-day average and 30-day average), TSS (maximum 7-day average and 30-day average) and Ammonia (30-day average) Additionally, the *E. coli* calculations for May 2019 were reviewed and it was found that the	According to Section 4.8 of the city of Worthing's permit, if the permittee becomes aware that it failed to submit any relevant facts in a permit application form, or submitted incorrect information in a permit application form or any report to the Secretary, it shall promptly submit such facts or information. Please review and resubmit your 04/2024 and 05/2024 DMRs to correct any calculation errors. If there are any questions as to how to perform

COMMENTS	REQUIRED CORRECTIVE ACTIONS
30-day geometric mean was calculated incorrectly.	a DMR calculation, you may reach out to DANR by calling (605) 773-3351.
The number of exceedances (No. EX) column is not being completed properly on the Discharge Monitoring Report (DMR) forms. **Number of exceedances were reported correctly for the 05/2022, 11/2023 and 04/2024 discharges.** **Number of exceedances were unreported, incorrectly reported or partially reported for the 05/2023, 06/2022, 11/2021, 04/2021, 10/2020, 04/2020, 10/2019, 05/2019, 03/2019, 08/2018, 06/2018 and 03/2018 discharges.**	If any sample result or calculated value exceeds the permit limits, it must be marked as an exceedance on the DMR. If there is no exceedance, "0" should be reported. If you have questions about filling out DMRs, please contact this office for assistance.
The incorrect units were reported for the metals and semi-annual Ag/Cu monitoring reports submitted for 06/2020 and 12/2020. The incorrect units were also reported for the metals report for 12/2023.	Results must be reported with the correct units specified on your permit. **Section 3.7** of your permit lists which units to use in reporting for metals monitoring.
The permittee has not monitored for parameters as required by the SWD permit. Arsenic was not sampled for in 2022.	According to **Section 3.7** of the SWD permit, Total Recoverable Arsenic must be monitored annually with a grab sample. This parameter shall be monitored and reported but does not have effluent limits associated with it. According to the permit, "The influent and effluent shall be sampled and analyzed as frequently as shown in the table above and the results reported on Discharge Monitoring Report Forms (EPA No. 3320-1)."
The permittee experienced the following effluent violations on the following dates: March 2019: Three daily maximum for *E. coli*, one 30-Day Average for Ammonia-Nitrogen (as N) May 2019: One daily maximum for *E. coli* October 2019: One daily maximum for total residual chlorine	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.

COMMENTS	REQUIRED CORRECTIVE ACTIONS
November 2021: One daily maximum for *E. coli* May 2023: Eight daily maximum for pH	
The permittee did not notify SDDANR of a permit violation in March 2019, May 2019 or November 2021 within 24 hours of becoming aware of the violation as required by the SWD permit.	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.
The permittee did not submit a written report to SDDANR of the circumstances regarding the effluent violations that occurred on March 2019, May 2019 or November 2021 as required by the SWD permit.	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." According to **Section 4.2** of the SWD permit, the written submission shall contain: 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 expected to continue if it has not been corrected; 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. According to **Section 4.2** of the SWD permit, the written report shall be submitted by **the 28th day of the following month**.

EFFLUENT LIMITS

Outfall 002 – Any discharge from the 24" pipe that flows from chlorine contact basin to the Big Sioux River (Latitude 43.296218°, Longitude -96.561531°, Navigational Quality GPS).

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), Iowa's water quality standards, the SDSWQS, permit writer's judgment, and the current permit limits.

1. The Five-Day Biochemical Oxygen Demand (BOD_5) 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 BOD_5 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 80 mg/L (30-day average) or 120 mg/L (7-day average). These limits are based on Iowa's water quality standards, Secondary Treatment Standards and the variance granted to the city of Canton during the current permit term 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. Iowa's Standards shall be used as the Big Sioux River is a boundary water between South Dakota and Iowa. Iowa's standards are more stringent than South Dakota's TSS variance.

3. The pH shall not be less than 6.5 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on warmwater semipermanent fish life propagation waters classification of the Big Sioux River and 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. The minimum pH required under the Secondary Treatment Standards is 6.0 standard units; the minimum pH required by the beneficial uses assigned to the Big Sioux River is 6.5 standard units. Therefore, the more stringent limit of 6.5 standard units shall be applied to this discharge to ensure compliance with both the Secondary Treatment Standards and 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 126 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 March 1 to November 30.*

   In addition, the *E. coli* organisms shall not exceed 235 per 100 milliliters in any one sample from March 1 to November 30.

These limits are based on the immersion recreation beneficial use classification (SDSWQS, ARSD Section 74:51:01:50) and the primary contact recreation uses classification (IAWQS, IAC, Environmental Protection, Chapter 61, Section 61.3(3), a(1)) of the Big Sioux River, 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 and the IAWQS.

Note: South Dakota's recreation season is May 1 to September 30, and Iowa's recreation season is March 15 to November 15. As effluent monitoring data is submitted on a monthly basis, the *E. coli* monitoring and effluent limits will be effective from March 1 to November 30. *E. coli* effluent monitoring will not be required from December 1 to February 29.

5. The Total Residual Chlorine (TRC) concentration in any one sample shall not exceed 0.019 mg/L. This limit is based on the warmwater marginal fish life propagation waters classification of the Big Sioux River and the SDSWQS (ARSD Section 74:51:01:55) and are being included because SDDANR has determined there is a reasonable potential for TRC to be present in the discharge at levels that may violate the SDSWQS. This limit is applicable only if the effluent is chlorinated.

Note: SDDANR considers the analytical detection limit for total residual chlorine to be 0.05 mg/L. If the effluent value is less than the analytical detection limit, "Below Detection Level" shall be used for reporting purposes.

6. The ammonia-nitrogen (as N) concentration shall not exceed the limits specified in the table below. These limits are based on the warmwater semipermanent fish life propagation waters classification of the Big Sioux River, the SDSWQS (ARSD Section 74:51:01:48), the current permit monitoring requirements, warm water – type 1 classification (IAWQS, IAC, Environmental Protection, Chapter 61, Section 61.3(3), b(6), and Tables 3a-3c) of the Big Sioux River 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. The pounds per day shall be calculated for each sample based on the concentration and the flow discharged (in MGD) using the following equation: Q x C x 8.346, where: Q = effluent flow in MGD; C = sample concentration in mg/L. See Attachment 3 for more detail.

Season	**Ammonia-Nitrogen (as N) Limits**	
	30-Day Average (lbs/day) [1]	**Daily Maximum (lbs/day)**
January 1 – January 31	157	157
February 1 – February 29	138	138
March 1 – March 31	69	120
April 1 – April 30	117	117
May 1 – May 31	157	157
June 1 – June 30	82	122

Season	Ammonia-Nitrogen (as N) Limits	
	30-Day Average (lbs/day) [1]	Daily Maximum (lbs/day)
July 1 – July 31	32	60
August 1 – August 31	18	41
September 1 – September 30	30	53
October 1 – October 31	46	46
November 1 – November 30	60	60
December 1 – December 31	74	74

[1] For non-continuous dischargers such as seasonal or intermittent, the 30-day average effluent limit is only applicable if 5 or more samples are taken. This applicability is based on the development of the chronic ammonia-nitrogen (as N) criteria that were adopted into the SDSWQS in 2021, which were calculated for a 30-day rolling average time period, with the additional restriction that the highest 4-day average calculated during the month can be no greater than 2.5 times the chronic criteria. For a short-term (acute) discharge that is sampled 4 times or less over two weeks, the daily maximum effluent limit assumed to be protective and the 30-day average effluent limit does not apply. For a long-term (chronic) discharge that is sampled 5 or more times over more than 2 weeks, both the 30-day average and daily maximum effluent limits are applicable. See the "Self Monitoring Requirements" section of this Statement of Basis for the sampling frequency requirements for this facility.

7. Acute Toxicity, as measured by the Whole Effluent Toxicity (WET) test, shall be less than 1.0 toxic unit (TU_a). This is equivalent to LC50 > 100%. This limit is based on the SDSWQS (ARSD Section 74:51:01:12), the *South Dakota WET Implementation Plan*, and permit writer's judgment.

8. 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 the Big Sioux River 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 EPA 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 EPA copper criteria from total recoverable to dissolved metals, SDDANR used EPA'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:

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

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 65 and calculated the 20th percentile of the daily maximum and 30-day average hardness data (see Attachment 4). For effluent limit development, SDDANR used a hardness value of 400 mg/L. The 20th percentile hardness at WQM 65 was calculated to be 440 mg/L. Using 40 CFR 131.36(b)(4) as guidance, the minimum hardness to be used in the equations above shall not be less than 25 mg/L, and the maximum hardness shall not exceed 400 mg/L. South Dakota, other states, and EPA have used this section of the CFR for guidance on determining hardness-based metals limits.

SDDANR has determined through a statistical analysis of the water quality data since 2015 that there is a reasonable potential for copper to be present in the discharge at levels that may violate the SDSWQS (see Attachments 2 and 7). 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.

9. The total recoverable mercury concentration shall not exceed 0.8 µg/L (30-day average) or 1.7 µg/L (daily maximum). These limits are based on the fish and wildlife propagation, recreation, and stock watering waters classification of the Big Sioux River, the SDSWQS (ARSD Sections 74:51:01:52 and 74:51:01:55 and Appendix B), and permit writer's judgement.

   The acute water quality criterion for mercury in the SDSWQS is based on dissolved mercury; the chronic water quality criterion for mercury in the SDSWQS is based on total recoverable mercury. The SDSWQS (Appendix B) and ARSD Section 74:52:03:16 require permit effluent limits to be expressed in terms of total recoverable metals. The acute standard was applied as the daily maximum limit and the chronic standard was applied as the 30-day average.

   SDDANR has determined through a statistical analysis of the water quality data since 2015 that there is a reasonable potential for mercury to be present in the discharge at levels that may violate the SDSWQS (see Attachments 2 and 7). Therefore, limits for mercury are included in the draft permit to ensure the discharge does not cause or contribute to a violation of the SDSWQS.

10. The free cyanide concentration shall not exceed 5.2 µg/L (30-day average) or 22 µg/L (daily maximum). These limits are based on the fish and wildlife propagation, recreation,

and stock watering waters classification of the Big Sioux River and the SDSWQS (ARSD Sections 74:51:01:52 and 74:51:01:55 and Appendix B).

The water quality criteria for cyanide in the SDSWQS is based on free cyanide, which is the form of cyanide that is bioavailable and known for its toxic effect on organisms.

SDDANR has determined through a statistical analysis of the water quality data there is a reasonable potential for cyanide to be present in the discharge at levels that may violate the SDSWQS (see Attachments 2 and 7). Therefore, limits for free cyanide are being included to ensure the discharge does not cause or contribute to a violation of the SDSWQS.

SDDANR considers the analytical detection limit for free cyanide to be 20 µg/L. If the effluent value is less than the analytical detection limit, "below detection level (NODI B)" shall be used for the 30-day average reporting purposes. If the effluent results are reported as "below detection", report the detection level for the daily maximum.

11. 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 Canton's discharge.

