STATEMENT OF BASIS

Applicant:	City of Harrisburg
Permit Number:	SD0023728
Contact Person:	Derick Wenck, Mayor Dustin Preheim, Water Reclamation Facility Superintendent PO Box 26 Harrisburg, SD 57032
Phone:	(605) 498-4936
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

- SSO sampling requirements have been removed.
- Effluent limits for ammonia are more stringent in some months. See permit **Section 3.7**.
- Monitoring units for water temperature have changed to °F. See permit **Section 3.7**.
- Monitoring for Nitrate-Nitrogen has been removed. See permit **Section 3.7**.
- An industrial waste survey must be submitted within 90 days of the effective date of this permit. See permit **Section 6.1**.

DESCRIPTION

The city of Harrisburg operates a wastewater treatment facility (WWTF) located southeast of the city, in the Northwest ¼ of Section 7, Township 99 North, Range 49 West, in Lincoln County, SD (Latitude 43.414755°, Longitude -96.681416°, Satellite Map Estimation). The facility serves a population of 6,732 persons (2020 Census), with no known Significant Industrial Users (SIU).

Wastewater influent enters the headworks, where preliminary treatment includes screening by mechanical bar screen, with a manual bar screen available for bypasses and room to build in future grit removal. An equalization basin is available after the headworks if needed.

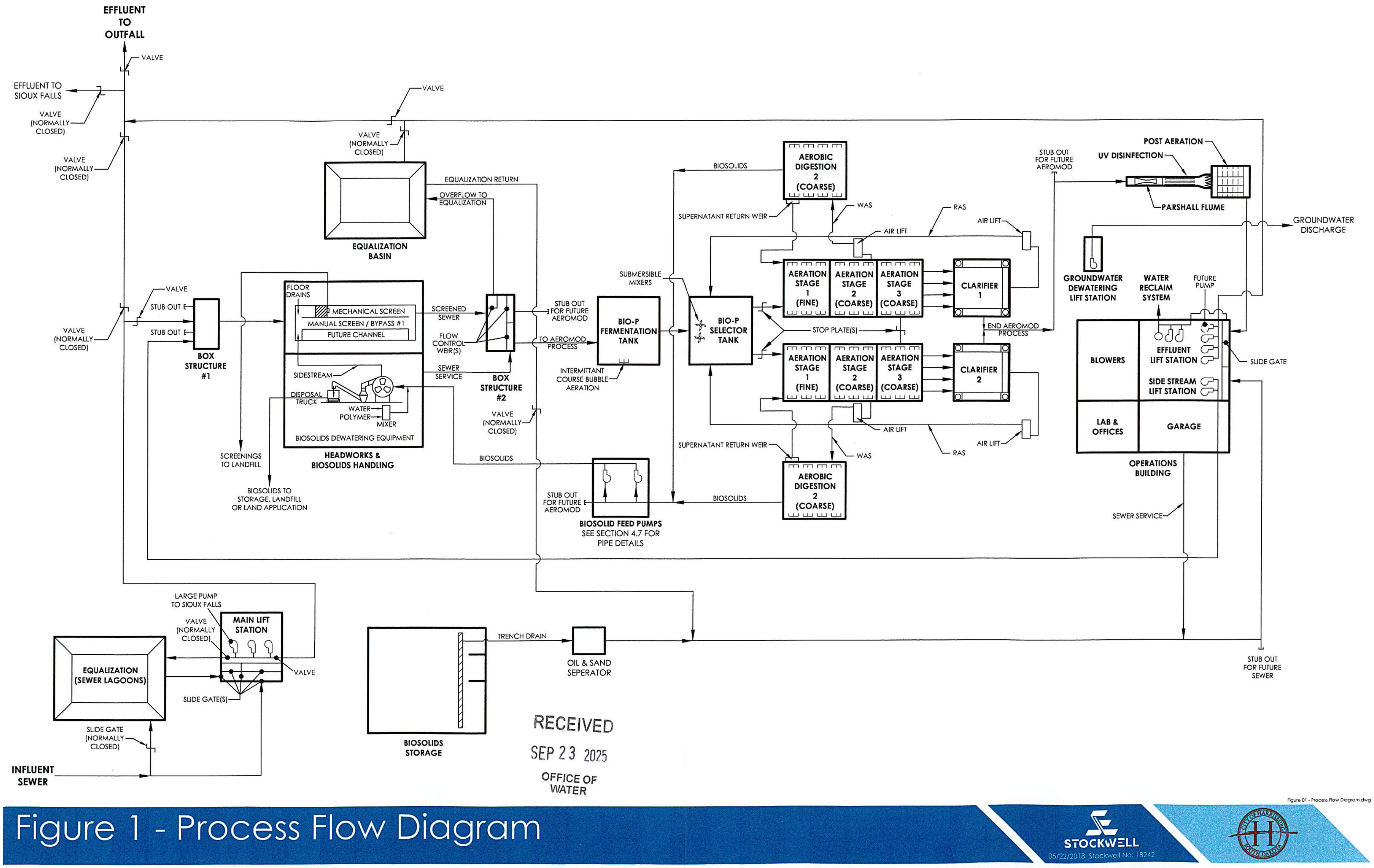
After screening, wastewater enters the Bio-P and activated sludge processes, which include a Bio-P fermentation tank with intermittent coarse bubble aeration, a Bio-P selector tank with submersible mixers, and two three-stage aeration basins with first-stage fine bubble aeration, second-stage coarse bubble aeration, and third-stage coarse bubble aeration. Waste Activated Sludge (WAS) from stage 2 is directed to an aerobic digester, and supernatant return from the aerobic digester is directed to stage 1. The aeration basins are operated in parallel; wastewater from Stage 3 is directed to its own final clarifier. The two final clarifiers are also operated in parallel, and are followed by effluent flow measurement via Parshall flume, UV disinfection, and post-aeration. The final treated effluent is pumped via pipe about 5 miles east along 274th Street for discharge to the Big Sioux River (**Outfall 002A**).

Biosolids treatment includes two aerobic digesters operated in parallel, fan press dewatering, and biosolids storage. Treated biosolids will be stored on-site until disposal. The city of Harrisburg has coverage under a general biosolids permit. (permit number SDLG23728).

The WWTF has additional equalization storage for high flow events. The existing half of the old primary treatment cell can be used for equalization, and an additional new equalization basin (2.4 MG) is available after the headworks. The city decommissioned the old Cell #1, Cell #2, and part of Cell #3; the remaining storage in Cell #3 was converted to emergency lift station equalization storage (2.4 MG). Outfall 001N for the old wastewater treatment facility has been removed from the draft permit.

The upgraded facility has an average design flow of 1.0 MGD and peak design flow of 3.0 MGD. 30-day average effluent flows to Outfall 002A during the previous permit cycle were calculated to be 0.39 MGD while discharging. A municipal wastewater treatment facility that discharges less than 1.0 MGD is considered a minor wastewater treatment facility. Figure 1 includes a process flow diagram for the facility.

Figure 1: Process Flow Diagram



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), Section 74:51:03:01 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) and *Escherichia coli* (*E. coli*) but a TMDL has not been completed yet and no wasteload allocation has been assigned to the city of Harrisburg. 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 Harrisburg has been submitting Discharge Monitoring Reports (DMRs) as required under the current permit. As shown in Attachment 2, this facility has had one violation of *E. coli* since June 1, 2021. No discharge was reported for the months not included in the table.

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

INSPECTIONS

Personnel from SDDANR conducted a Compliance Inspection of the city of Harrisburg's wastewater treatment facility on August 5, 2025. The following comments and corrective actions were required in order to come into compliance with the city of Harrisburg's Surface Water Discharge (SWD) permit:

COMMENTS	REQUIRED CORRECTIVE ACTIONS
The permittee experienced the effluent violation on the following date: November 2022: Daily Maximum *E. coli*	This violation 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.

EFFLUENT LIMITS

Outfall 002 – Any discharge from the final upgraded wastewater treatment facility pumped about 5 miles to the Big Sioux River (Latitude 43.416980°, Longitude -96.569754°, Satellite Map Estimation).

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

1. The Five-Day Biochemical Oxygen Demand (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 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on Secondary Treatment Standards and are being included because SDDANR has determined there is a reasonable potential for TSS to be present in the discharge at levels that may violate the Secondary Treatment Standards.

3. The arithmetic mean of the BOD_5 concentration for effluent samples collected in a calendar month shall not exceed 15 percent of the arithmetic mean of the concentration for influent samples collected at approximately the same times during the same period (85 percent removal). This limit is based on the Secondary Treatment Standards.

4. The arithmetic mean of the TSS concentration for effluent samples collected in a calendar month shall not exceed 15 percent of the arithmetic mean of the concentration for influent samples collected at approximately the same times during the same period (85 percent removal). This limit is based on the Secondary Treatment Standards.

5. 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.

6. 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 are 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 April 30.

7. 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. See Attachment 3 for more detail.

Season	**Ammonia-Nitrogen (as N) Limits [1]**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**
January	Report	Report
February	17.8	17.8
March	18.4	18.4
April – June	Report	Report
July	8.5	8.5
August	7.1	7.1
September	4.8	4.8
October	11.7	11.7
November	7.5	7.5
December	9.5	9.5

[1] The ammonia limits calculated for January and April through June were calculated to be above 20 mg/L, which is the highest ammonia concentration typically observed in municipal effluent. For those months, the permittee shall report the ammonia concentration and will not have a numerical limit.

8. 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 Harrisburg's discharge.

SELF MONITORING REQUIREMENTS

The draft permit requires the permittee to monitor all discharges for BOD_5 (mg/L), TSS (mg/L), BOD_5 percent removal (%), TSS percent removal (%), pH (su), ammonia-nitrogen (as N, 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 nitrogen (as N, mg/L), total phosphorus (as P, mg/L), dissolved oxygen (DO, mg/L), influent BOD_5 (mg/L), influent TSS (mg/L), and flow rate (MGD) shall be monitored, but will not have a limit. These monitoring requirements are based on the need to fully characterize the discharge.

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

The permittee shall inspect the facility on at least a **daily** basis, and discharge location on at least a **monthly** basis. Equalization basins shall be inspected at least **monthly** when in use. Each lift station shall be inspected on at least a **weekly** basis, although **daily** inspections are recommended. The frequency of on-site inspection may be reduced at the Secretary's discretion with reasonable justification. During any sanitary overflow, the lift stations shall be inspected on a **daily** basis. Documentation of each of these visits shall be kept in a log in either paper or electronic format to be reviewed by SDDANR or EPA personnel when an inspection occurs.

WHOLE EFFLUENT TOXICITY

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

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

PRETREATMENT

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

The city of Harrisburg 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 Harrisburg 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

SDDANR has issued the city of Harrisburg an individual Biosolids Management permit (SDLG23728). Therefore, the draft Surface Water Discharge permit shall not contain sludge disposal requirements.

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 Harrisburg's geographic area.

COUNTY	GROUP	SPECIES
Lincoln	Fish	Topeka Shiner
	Mammal	Northern Long-eared Bat

This information was accessible at the following US Fish and Wildlife Service website as of February 11, 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.

February 11, 2026

ATTACHMENT 1

Antidegradation Review

Permit Type: **Minor Municipal - Renewal** Applicant: **City of Harrisburg**
Date Received: **9/23/2025** Permit #: **SD0023728**
County: **Lincoln** Legal Description: **NW ¼ of Sec. 7, T 99N, R 49W**
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: **N/A**

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: ____________________________

Tom Anderson	February 11, 2026
Permit Writer	Date
Kyle Doerr	April 2, 2026
Reviewer	Date

ATTACHMENT 2

Monitoring Data

MONITORING DATA
SD0023728, City of Harrisburg

The monitoring data was obtained from the facility's DMRs and retrieved through the ICIS database, accessed February 12, 2026. The period of the data is from June 1, 2021 through December 31, 2025. Public access to the facility's monitoring data is available at EPA's Enforcement and Compliance History Online (ECHO) website: https://echo.epa.gov/.

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

	BOD_5		BOD_5 Percent Removal	*E. coli*	
	30-Day Average	Maximum 7-Day Average	Month Average Minimum	30-Day Geometric Mean	Daily Maximum
	30 mg/L	45 mg/L	85 %	126 #/100mL	235 #/100mL
Oct 2021	21	26	93.9	21	172
Nov 2021	18	23	95	13	36
Dec 2021	22	34	94.6	NR	NR
Jan 2022	17	22	95.8	NR	NR
Feb 2022	10	14	97.8	NR	NR
Mar 2022	8	10	98.1	14	39
Apr 2022	11	13	97.5	11	36
May 2022	10	13	96.8	2	16
Jun 2022	24	29	92	1	3
Jul 2022	7	10	97.9	1	4
Aug 2022	5	7	98.6	4	24
Sep 2022	4	5	98.9	2	15
Oct 2022	4	5	99.1	6	23
Nov 2022	8	11	98.2	28	**866**
Dec 2022	9	12	98	NR	NR
Jan 2023	8	8	98.2	NR	NR
Feb 2023	8	9	98.1	NR	NR
Mar 2023	9	11	97.5	3	8
Apr 2023	5	6	98.2	4	13
May 2023	5	5	98.7	3	25
Jun 2023	7	9	98.8	2	6
Jul 2023	3	5	99.4	2	58
Aug 2023	2	3	99.3	27	140
Sep 2023	4	4	99.2	9	206

	BOD_5		BOD_5 Percent Removal	*E. coli*	
	30-Day Average	Maximum 7-Day Average	Month Average Minimum	30-Day Geometric Mean	Daily Maximum
	30 mg/L	45 mg/L	85 %	126 #/100mL	235 #/100mL
Oct 2023	5	6	98.8	3	10
Nov 2023	7	7	98.4	19	75
Dec 2023	8	9	98.2	NR	NR
Jan 2024	17	24	96.3	NR	NR
Feb 2024	18	21	95.9	NR	NR
Mar 2024	11	13	97.3	4	21
Apr 2024	6	8	98.6	1	4
May 2024	3	4	99	1	2
Jun 2024	4	5	98.6	1	2
Jul 2024	4	5	98.6	1	4
Aug 2024	5	6	98.8	2	17
Sep 2024	4	4	99.1	4	55
Oct 2024	7	9	98.3	5	21
Nov 2024	8	11	98.3	6	19
Dec 2024	10	14	97.8	NR	NR
Jan 2025	13	17	97.3	NR	NR
Feb 2025	9	14	98.1	NR	NR
Mar 2025	4	7	99	6	41
Apr 2025	3	4	99.6	4	15
May 2025	4	5	99.1	2	10
Jun 2025	4	5	99.2	1	4
Jul 2025	3	4	99.3	1	1
Aug 2025	3	4	99.2	1	4
Sep 2025	6	6	98.8	2	8
Oct 2025	7	8	98.3	4	12
Nov 2025	6	6	98.8	2	6
Dec 2025	8	10	98	NR	NR