SELF MONITORING REQUIREMENTS

The draft permit requires the permittee to monitor all discharges for BOD_5 (mg/L), TSS (mg/L), pH (s.u.), ammonia-nitrogen (as N, mg/L), Acute Whole Effluent Toxicity (TU_a), total recoverable copper (µg/L), total mercury (µg/L), free cyanide (µg/L), total residual chlorine (mg/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 hardness (as $CaCO_3$, mg/L), total recoverable cadmium (µg/L), total recoverable selenium (µg/L), total cyanide (µg/L), influent total recoverable copper (µg/L), influent total recoverable mercury (µg/L), influent free cyanide (µg/L), influent total cyanide (µg/L), influent total recoverable cadmium (µg/L), influent total recoverable selenium (µg/L), total nitrogen (as N, mg/L), total phosphorus (as P, mg/L), total flow (million gallons), flow rate (MGD), 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.

If a single, continuous discharge's duration is less than or equal to three days, the permittee shall take one sample per day. For a single, continuous discharge that is greater than three days and less than or equal to seven days, three samples shall be taken during the discharge. For discharges greater than seven days, three samples shall be taken during the first seven days of the discharge and then one sample shall be taken per week of discharge after that. All of the samples collected during the 7-day or 30-day period are to be used in determining the averages. The permittee always has the option of collecting additional samples if appropriate.

Effluent monitoring results shall be summarized for each month, quarter, six months, and yearly basis and recorded on a DMR to be submitted via NetDMR to SDDANR on a **monthly**, **quarterly**, **semiannual**, **and annual** basis. If no discharge occurs during a month, it shall be stated as such on the DMR.

Monitoring shall consist of **monthly** 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. **Daily** inspections are required during a discharge. 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 WET testing is applicable to the city of Canton. Following the guidance document, the city of Canton has reasonable potential to cause or contribute to an exceedance of the SDSWQS for toxicity.

The city of Canton's current permit includes Acute WET testing and monitoring requirements; the facility currently monitors WET and has had no WET violations during the current permit cycle. Due to the potential presence of toxic compounds in the discharge, the draft permit will include WET monitoring and limits.

The *South Dakota WET Implementation Plan* was followed to determine the limits, sampling and monitoring frequency and types, dilution water, dilution series, hardness of the dilution water, test methods, test temperatures, and other WET testing procedures to use.

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 Canton has a design flow of less than 5.0 MGD, and no industries who are likely to cause pass through or interference with the POTW. Therefore, the draft permit will not require the city of Canton to develop an industrial pretreatment program. Any categorical industrial user (CIU) or significant industrial user (SIU) that discharges to the POTW will be permitted by the state. However, the city must still meet the requirements for regulating nondomestic sources of wastewater entering its system in accordance with the requirements of Section 6.0 of the draft permit.

SLUDGE

Based on the city of Canton'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 Canton is required to submit to SDDANR a sludge disposal plan for review and approval **prior** to the removal and disposal of sludge.

DRAINAGE ISSUES

Lincoln County has the authority to regulate drainage. The city of Canton is responsible for getting any necessary drainage permits from the county **prior** to discharging.

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 Canton's geographic area.

COUNTY	GROUP	SPECIES
Lincoln	Mammals	Northern Long-eared Bat

This information was accessible at the following US Fish and Wildlife Service website as of April 24, 2026: 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.

April 24, 2026

ATTACHMENT 1

Antidegradation Review

Permit Type: **Minor Municipal - Renewal** Applicant: **City of Canton**
Date Received: **6/13/2023** Permit #: **SD0022110**
County: **Lincoln** Legal Description: **N ½ of Sec 19, T98N, R48W**
Receiving Stream: **Big Sioux River** Classification: **5, 7, 8, 9, 10**
If the discharge affects a downstream waterbody with a higher use classification, list its name and uses: **None**

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 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: _____

Thomas Anderson — April 24, 2026
Permit Writer — Date

Kathleen Grigg — July 24, 2026
Reviewer — Date

ATTACHMENT 2

Monitoring Data

MONITORING DATA
SD0022489, City of Canton

The monitoring data was obtained from the facility's DMRs and retrieved through the ICIS database, accessed November 14, 2025. The period of the data is from January 1, 2019 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/

BD is Below Detection. Pollutant concentrations were too small to be measured.
NS is No Sample. No sample is available for these parameters.
Violations are bolded, shaded, and larger font.

Outfall 002, Effluent Gross

	BOD_5		**Total Residual Chlorine**	**Duration of Discharge**	***E. coli***	
	30-Day Average	**Maximum 7-Day Average**	**Daily Maximum**	**Month Total**	**30-Day Geometric Mean**	**Daily Maximum**
	mg/L	**mg/L**	**.019 mg/L**	**Days**	**126 #/100mL**	**235 #/100mL**
Mar 2019	7.8	7.8	0	7	**279**	**341**
May 2019	9	13	0	18	**284**	**1410**
Oct 2019	12.4	16.7	**3**	15	8.97	100
Apr 2020	31	38	0	11	< 10	< 10
Oct 2020	8.5	11	0	< 10	5.9	13.2
Apr 2021	24.25	35	0	11	2.3	6.2
Nov 2021	9.66	9.66	0	12	64.8	**240**
May 2022	14	15.7	NR	8	NR	7.4
Jun 2022	13	19	0	11	18.05	33.6
May 2023	16.13	20	0	11	4.21	12.2
Nov 2023	10.25	14	0	8	NR	NR
Apr 2024	23.8	32	0	13	NR	NR
Jun 2024	5.7	5.7	NR	10	NR	137
Jul 2024	7	8.5	NR	11	4.9	210
Nov 2024	< 5	< 5	NR	6	24.81	37.9
Apr 2025	23.4	28	0	17	7.47	11
Aug 2025	14.6	17	0	12	4.32	20.1

	Flow Rate		Total Flow	Ammonia-Nitrogen			
	30-Day Average	Daily Maximum	Month Total	30-Day Average		Daily Maximum	
	MGD	MGD	Million Gallons	Varies (lb/day)	mg/L	Varies (lb/day)	mg/L
Mar 2019	3.9	7.2	29.016	**272**	8.36	272	8.36
May 2019	2.2	2.88	44.8	34.8	1.454	58.8	2.45
Oct 2019	.79	1	13.24	24.95	3.4	64.77	35.3
Apr 2020	.72	.72	8.64	.78	.13	1.26	.21
Oct 2020	.0006	.864	8.496	.0007	.152	.0001	.22
Apr 2021	.95	1	10.44	7.17	.86	20.3	2.44
Nov 2021	.0008	.0008	12.7	.11	16.49	.009	1.41
May 2022	1.15	1.15	9.2	1.2	.16	4.2	.44
Jun 2022	1	1	11.1	40.22	4.83	48.21	5.78
May 2023	1.98	3.6	15.83	17.18	1.57	27.53	2.87
Nov 2023	1.52	1.296	8.03	.67	.076	.76	.12
Apr 2024	1.15	1.22	14.97	.67	.083	1.53	.15
Jun 2024	2.6	3.5	25.7	**147.9**	6.9	**156**	7.3
Jul 2024	1.5	2.3	16.5	32.5	2.6	58.8	4.7
Nov 2024	1.284	1.512	7.704	3.432	.29	5.404	.45
Apr 2025	.89	1.15	15.173	19.15	2.58	51.31	5.35
Aug 2025	.87	1.08	10.405	.65	.13	1.86	.37

	pH		TSS		Water Temperature	
	Daily Minimum	Daily Maximum	30-Day Average	Maximum 7-Day Average	30-Day Average	Daily Maximum
	6.5 SU	9 SU	mg/L	mg/L	deg C	deg C
Mar 2019	7.66	7.81	7.2	7.2	6.5	8.2
May 2019	6.77	8.78	12.6	30	17.7	21.3
Oct 2019	7.55	8.15	46.3	44	17.76	18.5
Apr 2020	8.5	8.8	71	81.3	8	11.3
Oct 2020	8.5	8.7	16.25	21	12.9	16.8
Apr 2021	8.7	8.8	32	34	12.6	15.7
Nov 2021	8.11	8.46	16	20.3	5.7	6.4
May 2022	8.7	8.9	25.8	31.3	12.7	18.3
Jun 2022	8.02	8.12	7.5	14	25.7	29.2
May 2023	9.13	**9.61**	31.75	44	14.9	19.8
Nov 2023	7.15	7.8	12.5	19	7.35	8.5
Apr 2024	8.9	8.98	59.5	68	11.18	14.7
Jun 2024	7.9	8	6.8	7	26.6	28

	pH		TSS		Water Temperature	
	Daily Minimum	Daily Maximum	30-Day Average	Maximum 7-Day Average	30-Day Average	Daily Maximum
	6.5 SU	9 SU	mg/L	mg/L	deg C	deg C
Jul 2024	8.3	8.7	13.2	15	24.6	26
Nov 2024	8.07	8.14	12	15	6.89	7.9
Apr 2025	8.57	8.89	40.8	56	7.1	11.2
Aug 2025	8.91	8.94	40.8	54	23.9	25.6

	BOD_5		TSS	
	30-Day Average	Maximum 7-Day Average	30-Day Average	Maximum 7-Day Average
	465 lb/d	698 lb/d	1241 lb/d	1862 lb/d
Mar 2019	253.7	253.7	234.1	234.1
May 2019	165	312	231	720
Oct 2019	25.22	78.9	308.2	315.6
Apr 2020	186	228	426	488
Oct 2020	.042	.055	.081	.105
Apr 2021	202.24	231	266.88	283.56
Nov 2021	.06	.06	.107	.135
May 2022	134.3	150.6	247.4	300.2
Jun 2022	108.42	158.46	75.06	116.76
May 2023	249.69	378.3	562.8	1261.01
Nov 2023	93.98	118.9	112.29	129.7
Apr 2024	227.79	325.59	570.66	570.66
Jun 2024	122.2	122.2	145.7	150
Jul 2024	87.6	106.3	165.1	187.7
Nov 2024	53.678	61.549	130.478	184.647
Apr 2025	173.69	268.55	302.84	537.1
Aug 2025	73.3	85.4	204.85	271.1

	Total Recoverable Copper	Total Recoverable Silver
	Daily Maximum	Daily Maximum
	ug/L	ug/L
Jun 2019	< .02	< .3
Dec 2019	< .02	< .34
Jun 2020	< .1	< 1
Dec 2020	< .1	< 1

	Total Recoverable Copper	Total Recoverable Silver
	Daily Maximum	Daily Maximum
	ug/L	ug/L
Jun 2021	.02	< 1
Dec 2021	19.9	< 1
Jun 2022	11.1	< 1
Dec 2022	11.1	< 1
Jun 2023	< 10	< 1
Dec 2023	11.9	< 1
Jun 2024	13.3	< 1
Dec 2024	10.9	< 1
Jun 2025	< 10	< 1
Dec 2025	10.1	< 1