	Flow Rate		Ammonia-Nitrogen (as N)		Nitrate-Nitrogen (as N)	
	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum
	MGD	MGD	mg/L	mg/L	mg/L	mg/L
Oct 2021	0.334	0.405	.6	2.5	NS	NS
Nov 2021	0.341	0.386	1.7	6.8	3.8	3.8

	Flow Rate		Ammonia-Nitrogen (as N)		Nitrate-Nitrogen (as N)	
	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum
	MGD	MGD	mg/L	mg/L	mg/L	mg/L
Dec 2021	0.357	0.405	3.7	8.9	6.6	8
Jan 2022	0.353	0.393	3.4	9	6.7	8.7
Feb 2022	0.328	0.386	.3	.5	8.4	11.1
Mar 2022	0.345	0.398	.4	.6	3.1	5.8
Apr 2022	0.356	0.457	.4	.6	1.6	2.3
May 2022	0.445	0.619	.3	.5	2.5	4.9
Jun 2022	0.413	0.527	.2	.3	1.8	4
Jul 2022	0.349	0.486	.2	.4	4	5.1
Aug 2022	0.369	0.502	.1	.3	2.9	4.8
Sep 2022	0.413	0.481	.2	.4	2.8	3.4
Oct 2022	0.402	0.452	.4	.9	2.7	3.2
Nov 2022	0.339	0.396	1.6	4.9	4.8	11.6
Dec 2022	0.362	0.442	.6	.9	4.7	8.7
Jan 2023	0.348	0.408	.5	.9	1.2	1.3
Feb 2023	0.349	0.452	.9	2.9	1.8	2.3
Mar 2023	0.431	0.568	1.3	2.8	1.5	2.2
Apr 2023	0.463	0.612	.5	.7	2.4	3
May 2023	0.366	0.561	.2	.5	5.3	7.8
Jun 2023	0.323	0.368	.3	.8	6.5	7.1
Jul 2023	0.33	0.379	.1	.1	3.7	4.4
Aug 2023	0.339	0.435	.1	.1	4.2	5
Sep 2023	0.339	0.398	.1	.2	3.8	4.1
Oct 2023	0.361	0.511	.1	.1	3	3.4
Nov 2023	0.37	0.475	.2	.5	2.3	2.7
Dec 2023	0.375	0.452	.1	.4	2.3	2.5
Jan 2024	0.38	0.435	1.6	7.5	3.7	8.2
Feb 2024	0.392	0.446	4.3	7.3	2.3	2.9
Mar 2024	0.364	0.458	1.8	3.5	2.4	2.8
Apr 2024	0.431	0.671	.3	.8	1.7	1.8
May 2024	0.496	0.716	.1	.2	3.2	3.8
Jun 2024	0.604	1.185	.1	.2	4.7	5.8
Jul 2024	0.473	0.632	.1	.3	6.7	8.3
Aug 2024	0.406	0.473	.1	.1	6	7.3
Sep 2024	0.389	0.456	.1	.3	5.4	6.2
Oct 2024	0.375	0.428	.3	.6	5.9	6.9
Nov 2024	0.401	0.468	.4	.8	4.5	6
Dec 2024	0.423	0.487	.2	.8	4.2	4.8

	Flow Rate		Ammonia-Nitrogen (as N)		Nitrate-Nitrogen (as N)	
	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum
	MGD	MGD	mg/L	mg/L	mg/L	mg/L
Jan 2025	0.408	0.463	1.7	4.8	3.7	4.6
Feb 2025	0.395	0.445	.6	2.6	2.8	4
Mar 2025	0.378	0.454	.2	.8	1.4	1.6
Apr 2025	0.375	0.439	.1	.5	1.3	1.6
May 2025	0.378	0.466	.1	.1	2	3.4
Jun 2025	0.392	0.462	.1	.2	3.9	4.7
Jul 2025	0.432	0.559	.1	.1	5	5.9
Aug 2025	0.437	0.535	.1	.1	5.1	5.5
Sep 2025	0.371	0.466	.1	.2	4.1	4.6
Oct 2025	0.387	0.45	.4	1.1	5.6	6.6
Nov 2025	0.39	0.462	.1	.3	3.8	5.1
Dec 2025	0.404	0.457	.3	.6	3.5	3.8

	Total Nitrogen (as N)		DO	pH	
	30-Day Average	Daily Maximum	Daily Minimum	Daily Minimum	Daily Maximum
	mg/L	mg/L	mg/L	6.5 SU	9 SU
Oct 2021	NS	NS	7.9	7.1	7.4
Nov 2021	7.5	7.5	7.9	7	7.5
Dec 2021	13.6	19.6	8	7.1	7.5
Jan 2022	11.4	17.2	8.5	6.7	7.6
Feb 2022	10.4	12.8	8.8	6.8	7.7
Mar 2022	6.4	8.4	8.4	6.9	7.3
Apr 2022	3.8	5	8.2	6.9	7.2
May 2022	4.5	6.8	7.5	6.9	7.6
Jun 2022	3.8	6.3	7.9	7.4	7.6
Jul 2022	6.5	7	7.7	7.4	7.6
Aug 2022	4.8	6	7.6	7.3	7.6
Sep 2022	4.8	5.4	7.7	7.3	7.5
Oct 2022	4.1	5.5	7.8	7.3	7.5
Nov 2022	8.4	14.3	8	7.1	7.6
Dec 2022	7.4	11.7	8.3	6.9	8
Jan 2023	3.8	4.4	7.6	6.9	7.6
Feb 2023	4.2	4.7	8	6.8	7.9
Mar 2023	5.4	7.4	8.5	7.1	7.6

	Total Nitrogen (as N)		DO	pH	
	30-Day Average	Daily Maximum	Daily Minimum	Daily Minimum	Daily Maximum
	mg/L	mg/L	mg/L	6.5 SU	9 SU
Apr 2023	4.8	5.6	8.7	7.3	7.9
May 2023	7.7	9.9	8.2	7.1	7.5
Jun 2023	9.1	10	7.8	7.1	7.4
Jul 2023	5.9	6.6	8	7	7.4
Aug 2023	7.5	13.4	7.7	7.1	7.4
Sep 2023	5.5	5.8	7.3	7.1	7.4
Oct 2023	5.2	5.4	7.2	7.1	7.5
Nov 2023	4.7	5.1	8.1	7	7.4
Dec 2023	6.8	13.8	8.2	6.9	7.3
Jan 2024	7.8	14.5	8.5	7	7.4
Feb 2024	9.2	11.7	8.3	7.1	7.4
Mar 2024	6.3	8.2	8.1	7	7.3
Apr 2024	4.3	5.3	8.2	7	7.3
May 2024	5.2	5.7	8.1	7.1	7.5
Jun 2024	6.9	7.7	8	7.3	7.6
Jul 2024	9.4	10.6	7.2	7.2	7.5
Aug 2024	7.8	9.1	7.7	7.2	7.7
Sep 2024	7.1	8.4	7.2	7.1	7.4
Oct 2024	8.6	9.4	7.8	7	7.3
Nov 2024	7.1	9.3	7.5	7	7.2
Dec 2024	6.6	7	8	7	7.4
Jan 2025	7.3	10.6	7.7	6.9	7.1
Feb 2025	5.1	6.1	7.9	6.8	7
Mar 2025	3.6	4.1	8.1	6.9	7.3
Apr 2025	3.4	4.2	7.7	6.9	7.2
May 2025	4	5.7	7.4	7	7.3
Jun 2025	6.2	6.5	7.2	7.1	7.4
Jul 2025	7	8.1	7.2	7.2	7.4
Aug 2025	6.9	7	7.8	7.1	7.7
Sep 2025	6	6.6	7.2	7.1	7.6
Oct 2025	8.1	9.1	6.2	6.9	7.6
Nov 2025	6	6.9	7.4	6.8	7.6
Dec 2025	5.7	6.3	7.7	6.7	7.7