	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
	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2019	< .4	.012	< .5	< .3	< .5
Dec 2020	< 1	< .005	< 1	< 1	< 1
Dec 2021	< 1	< .005	< 1	< 1	3
Dec 2022	BD	NS	1.9	1.6	1.6
Dec 2023	< 1	< 2.5	< 1	< 1	2.4
Dec 2024	< 1	< 2.5	< 1	< 1	1.7

	Total Cyanide	WAD Cyanide	Total Recoverable Lead	Total Recoverable Mercury	Total Recoverable Molybdenum
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2019	< .01	< .01	< .3	.2	6.6
Dec 2020	.014	.01	< .5	.2	3.7
Dec 2021	< .01	< .01	< .5	.21	4.8
Dec 2022	.00001	.00001	< .05	BD	6.4
Dec 2023	< .01	< .01	< .5	< .2	4.5
Dec 2024	< .01	< .01	.56	< .2	9.4

	Total Recoverable Nickel	Total Phenols	Total Recoverable Selenium	Total Recoverable Thallium	Total Recoverable Zinc
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2019	3.1	< .05	< 1	< .1	8
Dec 2020	4.8	< .05	< 2.5	< .5	29.1
Dec 2021	3.9	< .01	< 2.5	< .5	< 15
Dec 2022	4.4	BD	BD	< .5	5.2
Dec 2023	3.7	< .05	< 2.5	< .5	< 5
Dec 2024	8	< .05	< 2.5	< .5	11.5

	Acute WET, Ceriodaphnia dubia	Acute WET, Pimephales promelas [Fathead Minnow]
	Daily Maximum	Daily Maximum
	tox acute	tox acute
Dec 2019	< 1	< 1
Dec 2020	0	0
Dec 2021	0	0
Dec 2022	< 1	< 1
Dec 2023	< 1	< 1
Dec 2024	< 1	< 1
Dec 2025	< 1	< 1

Outfall 002, Influent Gross

	Total Recoverable Copper	Total Recoverable Silver
	Daily Maximum	Daily Maximum
	ug/L	ug/L
Jun 2019	.03	< .3
Dec 2019	.07	< .34
Jun 2020	.12	1.2
Dec 2020	.12	1.2
Jun 2021	.1	< 1
Dec 2021	107	< 1
Jun 2022	49.4	1.5
Dec 2022	49.4	1.5
Jun 2023	72	< 1

	Total Recoverable Copper	Total Recoverable Silver
	Daily Maximum	Daily Maximum
	ug/L	ug/L
Dec 2023	95.3	1
Jun 2024	68.9	< 1
Dec 2024	104	< 1
Jun 2025	51.1	< 1
Dec 2025	29.8	< 1

	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
	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2019	< .4	.012	< .5	< .3	< .5
Dec 2020	< 1	< .005	< 1	< 1	< 1
Dec 2021	< 1	< .005	< 1	< 1	2.3
Dec 2022	BD	NS	BD	BD	< 1
Dec 2023	1	< 2.5	< 1	< 1	2.8
Dec 2024	< 1	< 2.5	< 1	< 1	1.6

	Total Cyanide	WAD Cyanide	Total Recoverable Lead	Total Recoverable Mercury	Total Recoverable Molybdenum
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2019	< .01	< .01	< .3	.2	3.7
Dec 2020	< .01	< .01	.96	.3	3
Dec 2021	< .01	< .01	1.1	< .1	9.5
Dec 2022	.0001	.00001	.59	BD	2.7
Dec 2023	< .01	< .01	1	< .2	2.3
Dec 2024	< .01	< .01	.53	< .2	3.3

	Total Recoverable Nickel	Total Phenols	Total Recoverable Selenium	Total Recoverable Thallium	Total Recoverable Zinc
	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum	Daily Maximum
	ug/L	ug/L	ug/L	ug/L	ug/L
Dec 2019	5.3	< .05	8.2	< .1	26.7
Dec 2020	5.6	< .05	4.7	< .5	74.2
Dec 2021	4.2	< .05	2.7	< .5	70.2
Dec 2022	6.6	BD	6.6	< .5	55.9
Dec 2023	5.3	< .05	4.9	< .5	47.5
Dec 2024	11.6	< .05	4.9	< .5	39.6

ATTACHMENT 3

Ammonia Limits Development
for the
Canton Treatment Facility

in the Big Sioux River
near
Canton, South Dakota

Prepared by

South Dakota Department of Agriculture and Natural Resources

April 2026

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 and Iowa have 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 Canton's wastewater treatment facility (WWTF). These limits will ensure the surface water quality standards for the Big Sioux River near Canton are maintained and protected.

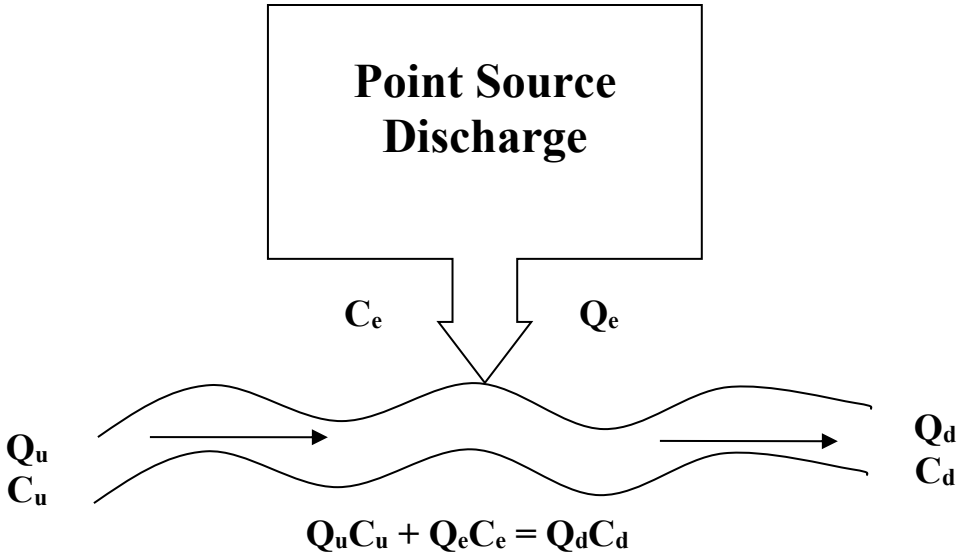
Developing the ammonia limits for the city of Canton is a matter of determining the maximum level of ammonia that can be present in the Big Sioux River without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) and the Iowa Water Quality Standards (IAWQS) for ammonia to be exceeded.

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 Canton:

Figure 1: Mass Balance of Receiving Stream



Where:

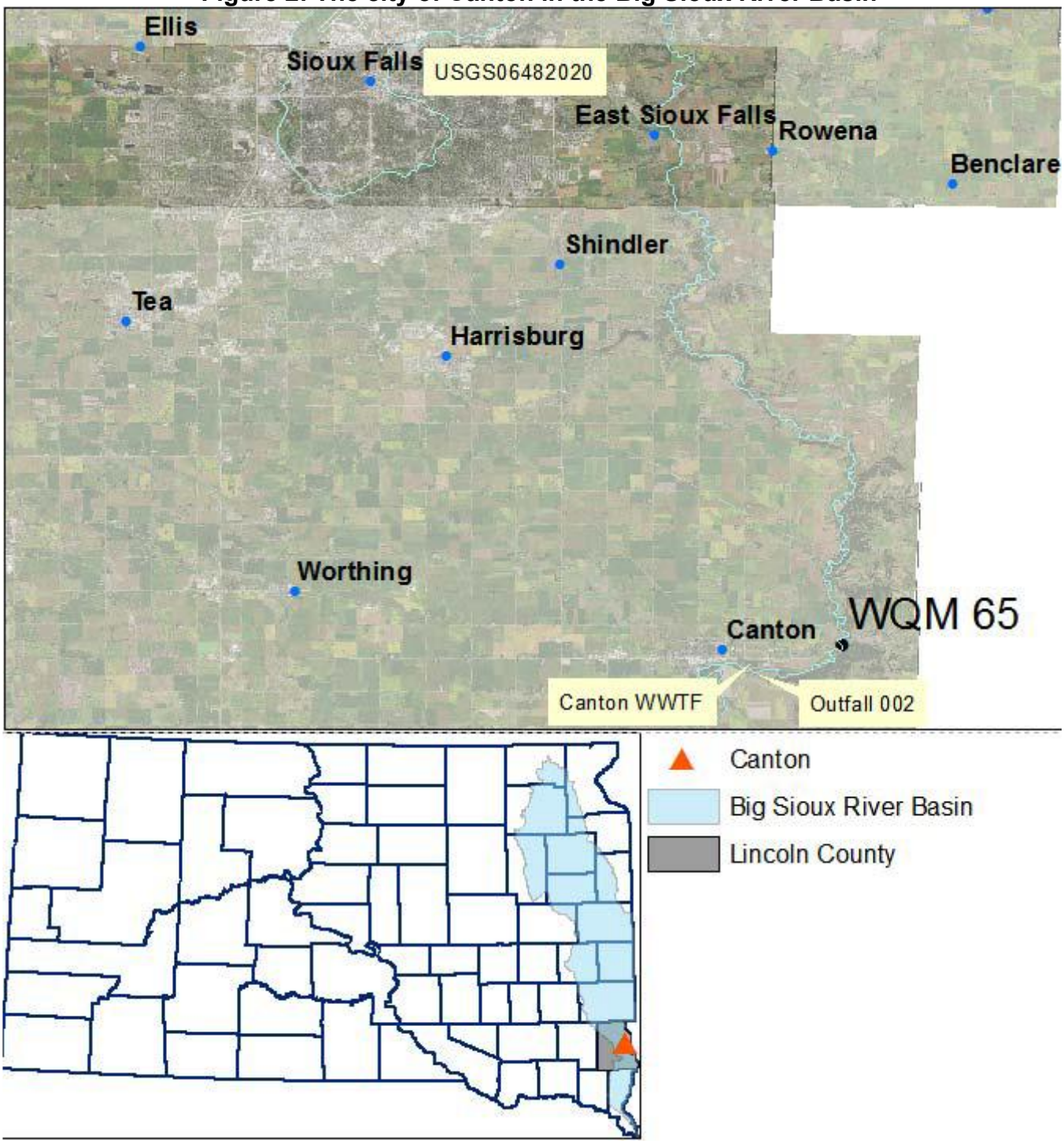
- Q_u = Receiving stream flow, in cubic feet per second (cfs);
- C_u = Ambient upstream ammonia concentration, in milligrams per liter (mg/L);
- Q_e = Effluent discharge flow rate, in cfs;
- C_e = Water quality based effluent limit for ammonia in mg/L;
- Q_d = Downstream flow (equal to $Q_u + Q_e$), 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 Canton's discharge into the Big Sioux River.

GEOGRAPHICAL EXTENT

The Big Sioux River is located in the Big Sioux River Basin in the southeastern portion of the state. The Big Sioux River Basin drains approximately 5,382 square miles of land in South Dakota, which is comprised largely of cropland. Figure 2 shows the Big Sioux River near Canton.