	Total Phosphorus (as P)		TSS Percent Removal	TSS	
	30-Day Average	Daily Maximum	Month Average Minimum	30-Day Average	Maximum 7-Day Average
	mg/L	mg/L	85 %	30 mg/L	45 mg/L
Oct 2021	NS	NS	88.3	25	35
Nov 2021	5.3	5.3	90.4	22	28
Dec 2021	4.1	4.3	88.9	25	37
Jan 2022	4.2	4.6	95.3	13	14
Feb 2022	5.4	5.6	96.4	12	15
Mar 2022	4.8	6.2	97.2	8	10
Apr 2022	4.7	5.1	97.3	9	12
May 2022	2.9	3.2	96.2	10	7
Jun 2022	2.8	3.3	97	8	24
Jul 2022	5.9	6.8	97	8	12
Aug 2022	5.6	7.9	97	8	12
Sep 2022	5.3	7.2	97.1	7	7
Oct 2022	2.4	3.3	96.9	8	10
Nov 2022	4.5	7	94.7	14	15
Dec 2022	4.1	4.3	96.2	10	14
Jan 2023	1.9	2.4	97.2	9	17
Feb 2023	3.7	4.1	98.4	5	6
Mar 2023	1.9	2.9	96.8	9	12
Apr 2023	4.3	4.8	97.3	7	8
May 2023	6.8	8	97.2	6	7
Jun 2023	8.4	10.8	97.7	10	12
Jul 2023	3.8	5.6	98.5	4	7
Aug 2023	6.4	7.3	98.5	4	4
Sep 2023	4	4.5	98.4	5	5
Oct 2023	2.1	2.9	97.5	7	9
Nov 2023	.6	.6	96.7	11	12
Dec 2023	.5	.5	97.1	8	9
Jan 2024	.7	1.3	96.6	9	11
Feb 2024	.4	.6	97.1	8	8
Mar 2024	.5	.6	96.6	10	11
Apr 2024	.3	.3	98	6	8
May 2024	2.5	4.5	98.5	4	4
Jun 2024	4.7	5.4	97.6	5	7
Jul 2024	7	9.4	96.6	8	11
Aug 2024	3.5	4.6	97.9	7	10
Sep 2024	2	2.9	97.7	7	10

	Total Phosphorus (as P)		TSS Percent Removal	TSS	
	30-Day Average	Daily Maximum	Month Average Minimum	30-Day Average	Maximum 7-Day Average
	mg/L	mg/L	85 %	30 mg/L	45 mg/L
Oct 2024	4.9	5.4	96.2	10	13
Nov 2024	2.8	4.4	96.3	12	14
Dec 2024	1.1	1.5	97.1	11	13
Jan 2025	.6	.8	97.7	10	10
Feb 2025	.4	.6	98	7	10
Mar 2025	.3	.4	98.5	5	7
Apr 2025	.3	.4	99.4	5	6
May 2025	.3	.4	98.7	4	5
Jun 2025	1.1	1.8	98.8	4	5
Jul 2025	2.4	2.7	98.7	4	5
Aug 2025	2.9	3.9	98.3	4	5
Sep 2025	2.5	4.5	97.6	7	8
Oct 2025	5.3	7.1	95.6	12	15
Nov 2025	.7	1.3	97.8	6	8
Dec 2025	.4	.5	96.8	8	10

	Water Temperature		Influent BOD_5	Influent TSS
	30-Day Average	Daily Maximum	30-Day Average	30-Day Average
	deg C	deg C	mg/L	mg/L
Oct 2021	18	21	337	212
Nov 2021	14	16	362	233
Dec 2021	12	15	405	222
Jan 2022	9	10	404	270
Feb 2022	8	11	457	344
Mar 2022	10	12	427	293
Apr 2022	11	14	421	314
May 2022	15	17	293	255
Jun 2022	19	21	297	265
Jul 2022	22	23	350	271
Aug 2022	22	23	375	264
Sep 2022	21	22	345	227
Oct 2022	17	19	403	271
Nov 2022	13	17	457	256
Dec 2022	10	12	455	267

	Water Temperature		Influent BOD_5	Influent TSS
	30-Day Average	Daily Maximum	30-Day Average	30-Day Average
	deg C	deg C	mg/L	mg/L
Jan 2023	9	11	422	330
Feb 2023	9	11	423	337
Mar 2023	10	11	358	289
Apr 2023	12	14	294	257
May 2023	16	18	346	219
Jun 2023	20	21	564	426
Jul 2023	21	23	483	302
Aug 2023	22	23	372	276
Sep 2023	21	22	428	298
Oct 2023	18	21	436	282
Nov 2023	15	17	436	332
Dec 2023	13	14	445	264
Jan 2024	10	13	461	269
Feb 2024	12	13	430	285
Mar 2024	11	13	414	301
Apr 2024	13	15	398	295
May 2024	16	18	340	288
Jun 2024	19	19	287	231
Jul 2024	21	22	307	245
Aug 2024	21	23	424	336
Sep 2024	21	22	395	310
Oct 2024	19	20	383	272
Nov 2024	15	18	432	322
Dec 2024	12	13	470	374
Jan 2025	10	13	492	432
Feb 2025	10	12	463	360
Mar 2025	12	14	444	305
Apr 2025	14	15	682	791
May 2025	16	18	452	320
Jun 2025	20	22	483	372
Jul 2025	22	23	475	338
Aug 2025	22	23	395	252
Sep 2025	21	22	448	290
Oct 2025	19	22	410	271
Nov 2025	16	17	462	286
Dec 2025	13	15	404	261

ATTACHMENT 3

Ammonia Limits Development
for the
Harrisburg Treatment Facility

in the Big Sioux River
near
Harrisburg, South Dakota

Prepared by

South Dakota Department of Agriculture and Natural Resources

February 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 has assigned beneficial uses to all waters of the state and developed water quality criteria to protect those uses. South Dakota's surface water quality standards and assigned beneficial uses are found in the Administrative Rules of South Dakota (ARSD) Article 74:51.

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

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

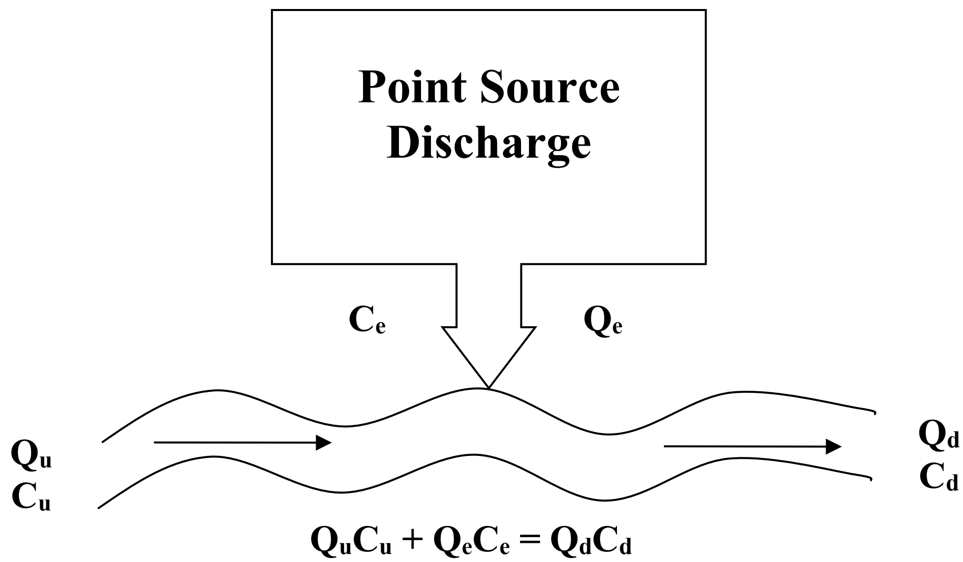
Developing the ammonia limits for the city of Harrisburg is a matter of determining the maximum level of ammonia that can be present in the Big Sioux River without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) and the Iowa Water Quality Standards (IAWQS) for ammonia to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

Figure 1: Mass Balance of Receiving Stream



Where:

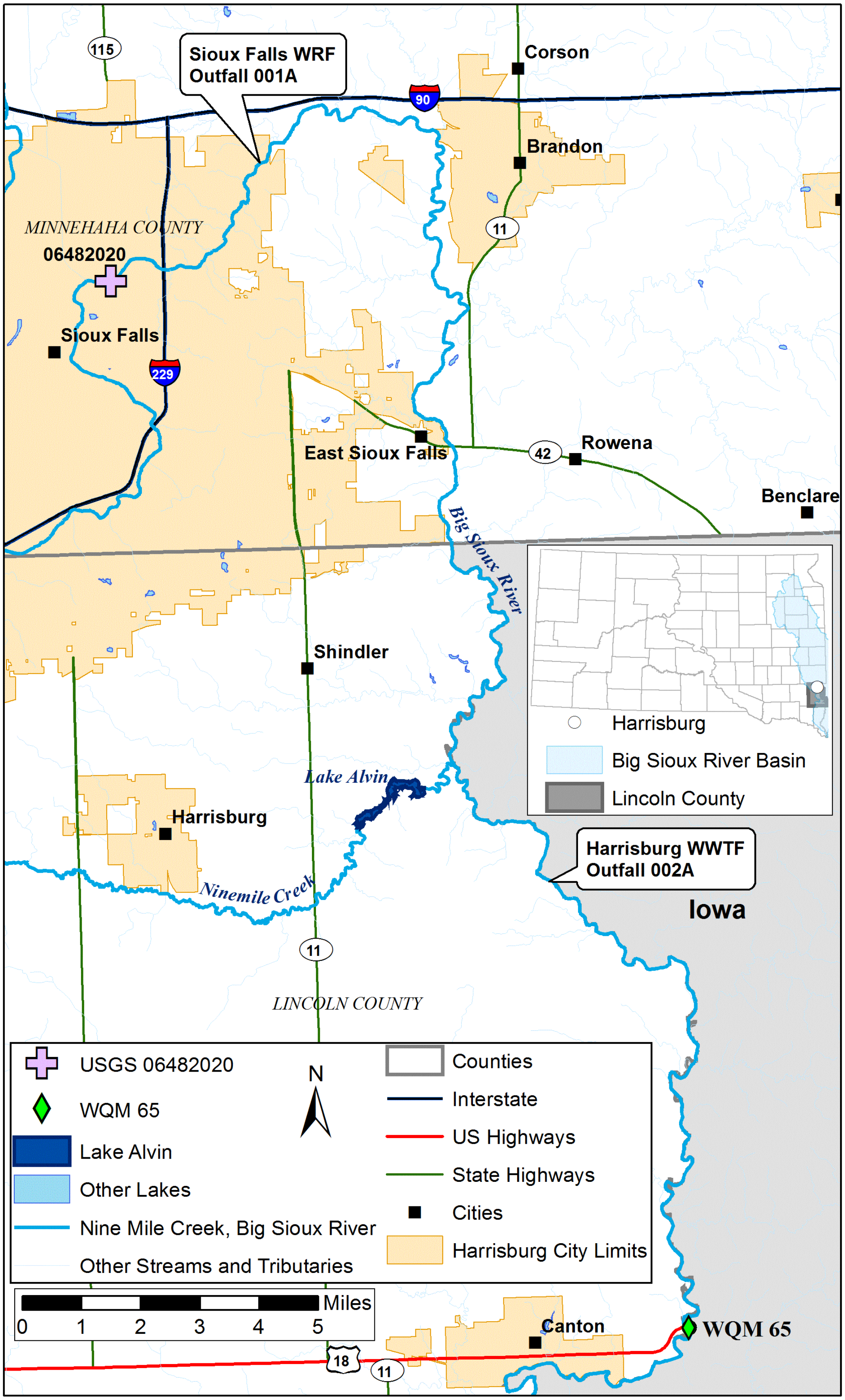
Q_u = Receiving stream flow, in cubic feet per second (cfs);
C_u = Ambient upstream ammonia concentration, in milligrams per liter (mg/L);
Q_e = Effluent discharge flow rate, in cfs;
C_e = Water quality based effluent limit for ammonia in mg/L;
Q_d = Downstream flow (equal to $Q_u + Q_e$), in cfs; and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

GEOGRAPHICAL EXTENT

The Big Sioux River is located in the Big Sioux River Basin in the eastern part of the state. The Big Sioux River Basin drains approximately 5,382 square miles in South Dakota, and an additional 3,000 square miles in Minnesota and Iowa. Four state educational institutions, several vocational schools, and the state's largest city Sioux Falls are located within this basin, making this the heaviest populated basin in the state. Figure 2 shows the Big Sioux River near Harrisburg.

Figure 2: The city of Harrisburg 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 Harrisburg'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 (SD): 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 (SD): 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 (SD): 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 x $10^{0.036 \text{ x } (20\text{-T})}$, 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 Harrisburg, South Dakota 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 critera.

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 Hwy 18 bridge 3 miles East of Canton. Approximately 3 stream miles upstream of Canton WWTF on SD-IA border (Latitude 43.306750°, Longitude -96.527028°).

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 50th 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	7.90	2.07	10.57
February	1.00	7.95	1.93	9.63
March	2.00	8.00	1.80	8.77
April	11.00	8.40	0.74	3.80
May	17.00	8.40	0.50	2.31
June	22.00	8.40	0.36	1.53
July	26.70	8.32	0.31	1.21
August	25.00	8.55	0.23	0.89
September	23.00	8.75	0.19	0.73
October	13.00	8.30	0.76	3.91
November	7.00	8.60	0.68	2.77
December	1.00	8.40	0.95	4.05

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	7.90	4.54	10.13
February	1.00	7.95	4.24	9.23
March	2.00	8.00	2.43	8.41
April	11.00	8.40	1.29	3.88
May	17.00	8.40	1.10	3.88
June	22.00	8.40	0.80	3.88
July	26.70	8.32	0.67	4.53
August	25.00	8.55	0.51	2.91
September	23.00	8.75	0.41	2.01
October	13.00	8.30	1.52	4.71
November	7.00	8.60	1.49	2.65
December	1.00	8.40	2.09	3.88

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 50th 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 50th 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	0.06
February	0.08
March	0.22
April	0.05
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 Harrisburg, 0.815 cfs was used for Q_e based on 80th percentile daily maximum flows submitted by the city of Harrisburg via NetDMR. This will ensure the ammonia standards are maintained during critical conditions. See Attachment 5 for more details.