Figure 2: The city of Canton in the Big Sioux River Basin



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 Canton's discharge into the Big Sioux River 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. The Big Sioux River is classified for the following beneficial uses:

(5) Warmwater semipermanent fish life propagation waters;
(7) Immersion recreation waters;
(8) Limited-contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

The proposed discharge location is at the South Dakota-Iowa border. The Big Sioux River is classified by the Iowa Department of Natural Resources *Surface Water Classification, Water Quality Monitoring and Assessment* (7/24/2019) for the following water use designations:

(A1) Primary contact recreation uses;
(B-WW-1) Warmwater type 1; and
(HH) Human health.

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 the Big Sioux River.

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 the Big Sioux River, 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):

South Dakota Equations (2013)

Equation 1: Daily Maximum (Salmonids present)

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

Equation 2: Daily Maximum (Salmonids NOT present)

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

Equation 3: 30-day Average

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

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 $23.12 \text{ x } 10^{0.036 \text{ x } (20-T)}$, whichever is the smaller value
MAX	=	use either the water temperature (T) for the sample or 7, whichever is the greater value

Iowa Equations (1999)

Equation 1 (IA): Daily Maximum (Salmonids present)

$$Cd = \frac{0.275}{(1+10^{(7.204-pH)})}+\frac{39.0}{(1+10^{(pH-7.204)})}$$

Equation 2 (IA): Daily Maximum (Salmonids NOT present)

$$Cd = \frac{0.411}{(1+10^{(7.204-pH)})}+\frac{58.4}{(1+10^{(pH-7.204)})}$$

Equation 3 (IA): 30-day Average (Early Life Stages Present)

$$Cd = \left[\frac{0.0577}{(1+10^{(7.688-pH)})}+\frac{2.487}{(1+10^{(pH-7.688)})}\right]\times MIN\left(2.85, 1.45\times 10^{0.028(25-T)}\right)$$

Equation 4 (IA): 30-day Average (Early Life Stages Absent)

$$Cd = \left[\frac{0.0577}{(1+10^{(7.688-pH)})} + \frac{2.487}{(1+10^{(pH-7.688)})} \right] \times [1.45 \times 10^{0.028((25-MAX(T,7))}]$$

pH = the pH of the water quality sample in standard units
T = the water temperature of the sample in degrees Centigrade
MIN = use either 2.85 or the value of $1.45^{0.028*(25-T)}$, 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 Canton, equations 2 and 3 will be used to determine the instream ammonia concentration, C_d, allowed in the Big Sioux River. 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 and the current permit seasons.

The Iowa Administrative Code includes tables with ammonia standards calculated based on pH and temperature, as applicable (IAWQS, IAC, Environmental Protection, Chapter 61, Tables 3a-3c). The values in these tables can be replicated using Iowa equation 2 (IAWQS Table 3a), Iowa equation 3 (IAWQS Table 3b), and Iowa equation 4 (IAWQS Table 3c), and are equivalent to the previous SDSWQS that were based on the 1999 ammonia criteria.

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 153 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 Big Sioux River. A description of the station is listed below. Figure 2 denotes the location of WQM 65.

WQM 65	At east-west US Highway 18 bridge 3 miles east of Canton (Latitude 43.306982°, Longitude -96.528455°, Satellite Image Interpolation).

Ambient water temperature, pH, and ammonia data at WQM 65 were obtained to represent instream conditions. The water quality information obtained from WQM 65 is presented in Attachment 4. The pH and temperature data are summarized in Tables 1 and 2 below.

Calculation of Allowable Instream Ammonia Concentration (C_d)

The SDSWQS and IAWQS specify the total ammonia concentration that is allowed at a given pH and temperature. The 80th percentile of the pH and temperature at WQM 65 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. Tables 1 and 2 summarize the allowable instream ammonia (C_d) for the Big Sioux River.

Table 1: Allowable Instream Total Ammonia Concentrations for the Big Sioux River (2013 EPA Ammonia Criteria, South Dakota)

Season	Temperature (°C)	pH (s.u.)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January	1.00	8.28	1.16	5.11
February	1.00	8.32	1.09	4.73
March	7.12	8.39	0.96	4.13
April	12.80	8.78	0.35	1.61
May	19.82	8.72	0.24	1.00
June	27.00	8.70	0.16	0.57
July	28.00	8.80	0.13	0.44
August	27.12	9.02	0.10	0.33
September	24.96	8.88	0.14	0.50
October	16.50	8.98	0.20	0.85
November	10.50	8.84	0.37	1.76
December	2.00	8.70	0.57	2.30

Table 2: Allowable Instream Total Ammonia Concentrations for the Big Sioux River (1999 EPA Ammonia Criteria, Iowa)

Season	Temperature (°C)	pH (s.u.)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January	1.00	8.28	2.56	4.90
February	1.00	8.32	2.39	4.53
March	7.12	8.39	1.31	3.96
April	12.80	8.78	0.68	1.91
May	19.82	8.72	0.53	2.13
June	27.00	8.70	0.35	2.20
July	28.00	8.80	0.28	1.84
August	27.12	9.02	0.21	1.28
September	24.96	8.88	0.30	1.61
October	16.50	8.98	0.44	1.37
November	10.50	8.84	0.80	1.72
December	2.00	8.70	1.26	2.20

AMBIENT AMMONIA CONCENTRATION (C_u)

The ammonia data at WQM 65 was reviewed to determine the ambient water quality in the Big Sioux River. The 80th percentile of the ammonia data was determined to ensure the ammonia standards are maintained during critical conditions. The ammonia data from WQM 65 is presented in Attachment 4. Table 3 below summarizes the 80th percentile ammonia data for each season. This data represents the ambient ammonia concentration for the Big Sioux River (C_u).

Table 3: Ambient Ammonia Data for the Big Sioux River

Season	Ammonia (mg/L)
January	0.16
February	0.16
March	0.79
April	0.20
May	0.05
June	0.05
July	0.05
August	0.05
September	0.05
October	0.05
November	0.05
December	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 Canton, 4.27 cfs was used for Q_e based on the 80th percentile of the daily maximum flows submitted by the city via NetDMR. This will ensure the ammonia standards are maintained during critical conditions. See Attachment 5 for more details.

Tables 4 and 5 summarize 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.

The IAWQS (IAC, Environmental Protection, Chapter 61, Section 61.2(5)) specify that the water quality standards apply when the flow of the receiving stream equals or exceeds 1Q10 for acute ammonia criteria, and 30Q10 for chronic criteria. The 1Q10 is the minimum daily low flow that can be expected to occur once every 10 years, and the 30Q10 is the minimum 30-day low flow that can be expected to occur every 10 years.

The monthly 7Q5, 1Q10, and 30Q10 flows were determined using data retrieved from the USGS gauging station 06482020 and a Log Pearson type III statistical analysis. The seven-day averages are calculated for the entire data set. After the averages are calculated, the data is split into the selected seasons. Analysis is then done in accordance with the EPA guidance document *Technical Guidance Manual for Performing Wasteload Allocation* to determine the seasonal 7Q5, 1Q10, and 30Q10 flow. A description of the station is listed below. Figure 2 denotes the location of the USGS gauging station.

USGS 06482020	The USGS gaging station at north-south bridge on North Cliff Avenue over the Big Sioux River located approximately 4.2 miles above the Sioux Falls WRF (Latitude 43.566922°, Longitude -96.711236°, USGS coordinates)

The SDSWQS and IAWQS allow a zone of mixing for discharges. In accordance with the SDSWQS and IAWQS, 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).

The IAWQS (IAWQS, IAC, Environmental Protection, Chapter 61, Sections 61.2(4), e(1)3 and 61.2(4), f(3)) specify the allowable mixing for the acute and chronic ammonia criteria. Using Iowa's procedures, the mixing zone for the city of Canton's WWTF at this location would allow 2.5% of the monthly 1Q10 for acute effluent limits, and 25% of the monthly 30Q10 for chronic effluent limits.

The Sioux Falls Wastewater Reclamation Facility (SFWRF) is a major discharging facility that has an average design flow of 30.1 MGD (46.6 cfs). Because USGS 06482020 is located 4.2 miles upstream of the city of Sioux Falls' outfall, this additional flow will be taken into consideration and added to the low flow values.

To meet both South Dakota's and Iowa's surface water quality standards, the low flow statistic plus the Sioux Falls WRF average effluent flow combination will be used to calculate the water-quality based effluent limit for each month. These adjusted flows represent the receiving streamflow rate (Qu). For acute ammonia, Qu values are 2.5% of the 1Q10 for every month. For chronic ammonia, Qu values are 50% of the 7Q5 for every month.

Table 3 and Attachment 6 summarize the flow data and the determination of Q_u for the Big Sioux River.

Table 4: 7Q5 Critical Low Flow Values for the Big Sioux River

Season	7Q5 Low Flow (cfs) + SFWRF (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q5	Allowable Ratio of 7Q5	Critical Low Flow Q_u (cfs)
January	91.13	4.27	0.05	0.50	45.56
February	78.95	4.27	0.05	0.50	39.48
March	102.68	4.27	0.04	0.50	51.34
April	487.59	4.27	0.01	0.50	243.80
May	544.03	4.27	0.01	0.50	272.02
June	414.26	4.27	0.01	0.50	207.13
July	143.77	4.27	0.03	0.50	71.89
August	125.65	4.27	0.03	0.50	62.82
September	113.30	4.27	0.04	0.50	56.65
October	125.01	4.27	0.03	0.50	62.51
November	148.55	4.27	0.03	0.50	74.28
December	105.67	4.27	0.04	0.50	52.83

Table 5: 1Q10 Acute Critical Low Flow Values for the Big Sioux River

Season	1Q10 Low Flow (cfs) + SFWRF (cfs)	Effluent Flow (cfs)	Ratio of Effluent to Low Flow	Allowable Ratio of Low Flow for Mixing	Critical Low Flow Q_u (cfs)
January	67.69	4.27	0.06	0.03	1.69
February	58.75	4.27	0.07	0.03	1.47
March	68.16	4.27	0.06	0.03	1.70
April	319.07	4.27	0.01	0.03	7.98
May	384.46	4.27	0.01	0.03	9.61
June	245.52	4.27	0.02	0.03	6.14

Season	1Q10 Low Flow (cfs) + SFWRF (cfs)	Effluent Flow (cfs)	Ratio of Effluent to Low Flow	Allowable Ratio of Low Flow for Mixing	Critical Low Flow Q_u (cfs)
July	76.07	4.27	0.06	0.03	1.90
August	75.60	4.27	0.06	0.03	1.89
September	74.55	4.27	0.06	0.03	1.86
October	77.47	4.27	0.06	0.03	1.94
November	89.71	4.27	0.05	0.03	2.24
December	75.84	4.27	0.06	0.03	1.90

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 not 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 Canton's discharge into the Big Sioux River is summarized in Tables 6 and 7 below.

CALCULATION OF AMMONIA LIMIT (C_e)

Each of the variables determined above is summarized in Tables 6 and 7. Using the mass balance equation, the ammonia limits for the city of Canton's discharge into the Big Sioux River can be calculated as follows:

Equation 4: Mass Balance Equation

$$Ce = \frac{(Qd * Cd) - (Qu * Cu)}{Qe}$$

The water quality-based effluent limits for ammonia for the city of Canton's discharge into the Big Sioux River are presented in Tables 6 and 7.