Tables 4, 5, and 6 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	Big Sioux River at North Cliff Avenue at Sioux Falls, SD, located approximately 4.2 miles above the Sioux Falls WRF and approximately 25 miles above the city of Harrisburg's WWTF (Latitude 43.567028°, Longitude -96.771000°).

The SDSWQS and IAWQS allow a zone of mixing for discharges. In accordance with the SDSWQS 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. Using South Dakota's procedures, the mixing zone for the city of Harrisburg's WWTF at this location would allow 50% of the monthly 7Q5.

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 Harrisburg'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 WRF 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 25% of the 30Q10 for April, and 50% of the 7Q5 for May through March.

The Sioux Falls WRF average of the 30-day average flows is 28.38 cfs from October 2021 through January 2026.

Tables 4, 5, and 6 and Attachment 5 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	54.25	0.82	0.02	0.50	27.12
February	51.93	0.82	0.02	0.50	25.97
March	75.33	0.82	0.01	0.50	37.67
April	455.18	0.82	0.00	0.50	227.59
May	524.51	0.82	0.00	0.50	262.26
June	364.22	0.82	0.00	0.50	182.11
July	115.94	0.82	0.01	0.50	57.97
August	99.21	0.82	0.01	0.50	49.61
September	78.36	0.82	0.01	0.50	39.18
October	88.52	0.82	0.01	0.50	44.26
November	108.05	0.82	0.01	0.50	54.03
December	71.35	0.82	0.01	0.50	35.67

Table 5: 30Q10 Chronic Critical Low Flow Values for the Big Sioux River

Season	30Q10 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	52.16	0.82	0.02	0.25	13.04
February	**	0.82	**	0.25	**
March	205.47	0.82	0.00	0.25	51.37
April	436.12	0.82	0.00	0.25	109.03
May	656.35	0.82	0.00	0.25	164.09
June	409.93	0.82	0.00	0.25	102.48
July	133.60	0.82	0.01	0.25	33.40
August	108.33	0.82	0.01	0.25	27.08
September	62.72	0.82	0.01	0.25	15.68
October	84.34	0.82	0.01	0.25	21.09
November	96.53	0.82	0.01	0.25	24.13
December	74.70	0.82	0.01	0.25	18.67

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

Table 6: 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	39.31	0.82	0.02	0.03	0.98
February	30.37	0.82	0.03	0.03	0.76
March	39.78	0.82	0.02	0.03	0.99
April	290.69	0.82	0.00	0.03	7.27
May	356.08	0.82	0.00	0.03	8.90
June	217.14	0.82	0.00	0.03	5.43
July	47.69	0.82	0.02	0.03	1.19
August	47.22	0.82	0.02	0.03	1.18
September	46.17	0.82	0.02	0.03	1.15
October	49.09	0.82	0.02	0.03	1.23
November	61.33	0.82	0.01	0.03	1.53
December	47.46	0.82	0.02	0.03	1.19

Topeka Shiners have been found in South Dakota’s James River, Missouri River, and Vermillion River watersheds. At this facility’s discharge location, the receiving stream has been identified as having a moderate probability of Topeka Shiners (U.S. Fish and Wildlife Service’s Topeka Shiner Probability Data GIS Layer, 2014), (U.S. Fish and Wildlife Service’s Topeka Shiner Range Map, 2023). Based on this information, Topeka Shiners are expected to be present in proximity of the discharge. The critical low flows proposed for effluent limits development in this draft permit are protective of this endangered species, as the updated ammonia criteria (EPA 2013) were developed to protect a more sensitive mussel species.

DOWNSTREAM FLOW RATE (Q_d)

The downstream flow rate, Q_d, is simply the sum of the upstream flow rate (Q_u) and the effluent flow rate (Q_e). The downstream flow rate used for the calculation of the ammonia limits for the city of Harrisburg's discharge into the Big Sioux River is summarized in Tables 7, 8, and 9 below.

CALCULATION OF AMMONIA LIMIT (C_e)

Each of the variables determined above is summarized in Tables 7, 8, and 9. Using the mass balance equation, the ammonia limits for the city of Harrisburg'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 Harrisburg's discharge into the Big Sioux River are presented in Tables 7, 8, and 9.

Table 7: 7Q5 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	0.06	2.07	10.57	0.82	27.94	**68.8**	**360.3**
February	0.08	1.93	9.63	0.82	26.78	**60.8**	**314.0**
March	0.22	1.80	8.77	0.82	38.48	**74.7**	**403.9**
April	0.05	0.74	3.80	0.82	228.41	**192.2**	**1051.6**
May	0.05	0.50	2.31	0.82	263.07	**145.2**	**730.3**
June	0.05	0.36	1.53	0.82	182.93	**70.1**	**331.7**
July	0.05	0.31	1.21	0.82	58.79	**18.5**	**83.6**
August	0.05	0.23	0.89	0.82	50.42	**11.3**	**52.2**
September	0.05	0.19	0.73	0.82	40.00	**6.9**	**33.4**
October	0.05	0.76	3.91	0.82	45.07	**39.5**	**213.6**
November	0.05	0.68	2.77	0.82	54.84	**42.4**	**182.8**
December	0.05	0.95	4.05	0.82	36.49	**40.4**	**179.1**

Table 8: 30Q10 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			30-Day Average
January	0.06	4.54	0.82	13.85	**76.3**
February	0.08	4.24	0.82	**	**
March	0.22	2.43	0.82	52.18	**142.0**
April	0.05	1.29	0.82	109.85	**167.2**
May	0.05	1.10	0.82	164.90	**212.3**
June	0.05	0.80	0.82	103.30	**94.6**
July	0.05	0.67	0.82	34.22	**26.2**
August	0.05	0.51	0.82	27.90	**15.8**
September	0.05	0.41	0.82	16.50	**7.4**
October	0.05	1.52	0.82	21.90	**39.7**
November	0.05	1.49	0.82	24.95	**44.2**
December	0.05	2.09	0.82	19.49	**48.9**

Table 9: 1Q10 Acute Variables Calculated for Mass Balance Equation

Season	C_u, mg/L	C_d, mg/L Daily Maximum	Q_e, cfs	Q_d, cfs	C_e, mg/L Daily Maximum
January	0.06	10.13	0.82	1.80	**22.3**
February	0.08	9.23	0.82	1.57	**17.8**
March	0.22	8.41	0.82	1.81	**18.4**
April	0.05	3.88	0.82	8.08	**38.1**
May	0.05	3.88	0.82	9.72	**45.8**
June	0.05	3.88	0.82	6.24	**29.4**
July	0.05	4.53	0.82	2.01	**11.1**
August	0.05	2.91	0.82	2.00	**7.1**
September	0.05	2.01	0.82	1.97	**4.8**
October	0.05	4.71	0.82	2.04	**11.7**
November	0.05	2.65	0.82	2.35	**7.5**
December	0.05	3.88	0.82	2.00	**9.5**

The calculated water-quality based effluent limits for each low flow criteria were compared and the most stringent effluent concentrations are presented in Table 10 below.

Table 10: Most Stringent Effluent Concentrations

Season	C_e, mg/L	
	30-Day Average	Daily Maximum
January	68.8 (7Q5)	22.3 (1Q10)
February	60.8 (7Q5)	17.8 (1Q10)
March	74.7 (7Q5)	18.4 (1Q10)
April	167.2 (30Q10)	38.1 (1Q10)
May	145.2 (7Q5)	45.8 (1Q10)

Season	C_e, mg/L	
	30-Day Average	Daily Maximum
June	70.1 (7Q5)	29.4 (1Q10)
July	18.5 (7Q5)	11.1 (1Q10)
August	11.3 (7Q5)	7.1 (1Q10)
September	6.9 (7Q5)	4.8 (1Q10)
October	39.5 (7Q5)	11.7 (1Q10)
November	42.4 (7Q5)	7.5 (1Q10)
December	40.4 (7Q5)	9.5 (1Q10)

The city of Harrisburg'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 months of January, April through August, the city of Harrisburg's current monitoring requirements and limits are adequate to protect the beneficial use and the water quality criteria for the Big Sioux River. These monitoring requirements 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 Harrisburg.

Table 11: Comparison of Current and Draft Effluent Limits

Month	Current Effluent Limits		Calculated Effluent Limits	
	30-Day Average (mg/L)	Daily Maximum (mg/L)	30-Day Average (mg/L)	Daily Maximum (mg/L)
January	Report	Report	Report	Report
February	Report	Report	Report	17.8
March	Report	Report	Report	18.4
April	Report	Report	Report	Report
May	Report	Report	Report	Report
June	Report	Report	Report	Report
July	8.5	8.5	18.5	11.1
August	7.1	7.1	11.3	7.1
September	6.8	6.8	6.9	4.8
October	18.7	18.7	Report	11.7
November	Report	Report	Report	7.5
December	Report	Report	Report	9.5

The proposed ammonia limits for the draft permit are presented in Table 12 below. 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. Where the effluent limit is greater than 20.0 mg/L, monitoring and reporting without an effluent limit will be required, based on the expected ammonia in raw influent to the WWTF prior to treatment.

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) allow the facility additional time to make operational adjustments to meet these proposed effluent limits (final limits).

Table 12: Proposed Effluent Limits

Month	Proposed Effluent Limits	
	30-Day Average (mg/L)	Daily Maximum (mg/L)
January	Report	Report
February	17.8	17.8
March	18.4	18.4
April	Report	Report
May	Report	Report
June	Report	Report
July	11.1	11.1
August	7.1	7.1
September	4.8	4.8
October	11.7	11.7
November	7.5	7.5
December	9.5	9.5

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 12, 2010 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			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
01/12/2010	0.08	1	7.3
01/18/2011	0.07	1	7.8
01/04/2012	0.05	1	7.9
01/07/2013	0.05	1	7.5
01/13/2014	0.21	1	7.6
01/20/2015	0.17	1	7.9
01/05/2016	0.05	1	8.2
01/09/2017	0.11	1	7.5
01/08/2018	0.09	1	7.8
01/14/2019	0.05	1	8
01/06/2020	0.05	1	8
01/04/2021	0.14	1	8
01/04/2022	0.05	0	8.96
01/10/2023	0.23	0	7.78
01/02/2024	0.05	0.5	8.62
01/08/2025	0.05	0	8.3
Average	0.09	0.78	7.95
50th Percentile	**0.06**	**1.00**	**7.90**
80th Percentile	0.14	1.00	8.20

February			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
02/16/2010	0.39	1	7.9
02/07/2011	0.05	1	7.8
02/13/2012	0.05	1	7.9
02/04/2013	0.1	1	7.7
02/10/2014	0.09	1	7.5
02/09/2015	0.17	1	8.3

February			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
02/01/2016	0.05	1	8.2
02/07/2017	0.25	1	8.1
02/14/2018	0.05	1	7.89
02/12/2019	0.11	1	7.7
02/03/2020	0.17	1	8
02/09/2021	0.07	1	8
02/02/2022	0.05	0.1	8.82
02/13/2023	0.09	0	7.87
02/07/2024	0.05	0.8	9.05
02/03/2025	0.05	0	8.33
Average	0.11	0.81	8.07
50th Percentile	**0.08**	**1.00**	**7.95**
80th Percentile	0.17	1.00	8.30

March			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
03/22/2010	0.23	4	7.8
03/14/2011	0.46	1	8
03/19/2012	0.05	17	8.2
03/11/2013	1.83	1	7.9
03/17/2014	0.9	1	7.7
03/09/2015	0.27	1	8.1
03/07/2016	0.05	6	7.9
03/06/2017	0.05	9	8.4
03/12/2018	0.97	2	7.9
03/21/2019	1.07	2	8
03/10/2020	0.36	2	7.7
03/02/2021	0.08	1	8
03/14/2022	0.05	0.2	9.43
03/07/2023	0.2	0	8.08
03/04/2024	0.05	7.4	8.95
03/17/2025	0.05	8.2	8.35
Average	0.42	3.93	8.15
50th Percentile	**0.22**	**2.00**	**8.00**
80th Percentile	0.90	7.40	8.35

April			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
04/12/2010	0.05	13	8.4
04/11/2011	0.05	11	8.2
04/02/2012	0.05	20	8.8
04/08/2013	0.2	10	8.1
04/07/2014	0.23	9	8
04/13/2015	0.05	17	8.8
04/04/2016	0.05	10	8.4
04/03/2017	0.05	12	8.5
04/05/2018	0.42	2	8.1
04/04/2019	0.09	5	7.8
04/01/2020	0.05	11	7.7
04/06/2021	0.05	16	8.7
04/13/2022	0.05	8	8.7
04/12/2023	0.44	11.2	8
04/09/2024	0.05	13	9.09
04/07/2025	0.05	10.9	9.22
Average	0.12	11.19	8.41
50th Percentile	**0.05**	**11.00**	**8.40**
80th Percentile	0.20	13.00	8.80

May			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
05/17/2010	0.05	16	8.3
05/09/2011	0.05	18	8.2
05/07/2012	0.44	17	7.9
05/13/2013	0.05	17	8.4
05/05/2014	0.05	14	8.6
05/12/2015	0.51	14	7.8
05/09/2016	0.05	17	8.5
05/02/2017	0.08	8	8.3
05/09/2018	0.05	18	8.4
05/07/2019	0.05	14	8.2
05/04/2020	0.05	16	8.2
05/03/2021	0.05	18	9
05/11/2022	0.05	18.3	8.5
05/23/2023	0.05	20.5	8.75
05/13/2024	0.05	20.2	8.48
05/12/2025	0.05	22	9.07
Average	0.11	16.75	8.41
50th Percentile	**0.05**	**17.00**	**8.40**

May			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
80th Percentile	0.05	18.30	8.60

June			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
06/14/2010	0.05	20	7.8
06/13/2011	0.05	19	8.1
06/05/2012	0.05	23	8.4
06/10/2013	0.05	18	7.8
06/02/2014	0.42	23	7.6
06/01/2015	0.05	20	8.7
06/13/2016	0.05	27	8.5
06/05/2017	0.05	25	8.5
06/04/2018	0.05	22	8.4
06/03/2019	0.05	21	8.1
06/01/2020	0.05	22	8.1
06/21/2022	0.05	27.5	8.59
06/05/2023	0.05	27.7	8.93
06/06/2024	0.05	21.2	8.46
06/10/2025	0.05	21.1	9.24
Average	0.07	22.50	8.35
50th Percentile	**0.05**	**22.00**	**8.40**
80th Percentile	0.05	25.40	8.61