Table 6: 7Q5 Acute and Chronic 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	0.16	1.16	5.11	4.27	49.83	**11.9**	**58.0**
February	0.16	1.09	4.73	4.27	43.75	**9.7**	**47.0**
March	0.79	0.96	4.13	4.27	55.61	**3.0**	**44.3**
April	0.20	0.35	1.61	4.27	248.07	**8.7**	**82.2**
May	0.05	0.24	1.00	4.27	276.29	**12.6**	**61.7**
June	0.05	0.16	0.57	4.27	211.40	**5.4**	**25.9**
July	0.05	0.13	0.44	4.27	76.16	**1.4**	**7.0**
August	0.05	0.10	0.33	4.27	67.09	**0.8**	**4.5**
September	0.05	0.14	0.50	4.27	60.92	**1.3**	**6.4**
October	0.05	0.20	0.85	4.27	66.78	**2.4**	**12.5**
November	0.05	0.37	1.76	4.27	78.55	**5.9**	**31.5**
December	0.05	0.57	2.30	4.27	57.10	**7.1**	**30.1**

Table 7: 1Q10 Acute 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
		Daily Maximum			Daily Maximum
January	0.16	5.11	4.27	5.96	**6.8**
February	0.16	4.73	4.27	5.74	**6.0**
March	0.79	4.13	4.27	5.97	**5.2**
April	0.20	1.61	4.27	12.25	**5.1**
May	0.05	1.00	4.27	13.88	**6.8**
June	0.05	0.57	4.27	10.41	**5.3**
July	0.05	0.44	4.27	6.17	**2.6**
August	0.05	0.33	4.27	6.16	**1.8**
September	0.05	0.50	4.27	6.13	**2.3**
October	0.05	0.85	4.27	6.21	**2.0**
November	0.05	1.76	4.27	6.51	**2.6**
December	0.05	2.30	4.27	6.17	**3.2**

The calculated water-quality based effluent limits for each low flow criteria were compared, and the most stringent effluent concentrations are presented in Table 8 below.

Table 8: Most Stringent Effluent Concentrations

Season	C_e, mg/L	
	30-Day Average	Daily Maximum
January	**11.9**	**6.8**
February	**9.7**	**6.0**

Season	C_e, mg/L	
	30-Day Average	Daily Maximum
March	**3.0**	**5.2**
April	**8.7**	**5.1**
May	**12.6**	**6.8**
June	**5.4**	**5.3**
July	**1.4**	**2.6**
August	**0.8**	**1.8**
September	**1.3**	**2.3**
October	**2.4**	**2.0**
November	**5.9**	**2.6**
December	**7.1**	**3.2**

Table 9: Adjusted Most Stringent Effluent Concentrations

Season	C_e, mg/L	
	30-Day Average	Daily Maximum
January	**6.8 ***	**6.8**
February	**6.0 ***	**6.0**
March	**3.0**	**5.2**
April	**5.1 ***	**5.1**
May	**6.8 ***	**6.8**
June	**5.3 ***	**5.3**
July	**1.4**	**2.6**
August	**0.8**	**1.8**
September	**1.3**	**2.3**
October	**2.0 ***	**2.0**
November	**2.6 ***	**2.6**
December	**3.2 ***	**3.2**

* Where the daily maximum limit is more stringent than the 30-day average limit, the daily maximum limit will be used for both 30-day average and daily maximum limits.

The proposed ammonia concentrations for the draft permit are presented in Table 9 above.

The concentration limits are converted to mass-based limits by multiplying the 80th percentile of the daily maximum flows submitted by the city via NetDMR rate (million gallons per day) by the measured pollutant concentration (mg/L) and by 8.34 (conversion factor). See Table 10 for more details.

Equation 5: Concentration-Based to Mass-Based Limit Conversion

$$Ce\left(\frac{lbs}{day}\right) = Ce\left(\frac{mg}{L}\right) * 8.34 * 80th\ Percentile\ Effluent\ Flow\ Rate\ (MGD)$$

Table 10: Conversions to Mass-Based Ammonia Limits

Month	Ammonia, C_e		Variables	Ammonia, C_e	
	30-Day Av.	Daily Max	Conversion Factor = 8.34	30-Day Av.	Daily Max
	(Chronic CCC, mg/L)	(Acute CMC, mg/L)	Flow (MGD) = 2.76	(Chronic CCC, lbs/day)	(Acute CMC, lbs/day)
January	6.8	6.8	January	157	157
February	6.0	6.0	February	138	138
March	3.0	5.2	March	69	120
April	5.1	5.1	April	117	117
May	6.8	6.8	May	157	157
June	5.3	5.3	June	122	122
July	1.4	2.6	July	32	60
August	0.8	1.8	August	18	41
September	1.3	2.3	September	30	53
October	2.0	2.0	October	46	46
November	2.6	2.6	November	60	60
December	3.2	3.2	December	74	74

The city of Canton's current permit contains ammonia limits. The current effluent limits were compared to the limits calculated using the information presented above. A comparison of the two limits is presented in Table 11 below.

During the month of June, the city of Canton's current 30-day average limit is adequate to protect the beneficial use and the water quality criteria for the Big Sioux River. These limits will be continued in the draft permit, to prevent backsliding. During the remaining months, it was necessary to establish more stringent limits. The shaded values in Table 11 indicate the limits that will be included for the city of Canton.

Table 11: Comparison of Current and Draft Effluent Limits

Month	Current Effluent Limits		Calculated Effluent Limits	
	30-Day Average (lbs/day)	Daily Maximum (lbs/day)	30-Day Average (lbs/day)	Daily Maximum (lbs/day)
January	350	679	157	157
February	278	621	138	138
March	169	860	69	120
April	278	494	117	117
May	278	494	157	157
June	82	149	122	122
July	43	149	32	60
August	40	149	18	41
September	39	185	30	53

Month	Current Effluent Limits		Calculated Effluent Limits	
	30-Day Average (lbs/day)	Daily Maximum (lbs/day)	30-Day Average (lbs/day)	Daily Maximum (lbs/day)
October	104	185	46	46
November	416	858	60	60
December	460	862	74	74

For non-continuous dischargers such as seasonal or intermittent, the 30-day average effluent limit is only applicable if 5 or more samples are taken over a two-week period. This applicability is based on the development of the chronic ammonia-nitrogen (as N) criteria (US EPA, 2013) that were adopted into the SDSWQS in 2021, which were calculated for a 30-day rolling average time period, with the additional restriction that the highest 4-day average calculated during the month can be no greater than 2.5 times the chronic criteria. For a short-term (acute) discharge that is sampled 4 times or less over two weeks, the daily maximum effluent limit assumed to be protective and the 30-day average effluent limit does not apply. For a long-term (chronic) discharge that is sampled 5 or more times over more than 2 weeks, both the 30-day average and daily maximum effluent limits are applicable.

The duration of discharge values for each discharge were analyzed to determine the applicability of chronic (30-day average) ammonia-nitrogen (as N) effluent limits to this facility's typical discharge. Discharges ranged in duration from 6 to 21 days, with an average of 11.9 days and a median of 11 days. The ammonia-nitrogen (as N) values reported ranged from 0.076 mg/L to 16.49 mg/L for 30-day average, and 0.12 mg/L to 35.3 mg/L for daily maximum For more information, see the "Effluent Limits" section of this Statement of Basis and Attachment 3, Ammonia Limits Development.

Based on recent facility performance (Attachment 2, Monitoring Data), the 30-day average limits are not expected to be applicable for a typical discharge from this facility, and the facility is expected to be able to meet the ammonia-nitrogen (as N) effluent limits proposed in the draft permit. A compliance schedule is not recommended to carry over the current permit's limits temporarily (interim limits) to allow the facility additional time to make operational adjustments to meet these proposed effluent limits (final limits).

ATTACHMENT 4

Water Quality Data

WATER QUALITY DATA
WQM 65

WQM data was obtained from the water quality monitoring station WQM 65. The period of the data is from January 13, 2014 through September 16, 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 65 Data

January			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
01/13/2014	0.21	1.00	7.60
01/20/2015	0.17	1.00	7.90
01/05/2016	0.05	1.00	8.20
01/09/2017	0.11	1.00	7.50
01/08/2018	0.09	1.00	7.80
01/14/2019	0.05	1.00	8.00
01/06/2020	0.05	1.00	8.00
01/04/2021	0.14	1.00	8.00
01/04/2022	0.05	0.00	8.96
01/10/2023	0.23	0.00	7.78
01/02/2024	0.05	0.50	8.62
01/08/2025	0.05	0.00	8.30
Average	0.10	0.71	8.06
50th Percentile	0.07	1.00	8.00
80th Percentile	**0.16**	**1.00**	**8.28**

February			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
02/10/2014	0.09	1.00	7.50
02/09/2015	0.17	1.00	8.30
02/01/2016	0.05	1.00	8.20
02/07/2017	0.25	1.00	8.10
02/14/2018	0.05	1.00	7.89
02/12/2019	0.11	1.00	7.70
02/03/2020	0.17	1.00	8.00
02/09/2021	0.07	1.00	8.00
02/02/2022	0.05	0.10	8.82
02/13/2023	0.09	0.00	7.87

February			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
02/07/2024	0.05	0.80	9.05
02/03/2025	0.05	0.00	8.33
Average	0.10	0.74	8.15
50th Percentile	0.08	1.00	8.05
80th Percentile	**0.16**	**1.00**	**8.32**

March			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
03/17/2014	0.90	1.00	7.70
03/09/2015	0.27	1.00	8.10
03/07/2016	0.05	6.00	7.90
03/06/2017	0.05	9.00	8.40
03/12/2018	0.97	2.00	7.90
03/21/2019	1.07	2.00	8.00
03/10/2020	0.36	2.00	7.70
03/02/2021	0.08	1.00	8.00
03/14/2022	0.05	0.20	9.43
03/07/2023	0.22	0.00	8.08
03/04/2024	0.05	7.40	8.95
03/17/2025	0.05	8.20	8.35
Average	0.34	3.32	8.21
50th Percentile	0.15	2.00	8.04
80th Percentile	**0.79**	**7.12**	**8.39**

April			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
04/07/2014	0.23	9.00	8.00
04/13/2015	0.05	17.00	8.80
04/04/2016	0.05	10.00	8.40
04/03/2017	0.05	12.00	8.50
04/05/2018	0.42	2.00	8.10
04/04/2019	0.09	5.00	7.80
04/01/2020	0.05	11.00	7.70
04/06/2021	0.05	16.00	8.70
04/13/2022	0.05	8.00	8.70
04/12/2023	0.44	11.20	8.00
04/09/2024	0.05	13.00	9.09
04/07/2025	0.05	10.90	9.22

April			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
Average	0.13	10.43	8.42
50th Percentile	0.05	10.95	8.45
80th Percentile	**0.20**	**12.80**	**8.78**

May			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
05/05/2014	0.05	14.00	8.60
05/12/2015	0.51	14.00	7.80
05/09/2016	0.05	17.00	8.50
05/02/2017	0.08	8.00	8.30
05/09/2018	0.05	18.00	8.40
05/07/2019	0.05	14.00	8.20
05/04/2020	0.05	16.00	8.20
05/03/2021	0.05	18.00	9.00
05/11/2022	0.05	18.30	8.50
05/23/2023	0.05	20.50	8.75
05/13/2024	0.05	20.20	8.48
05/12/2025	0.05	22.00	9.07
Average	0.09	16.67	8.48
50th Percentile	0.05	17.50	8.49
80th Percentile	**0.05**	**19.82**	**8.72**

June			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
06/02/2014	0.42	23.00	7.60
06/01/2015	0.05	20.00	8.70
06/13/2016	0.05	27.00	8.50
06/05/2017	0.05	25.00	8.50
06/04/2018	0.05	22.00	8.40
06/03/2019	0.05	21.00	8.10
06/01/2020	0.05	22.00	8.10
06/21/2022	0.05	27.50	8.59
06/05/2023	0.05	27.70	8.93
06/06/2024	0.05	21.20	8.46
06/10/2025	0.05	21.10	9.24
Average	0.08	23.41	8.47
50th Percentile	0.05	22.00	8.50
80th Percentile	**0.05**	**27.00**	**8.70**

July			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
07/14/2014	0.05	25.00	8.80
07/06/2015	0.05	26.00	8.70
07/11/2016	0.05	27.00	8.70
07/10/2017	0.05	28.00	9.00
07/18/2018	0.05	26.00	8.30
07/22/2019	0.05	24.00	8.20
07/06/2020	0.05	28.00	8.20
07/06/2021	0.05	28.80	9.20
07/07/2022	0.27	24.90	7.80
07/16/2024	0.05	26.40	8.34
07/08/2025	0.05	27.10	8.03
Average	0.07	26.47	8.48
50th Percentile	0.05	26.40	8.34
80th Percentile	**0.05**	**28.00**	**8.80**

August			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
08/11/2014	0.05	25.00	8.80
08/10/2015	0.05	28.00	9.00
08/15/2016	0.05	25.00	9.10
08/17/2017	0.05	22.00	8.60
08/06/2018	0.05	22.00	8.20
08/12/2019	0.05	25.00	8.10
08/10/2020	0.05	26.00	8.60
08/03/2021	0.05	27.40	9.02
08/03/2022	0.05	30.50	9.26
08/07/2023	0.12	23.90	8.18
08/07/2024	0.05	23.30	8.33
08/04/2025	0.05	22.80	8.30
Average	0.06	25.08	8.62
50th Percentile	0.05	25.00	8.60
80th Percentile	**0.05**	**27.12**	**9.02**

September			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
09/08/2014	0.05	22.00	8.90

September			
09/08/2015	0.05	25.00	8.80
09/06/2016	0.05	23.00	8.40
09/11/2017	0.05	23.00	8.90
09/17/2018	0.05	25.00	8.80
09/09/2019	0.05	19.00	8.10
09/01/2020	0.05	22.00	8.50
09/15/2021	0.05	21.10	8.68
09/14/2022	0.05	23.40	8.60
09/05/2023	0.05	28.20	8.75
09/23/2024	0.05	19.90	9.22
09/16/2025	0.05	24.80	8.62
Average	0.05	23.03	8.69
50th Percentile	0.05	23.00	8.72
80th Percentile	**0.05**	**24.96**	**8.88**

October			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
10/06/2014	0.05	13.00	8.30
10/13/2015	0.05	16.00	9.20
10/11/2016	0.05	13.00	8.10
10/16/2017	0.05	11.00	8.20
10/01/2018	0.05	12.00	8.20
10/21/2019	0.05	11.00	8.20
10/05/2020	0.05	14.00	8.00
10/07/2021	0.05	16.50	9.57
10/04/2022	0.05	17.00	8.90
10/02/2023	0.05	24.30	8.79
10/15/2024	0.05	10.50	8.98
Average	0.05	14.39	8.59
50th Percentile	0.05	13.00	8.30
80th Percentile	**0.05**	**16.50**	**8.98**

November			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
11/04/2014	0.05	9.00	8.79
11/02/2015	0.05	12.00	8.80
11/07/2016	0.05	11.00	8.60
11/21/2017	0.05	2.00	8.30
11/06/2018	0.05	6.00	8.20
11/04/2019	0.05	4.00	8.10

November			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
11/23/2020	0.05	3.00	8.80
11/10/2021	0.05	7.80	9.07
11/01/2022	0.05	10.50	9.14
11/01/2023	0.05	3.90	8.84
11/13/2024	0.05	7.20	8.65
Average	0.05	6.95	8.66
50th Percentile	0.05	7.20	8.79
80th Percentile	**0.05**	**10.50**	**8.84**

December			
Date	**Ammonia-Nitrogen (mg/L)**	**Water Temperature (°C)**	**pH (su)**
12/08/2014	0.05	1.00	8.28
12/07/2015	0.05	2.00	8.40
12/05/2016	0.05	2.00	8.30
12/06/2017	0.05	1.00	8.40
12/11/2018	0.05	1.00	8.00
12/03/2019	0.05	1.00	8.20
12/07/2020	0.05	2.00	8.70
12/01/2021	0.05	5.40	8.71
12/01/2022	0.05	0.30	8.69
12/12/2023	0.05	0.50	8.94
12/03/2024	0.05	0.10	8.41
Average	0.05	1.48	8.46
50th Percentile	0.05	1.00	8.40
80th Percentile	**0.05**	**2.00**	**8.70**

Date	**Hardness (as CaCO3, mg/L)**
01/09/2006	620
02/13/2006	730
03/27/2006	560
04/10/2006	480
05/08/2006	601
06/12/2006	507
07/17/2006	380
08/14/2006	408
09/25/2006	490
10/10/2006	480
11/06/2006	440

Date	Hardness (as CaCO3, mg/L)
12/13/2006	560
01/08/2007	470
02/20/2007	550
03/19/2007	260
05/14/2007	554
06/04/2007	498
07/09/2007	378
08/15/2007	391
04/11/2007	660
09/17/2007	500
10/09/2007	330
11/05/2007	580
12/03/2007	580
01/07/2008	440
02/19/2008	540
03/24/2008	420
04/14/2008	500
05/19/2008	543
06/16/2008	559
07/14/2008	499
08/11/2008	456
09/22/2008	400
10/14/2008	440
11/17/2008	500
12/16/2008	610
01/21/2009	550
02/10/2009	260
03/16/2009	380
04/13/2009	500
05/04/2009	538
06/22/2009	453
07/20/2009	552
08/10/2009	473
09/08/2009	440
10/19/2009	530
11/16/2009	560
12/15/2009	680
01/12/2010	570
02/16/2010	540
03/22/2010	340
04/12/2010	500
05/17/2010	606
06/14/2010	460
07/12/2010	573

Date	Hardness (as CaCO3, mg/L)
08/11/2010	330
09/07/2010	520
10/12/2010	600
11/09/2010	640
12/06/2010	620
01/18/2011	670
02/07/2011	670
03/14/2011	500
04/11/2011	480
05/09/2011	545
06/13/2011	589
07/11/2011	429
08/01/2011	512
09/12/2011	580
10/17/2011	580
11/07/2011	500
12/12/2011	560
01/04/2012	540
02/13/2012	560
03/19/2012	520
04/02/2012	540
05/07/2012	234
06/05/2012	561
07/02/2012	442
08/06/2012	425
09/10/2012	500
10/15/2012	560
11/05/2012	500
12/03/2012	500
01/07/2013	580
02/04/2013	600
03/11/2013	220
04/08/2013	380
05/13/2013	484
06/10/2013	395
07/08/2013	483
08/05/2013	504
09/09/2013	560
10/07/2013	460
11/12/2013	460
12/09/2013	660
01/13/2014	540
02/10/2014	720
03/17/2014	260

Date	Hardness (as CaCO3, mg/L)
04/07/2014	340
05/05/2014	504
06/02/2014	227
07/14/2014	499
08/11/2014	446
09/08/2014	540
10/06/2014	540
11/04/2014	660
12/08/2014	520
01/20/2015	560
02/09/2015	500
03/09/2015	400
04/13/2015	540
Average	502
20th Percentile	**440**
80th Percentile	504

ATTACHMENT 5

Point Source Dischargers Flow Rate

EFFLUENT FLOW RATE
SD0022489, City of Canton

	Flow Rate	
	30-Day Average	**Daily Maximum**
	MGD	**MGD**
Mar 2019	3.9	7.2
May 2019	2.2	2.88
Oct 2019	.79	1
Apr 2020	.72	.72
Oct 2020	.0006	.864
Apr 2021	.95	1
Nov 2021	.0008	.0008
May 2022	1.15	1.15
Jun 2022	1	1
May 2023	1.98	3.6
Nov 2023	1.52	1.296
Apr 2024	1.15	1.22
Jun 2024	2.6	3.5
Jul 2024	1.5	2.3
Nov 2024	1.284	1.512
Apr 2025	.89	1.15
Aug 2025	.87	1.08
Average	1.32	1.85
50th Percentile	1.15	1.15
80th Percentile	1.89	2.76
Average (cfs)	2.04	2.86
50th Percentile (cfs)	1.78	1.78
80th Percentile (cfs)	2.75	**4.27**

ATTACHMENT 6

Receiving Stream Flow Data

RECEIVING STREAMFLOW DATA
USGS 06482020 Gauging Station

The data to develop the seasonal 7Q5, 1Q10, and 30Q10 low flows was obtained from the USGS gauging station USGS 06482020 which is located on the Big Sioux River upstream of the city of Sioux Falls Water Reclamation Facility (WRF). Based on data availability and the development of other surface water discharge permits in this area (Smithfield Foods, Permit No.: SD0000078; Sioux Falls WRF, Permit No.: SD0022128), the data set was limited to January 1, 2005 to October 31, 2024. This data can be obtained at http://waterdata.usgs.gov/sd/nwis/sw.

7Q5

Month	7Q5 (cfs)	Mean (logs)	Variance (logs)	Standard Deviation (logs)	Skewness (logs)
January	**62.748**	2.144	0.167	0.408	0.170
February	**50.571**	2.081	0.199	0.447	0.046
March	**74.299**	2.312	0.275	0.524	0.000
April	**459.210**	3.039	0.193	0.440	0.567
May	**515.650**	3.013	0.123	0.351	0.737
June	**385.880**	2.881	0.128	0.357	-0.305
July	**115.390**	2.577	0.374	0.611	0.003
August	**97.266**	2.408	0.246	0.496	0.136
September	**84.921**	2.355	0.248	0.498	0.412
October	**96.633**	2.442	0.284	0.533	0.556
November	**120.170**	2.433	0.174	0.417	0.087
December	**77.289**	2.236	0.171	0.414	0.011

7Q5

Month	Standard Error of Skewness (logs)	Serial Correlation Coefficient (logs)	Coefficient of Variation (logs)	Non-Exceedance Probability
January	0.536	0.396	0.190	0.2000
February	0.536	0.382	0.215	0.2000
March	0.536	0.330	0.227	0.2000
April	0.536	0.268	0.145	0.2000
May	0.550	0.336	0.116	0.2000
June	0.550	0.015	0.124	0.2000
July	0.550	0.222	0.237	0.2000
August	0.550	0.264	0.206	0.2000
September	0.550	0.218	0.212	0.2000
October	0.550	0.435	0.218	0.2000
November	0.550	0.410	0.172	0.2000
December	0.550	0.317	0.185	0.2000

7Q5

Month	Recurrence Interval	Variance of Estimate	Lower 95-Pct Confidence Interval	Upper 95-Pct Confidence Interval
January	5.00	0.0748	34.788	100.400
February	5.00	0.0801	25.662	85.066
March	5.00	0.094	31.668	137.690
April	5.00	0.136	272.370	755.070
May	5.00	0.108	344.720	771.580
June	5.00	0.0377	197.230	605.290
July	5.00	0.159	44.191	240.450
August	5.00	0.111	45.690	175.340
Septembe r	5.00	0.153	43.640	152.490
October	5.00	0.205	49.924	179.980
November	5.00	0.0743	62.657	197.770
December	5.00	0.0724	40.362	126.970

1Q10

Month	1Q10 (cfs)	Mean (logs)	Variance (logs)	Standard Deviation (logs)	Skewness (logs)
January	**39.311**	2.118	0.173	0.415	0.190
February	**30.370**	2.059	0.203	0.451	0.028
March	**39.783**	2.222	0.234	0.484	-0.034
April	**290.690**	3.000	0.196	0.442	0.520
May	**356.080**	2.945	0.124	0.352	1.044
June	**217.140**	2.802	0.130	0.361	-0.075
July	**47.687**	2.495	0.399	0.632	-0.110
August	**47.218**	2.339	0.275	0.524	0.118
September	**46.165**	2.284	0.257	0.507	0.458
October	**49.088**	2.360	0.314	0.560	0.635
November	**61.328**	2.337	0.188	0.434	0.144
December	**47.457**	2.193	0.162	0.403	-0.010

1Q10

Month	Standard Error of Skewness (logs)	Serial Correlation Coefficient (logs)	Coefficient of Variation (logs)	Non-Exceedance Probability
January	0.536	0.411	0.196	0.1000
February	0.536	0.386	0.219	0.1000
March	0.536	0.289	0.218	0.1000

Month	Standard Error of Skewness (logs)	Serial Correlation Coefficient (logs)	Coefficient of Variation (logs)	Non-Exceedance Probability
April	0.536	0.262	0.147	0.1000
May	0.550	0.233	0.119	0.1000
June	0.550	0.077	0.129	0.1000
July	0.550	0.231	0.253	0.1000
August	0.550	0.287	0.224	0.1000
September	0.550	0.260	0.222	0.1000
October	0.550	0.399	0.237	0.1000
November	0.550	0.347	0.186	0.1000
December	0.550	0.323	0.184	0.1000

1Q10

Month	Recurrence Interval	Variance of Estimate	Lower 95-Pct Confidence Interval	Upper 95-Pct Confidence Interval
January	10.00	0.0215	17.625	63.888
February	10.00	0.0207	12.080	52.408
March	10.00	0.0197	13.574	72.738
April	10.00	0.0401	139.680	464.710
May	10.00	0.0432	217.960	486.910
June	10.00	0.0114	94.275	345.330
July	10.00	0.0331	10.768	108.150
August	10.00	0.0322	15.843	89.626
September	10.00	0.0496	19.020	81.325
October	10.00	0.0789	19.579	88.988
November	10.00	0.023	25.120	103.900
December	10.00	0.0145	18.640	79.395

30Q10

Month	30Q10 (cfs)	Mean (logs)	Variance (logs)	Standard Deviation (logs)	Skewness (logs)
January	**52.159**	2.243	0.167	0.409	-0.029
February	**	**	**	**	**
March	**205.470**	2.980	0.262	0.512	-0.230
April	**436.120**	3.174	0.185	0.430	0.321
May	**656.350**	3.195	0.096	0.310	0.480
June	**409.930**	3.084	0.128	0.358	-0.394
July	**133.600**	2.807	0.286	0.535	0.086
August	**108.330**	2.619	0.212	0.460	0.101

September	**62.721**	2.529	0.392	0.626	0.784
October	**84.340**	2.605	0.298	0.546	0.302
November	**96.526**	2.540	0.191	0.437	0.096
December	**74.696**	2.354	0.149	0.386	0.300

30Q10

Month	Standard Error of Skewness (logs)	Serial Correlation Coefficient (logs)	Coefficient of Variation (logs)	Non-Exceedance Probability
January	0.536	0.399	0.182	0.1000
February	**	**	**	**
March	0.536	0.462	0.172	0.1000
April	0.536	0.313	0.135	0.1000
May	0.550	0.344	0.097	0.1000
June	0.550	0.007	0.116	0.1000
July	0.550	0.234	0.191	0.1000
August	0.550	0.214	0.176	0.1000
September	0.550	0.279	0.247	0.1000
October	0.550	0.357	0.209	0.1000
November	0.550	0.379	0.172	0.1000
December	0.550	0.378	0.164	0.1000

30Q10

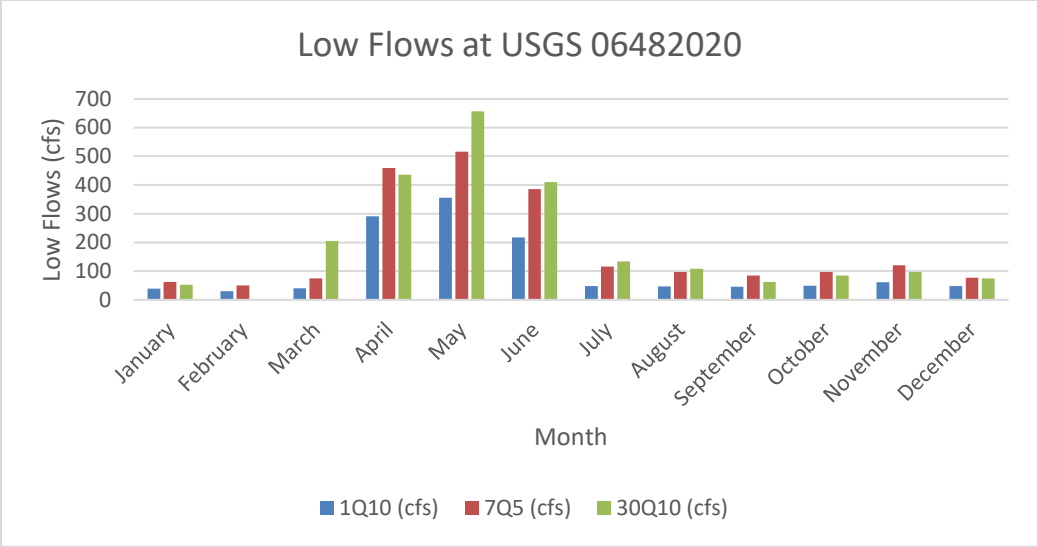
Month	Recurrence Interval	Variance of Estimate	Lower 95-Pct Confidence Interval	Upper 95-Pct Confidence Interval
January	10.00	0.0141	21.010	86.825
February	**	**	**	**
March	10.00	0.0172	59.263	400.490
April	10.00	0.0282	197.280	706.020
May	10.00	0.0193	381.930	925.830
June	10.00	0.00735	152.200	676.660
July	10.00	0.032	42.996	258.480
August	10.00	0.0242	41.170	190.650
September	10.00	0.112	23.610	116.190
October	10.00	0.0463	29.618	159.030
November	10.00	0.0216	38.413	165.250
December	10.00	0.0231	35.614	117.070

**** - Note -- Could not complete analysis for 30Low10 Review source data for missing or zero flows.**

Low Stream Flows

USGS Station	Month	Probability	Recurrence Interval	1-Day (1Q10) (cfs)	7-Day (7Q5) (cfs)	30-Day (30Q10) (cfs)
6482020	January	0.2	5	--	62.748	--
6482020	January	0.1	10	39.311	--	52.159
6482020	February	0.2	5	--	50.571	--
6482020	February	0.1	10	30.37	--	**
6482020	March	0.2	5	--	74.299	--
6482020	March	0.1	10	39.783	--	205.47
6482020	April	0.2	5	--	459.21	--
6482020	April	0.1	10	290.69	--	436.12
6482020	May	0.2	5	--	515.65	--
6482020	May	0.1	10	356.08	--	656.35
6482020	June	0.2	5	--	385.88	--
6482020	June	0.1	10	217.14	--	409.93
6482020	July	0.2	5	--	115.39	--
6482020	July	0.1	10	47.687	--	133.6
6482020	August	0.2	5	--	97.266	--
6482020	August	0.1	10	47.218	--	108.33
6482020	September	0.2	5	--	84.921	--
6482020	September	0.1	10	46.165	--	62.721
6482020	October	0.2	5	--	96.633	--
6482020	October	0.1	10	49.088	--	84.34
6482020	November	0.2	5	--	120.17	--
6482020	November	0.1	10	61.328	--	96.526
6482020	December	0.2	5	--	77.289	--
6482020	December	0.1	10	47.457	--	74.696

**** - Note -- Could not complete analysis for 30Low10 Review source data for missing or zero flows.**



Sioux Falls Water Reclamation Facility (SFWRF) Effluent Flow

The Sioux Falls WRF is a major discharging facility that has an average flow of 18.34 MGD, or 28.38 cfs (30-Day Average effluent flows from October 2021 through January 2026). Because stream gage 06482020 is located upstream of the city of Sioux Falls' outfall, this additional flow will be taken into consideration and added to the low flow values. The tables below summarize the low flows and mixing zones that were calculated.

Low Flows + SFWRF Effluent Flows

Month	1Q10 + SFWRF (cfs)	7Q5 + SFWRF (cfs)	30Q10 + SFWRF (cfs)
January	67.691	91.128	80.539
February	58.75	78.951	**
March	68.163	102.679	233.85
April	319.07	487.59	464.5
May	384.46	544.03	684.73
June	245.52	414.26	438.31
July	76.067	143.77	161.98
August	75.598	125.646	136.71
September	74.545	113.301	91.101
October	77.468	125.013	112.72
November	89.708	148.55	124.906
December	75.837	105.669	103.076

Final Flows Used for Chronic Effluent Limits Development

Month	Low Flow Analytic	Chronic Low Flow	Allowable Ratio of Low Flow for Mixing	Q_u, Critical Low Flow (cfs)

January	7Q5 + SFWRF (cfs)	91.128	0.50	**45.56**
February	7Q5 + SFWRF (cfs)	78.951	0.50	**39.48**
March	7Q5 + SFWRF (cfs)	102.679	0.50	**51.34**
April	7Q5 + SFWRF (cfs)	487.59	0.50	**243.80**
May	7Q5 + SFWRF (cfs)	544.03	0.50	**272.02**
June	7Q5 + SFWRF (cfs)	414.26	0.50	**207.13**
July	7Q5 + SFWRF (cfs)	143.77	0.50	**71.89**
August	7Q5 + SFWRF (cfs)	125.646	0.50	**62.82**
September	7Q5 + SFWRF (cfs)	113.301	0.50	**56.65**
October	7Q5 + SFWRF (cfs)	125.013	0.50	**62.51**
November	7Q5 + SFWRF (cfs)	148.55	0.50	**74.28**
December	7Q5 + SFWRF (cfs)	105.669	0.50	**52.83**

Final Flows Used for Acute Effluent Limits Development

Month	Low Flow Analytic	Acute Low Flow	Allowable Ratio of Low Flow for Mixing	Q_u, Critical Low Flow (cfs)
January	1Q10 + SFWRF (cfs)	67.691	0.025	**1.692**
February	1Q10 + SFWRF (cfs)	58.75	0.025	**1.469**
March	1Q10 + SFWRF (cfs)	68.163	0.025	**1.704**
April	1Q10 + SFWRF (cfs)	319.07	0.025	**7.977**
May	1Q10 + SFWRF (cfs)	384.46	0.025	**9.612**
June	1Q10 + SFWRF (cfs)	245.52	0.025	**6.138**
July	1Q10 + SFWRF (cfs)	76.067	0.025	**1.902**
August	1Q10 + SFWRF (cfs)	75.598	0.025	**1.890**
September	1Q10 + SFWRF (cfs)	74.545	0.025	**1.864**
October	1Q10 + SFWRF (cfs)	77.468	0.025	**1.937**
November	1Q10 + SFWRF (cfs)	89.708	0.025	**2.243**
December	1Q10 + SFWRF (cfs)	75.837	0.025	**1.896**

The data to develop the seasonal 7Q5 low flows was obtained from the USGS gauging station USGS 06482020. The period of the data is from April 1, 1973 through October 30, 2024. This data can be obtained at http://waterdata.usgs.gov/sd/nwis/sw.

Annual 7Q5 for Reasonable Potential Analysis

7Q5 (cfs)	Mean (logs)	Variance (logs)	Standard Deviation (logs)	Skewness (logs)	Standard Error of Skewness (logs)	Serial Correlation Coefficient (logs)
21.863	1.749	0.256	0.506	-0.488	0.330	0.496

Coefficient of Variance (logs)	Non-Exceedance Probability	Recurrence Interval	Variance of Estimate	Lower 95-Pct Confidence Interval	Upper 95-Pct Confidence Interval
0.289	0.200	5.00	1.064	13.228	32.139

ATTACHMENT 7

Reasonable Potential Analysis

INTRODUCTION

The following reasonable potential analyses were completed to determine if parameters found in city of Canton'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 city of Canton's DMRs from June 2015 to December 2025 were used.

The metals standards are listed in the SDSWQS, Appendix B of ARSD Chapter 74:51:01. The facility currently monitors the influent and effluent for 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 cyanide [as CN], weak acid dissociable cyanide [as CN], 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 antimony, beryllium, molybdenum, phenols, weak acid dissociable cyanide, total cyanide, 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 1.

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 20^{th} percentile of hardness at WQM 65 on the Big Sioux River to ensure that the water quality standards are maintained during critical conditions. See Attachment 4 for more information. The calculations are shown in Table 1.

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). An annual 7Q5 flow was determined using data

retrieved from the USGS gauging station 06482020 on the Big Sioux River and a Log Pearson type III statistical analysis. See Attachment 6 for more information.

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 and chronic reasonable potential analysis, zero mixing was allowed. The acute and chronic criteria for both metals and non-metals must be met at the point of discharge.

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
  - Copper
  - Mercury
  - Cyanide *
- Acute
  - None

* Every effluent sample for total cyanide and weak acid dissociable cyanide was reported at or below the detection level (10 µg/L). The SDSWQS for cyanide is 5.2 µg/L expressed as free cyanide. The reasonable potential analysis assumed each effluent sample was 10 µg/L of free cyanide, which would constitute as reasonable potential to exceed the SDSWQS. However, effluent limits will not be developed for total cyanide and weak acid dissociable cyanide. The facility will be required to sample total cyanide, and free cyanide so a direct comparison to the standard will be done moving forward.

Effluent limits were developed for total recoverable copper, total recoverable mercury, and free cyanide in accordance with South Dakota's *Reasonable Potential Implementation Procedure for SWD Permits.* While city of Canton only showed reasonable potential to violate the chronic copper and free cyanide standard, effluent limits were developed for both chronic and acute copper and free cyanide.

Situation B

The following parameters' highest reasonable potential concentration were greater than 50% of the SDSWQS.

- Chronic
- Acute
    - Cadmium
    - Selenium
    - Copper
    - Mercury

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
    - Arsenic
    - Chromium
    - Lead
    - Nickel
    - Zinc
- Acute
    - Arsenic
    - Cadmium
    - Chromium
    - Lead
    - Nickel
    - Selenium
    - Silver
    - Zinc

The current permit contains biannual or annual monitoring for the metals listed above. Monitoring for some of these metals will be reduced to once per year (annual) in the draft permit or removed.

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.

$$CCC = CF_c \times e^{mC[ln(hardness)-bC]}$$
$$CMC = CF_a \times e^{mA[ln(hardness)-bA]}$$

Where:

CCC = Criteria continuous concentration (chronic criteria)
CMC = Criteria maximum concentration (acute criteria)
CFc = Conversion factor for chronic criteria from Appendix B of ARSD Chapter 74:51:01
CFa = Conversion factor for acute criteria from Appendix B of ARSD Chapter 74:51:01
Hardness = 440 mg/L, capped at 400 mg/L for calculations (See Attachment 4)

Table 1. Metals Criteria

Parameter	Conversion Factors		Total Dissolved Criteria		Total Recoverable Criteria	
	CFc	CFa	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
Cyanide [as CN]					5.2	22
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 2. Chronic Standards Reasonable Potential Analysis (RPA) for Metals

Statistics	Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Cyanide	Cyanide, weak acid, dissociable	Lead, total [as Pb]	Mercury, total [as Hg]	Nickel, total [as Ni]	Selenium, total [as Se]	Zinc, total [as Zn]
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Number of Samples (n)	12	13	12	18	12	12	12	11	12	11	12
Mean	6.50	0.56	1.15	16.57	10.33	10.00	0.40	0.25	4.88	1.91	11.93
Variance	24.95	0.24	0.77	31.66	1.33	0.00	0.04	0.13	2.38	0.92	73.68
Standard Deviation	5.00	0.49	0.88	5.63	1.15	0.00	0.20	0.36	1.54	0.96	8.58
Minimum	1.00	0.20	0.20	10.00	10.00	10.00	0.10	0.01	3.10	0.50	3.00
Maximum	15.00	1.60	3.00	30.00	14.00	10.00	0.80	1.30	8.00	3.21	29.10
Coefficient of Variation	0.77	0.86	0.76	0.34	0.11	0.00	0.50	1.44	0.32	0.50	0.72
Multiplying factor	1.82	1.85	1.81	1.23	1.10	1.00	1.51	2.69	1.31	1.56	1.76
Calculations											
80th Percentile Upstream Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Is Mixing Granted for Parameter?	no	no	no	no	no	no	no	no	no	no	no
Maximum Instream Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Highest RP Concentration	27.24	2.96	5.42	36.85	15.43	10.00	1.21	3.50	10.48	5.00	51.23
SDSWQ Standard	150	2.39	11.43	30.5	5.2	5.2	18.58	0.77	168.54	5.00	387.83
Tests											
Is the Maximum Value > the SDSWQS?	No	No	No	No	Yes, RP	Yes, RP	No	Yes, RP	No	No	No
Is the Highest RP Concentration > the SDSWQS?	No	Yes, RP	No	Yes, RP	Yes, RP	Yes, RP	No	Yes, RP	No	No	No
Is the Maximum Value > 50% of SDSWQS?	No	Yes, RP	No	Yes, RP	Yes, RP	Yes, RP	No	Yes, RP	No	Yes, RP	No
Is the Highest RP Concentration > 50% of SDSWQS?	No	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	No
Decisions											
Current Chronic Limit	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Proposed Chronic Limit	N/A	Report	N/A	30.50	5.20	N/A	N/A	Report	N/A	Report	N/A
Current Monitoring Frequency	Annual	Annual	Annual	2 / year	Annual	None	Annual	Annual	Annual	Annual	Annual
Proposed Monitoring Frequency	None	Annual	None	2 / year	2 / year	None	None	2 / year	None	Annual	None
Limit & Monitoring Justification	RPA	RPA	RPA	RPA	RPA	Free Cyanide Instead	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 3. Acute Standards Reasonable Potential Analysis (RPA) for Metals

Statistics	Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Cyanide	Cyanide, weak acid, dissociable	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	µg/L	µg/L
Number of Samples (n)	12	13	12	18	12	12	12	11	12	11	20	12
Mean	6.50	0.56	1.15	16.57	10.00	10.00	0.37	0.25	4.88	1.91	0.73	11.93
Variance	24.95	0.24	0.77	31.66	0.00	0.00	0.05	0.13	2.38	0.92	0.14	73.68
Standard Deviation	5.00	0.49	0.88	5.63	0.00	0.00	0.22	0.36	1.54	0.96	0.38	8.58
Minimum	1.00	0.20	0.20	10.00	10.00	10.00	0.05	0.01	3.10	0.50	0.20	3.00
Maximum	15.00	1.60	3.00	30.00	10.00	10.00	0.80	1.30	8.00	3.21	1.00	29.10
Coefficient of Variation	0.77	0.86	0.76	0.34	0.00	0.00	0.61	1.44	0.32	0.50	0.51	0.72
Multiplying factor	1.82	1.85	1.81	1.23	1.00	1.00	1.63	2.69	1.31	1.56	1.31	1.76
Calculations												
Highest RP Concentration	27.24	2.96	5.42	36.85	10.00	10.00	1.31	3.50	10.48	5.00	1.31	51.23
SDSWQ Standard	340.00	7.38	16.29	51.68	22	22	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	No	No
Is the Highest RP Concentration > the SDSWQS?	No	No	No	No	No	No	No	Yes, RP	No	No	No	No
Is the Maximum Value > 50% of SDSWQS?	No	No	No	Yes	No	No	No	Yes	No	No	No	No
Is the Highest RP Concentration > 50% of SDSWQS?	No	No	No	Yes	No	No	No	Yes	No	No	No	No
Decisions												
Current Acute Limit	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report	Report
Proposed Acute Limit	N/A	Report	N/A	51.7	Report	N/A	N/A	Report	N/A	Report	N/A	N/A
Current Monitoring Frequency	Annual	Annual	Annual	2 / year	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
Proposed Monitoring Frequency	None	Annual	None	2 / year	2 / year	None	None	2 / year	None	Annual	None	None
Limit & Monitoring Justification	RPA	RPA	RPA	RPA	RPA	Free Cyanide Instead	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