July			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
07/12/2010	0.05	26	8.1
07/11/2011	0.05	27	8.1
07/02/2012	0.05	30	9
07/08/2013	0.05	28	8.1
07/14/2014	0.05	25	8.8
07/06/2015	0.05	26	8.7
07/11/2016	0.05	27	8.7
07/10/2017	0.05	28	9
07/18/2018	0.05	26	8.3
07/22/2019	0.05	24	8.2
07/06/2020	0.05	28	8.2
07/06/2021	0.05	28.8	9.2
07/07/2022	0.27	24.9	7.8

July			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
07/05/2023	0.05	25.8	8.78
07/16/2024	0.05	26.4	8.34
07/08/2025	0.05	27.1	8.03
Average	0.06	26.75	8.46
50th Percentile	**0.05**	**26.70**	**8.32**
80th Percentile	0.05	28.00	8.80

August			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
08/11/2010	0.05	25	7.8
08/01/2011	0.05	29	8.1
08/06/2012	0.05	28	9.4
08/05/2013	0.05	25	8.5
08/11/2014	0.05	25	8.8
08/10/2015	0.05	28	9
08/15/2016	0.05	25	9.1
08/17/2017	0.05	22	8.6
08/06/2018	0.05	22	8.2
08/12/2019	0.05	25	8.1
08/10/2020	0.05	26	8.6
08/03/2021	0.05	27.4	9.02
08/03/2022	0.05	30.5	9.26
08/07/2023	0.12	23.9	8.18
08/07/2024	0.05	23.3	8.33
08/04/2025	0.05	22.8	8.3
Average	0.05	25.49	8.58
50th Percentile	**0.05**	**25.00**	**8.55**
80th Percentile	0.05	28.00	9.02

September			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
09/07/2010	0.05	18	8
09/12/2011	0.05	23	8.8
09/10/2012	0.05	22	9
09/09/2013	0.05	29	NS
09/08/2014	0.05	22	8.9
09/08/2015	0.05	25	8.8
09/06/2016	0.05	23	8.4
09/11/2017	0.05	23	8.9

September			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
09/17/2018	0.05	25	8.8
09/09/2019	0.05	19	8.1
09/01/2020	0.05	22	8.5
09/15/2021	0.05	21.1	8.68
09/14/2022	0.05	23.4	8.6
09/05/2023	0.05	28.2	8.75
09/23/2024	0.05	19.9	9.22
09/16/2025	0.05	24.8	8.62
Average	0.05	23.03	8.67
50th Percentile	**0.05**	**23.00**	**8.75**
80th Percentile	0.05	25.00	8.90

October			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
10/12/2010	0.05	17	8
10/17/2011	0.05	12	8.3
10/15/2012	0.05	12	8.7
10/07/2013	0.05	15	8.5
10/06/2014	0.05	13	8.3
10/13/2015	0.05	16	9.2
10/11/2016	0.05	13	8.1
10/16/2017	0.05	11	8.2
10/01/2018	0.05	12	8.2
10/21/2019	0.05	11	8.2
10/05/2020	0.05	14	8
10/07/2021	0.05	16.5	9.57
10/04/2022	0.05	17	8.9
10/02/2023	0.05	24.3	8.79
10/15/2024	0.05	10.5	8.98
Average	0.05	14.29	8.53
50th Percentile	**0.05**	**13.00**	**8.30**
80th Percentile	0.05	16.60	8.92

November			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
11/09/2010	0.05	8	7.9
11/07/2011	0.05	7	8.3
11/05/2012	0.05	7	8.4
11/12/2013	0.05	2	8.6

November			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
11/04/2014	0.05	9	NS
11/02/2015	0.05	12	8.8
11/07/2016	0.05	11	8.6
11/21/2017	0.05	2	8.3
11/06/2018	0.05	6	8.2
11/04/2019	0.05	4	8.1
11/23/2020	0.05	3	8.8
11/10/2021	0.05	7.8	9.07
11/01/2022	0.05	10.5	9.14
11/01/2023	0.05	3.9	8.84
11/13/2024	0.05	7.2	8.65
Average	0.05	6.69	8.55
50th Percentile	**0.05**	**7.00**	**8.60**
80th Percentile	0.05	9.30	8.82

December			
Sample Date	**Ammonia-Nitrogen (as N, mg/L)**	**Water Temperature (°C)**	**pH (su)**
12/06/2010	0.05	1	8.4
12/12/2011	0.05	1	7.9
12/03/2012	0.05	5	8.3
12/09/2013	0.05	-15	8.1
12/08/2014	0.05	1	NS
12/07/2015	0.05	2	8.4
12/05/2016	0.05	2	8.3
12/06/2017	0.05	1	8.4
12/11/2018	0.05	1	8
12/03/2019	0.05	1	8.2
12/07/2020	0.05	2	8.7
12/01/2021	0.05	5.4	8.71
12/01/2022	0.05	0.3	8.69
12/12/2023	0.05	0.5	8.94
12/03/2024	0.05	0.1	8.41
Average	0.05	0.55	8.39
50th Percentile	**0.05**	**1.00**	**8.40**
80th Percentile	0.05	2.00	8.69

ATTACHMENT 5

Point Source Dischargers Flow Rate

EFFLUENT FLOW RATE
SD0023728, City of Harrisburg

	Flow Rate	
	30-Day Average	Daily Maximum
	MGD	MGD
Oct 2021	0.334	0.405
Nov 2021	0.341	0.386
Dec 2021	0.357	0.405
Jan 2022	0.353	0.393
Feb 2022	0.328	0.386
Mar 2022	0.345	0.398
Apr 2022	0.356	0.457
May 2022	0.445	0.619
Jun 2022	0.413	0.527
Jul 2022	0.349	0.486
Aug 2022	0.369	0.502
Sep 2022	0.413	0.481
Oct 2022	0.402	0.452
Nov 2022	0.339	0.396
Dec 2022	0.362	0.442
Jan 2023	0.348	0.408
Feb 2023	0.349	0.452
Mar 2023	0.431	0.568
Apr 2023	0.463	0.612
May 2023	0.366	0.561
Jun 2023	0.323	0.368
Jul 2023	0.33	0.379
Aug 2023	0.339	0.435
Sep 2023	0.339	0.398
Oct 2023	0.361	0.511
Nov 2023	0.37	0.475
Dec 2023	0.375	0.452
Jan 2024	0.38	0.435
Feb 2024	0.392	0.446
Mar 2024	0.364	0.458
Apr 2024	0.431	0.671
May 2024	0.496	0.716
Jun 2024	0.604	1.185
Jul 2024	0.473	0.632
Aug 2024	0.406	0.473
Sep 2024	0.389	0.456

	Flow Rate	
	30-Day Average	Daily Maximum
	MGD	MGD
Oct 2024	0.375	0.428
Nov 2024	0.401	0.468
Dec 2024	0.423	0.487
Jan 2025	0.408	0.463
Feb 2025	0.395	0.445
Mar 2025	0.378	0.454
Apr 2025	0.375	0.439
May 2025	0.378	0.466
Jun 2025	0.392	0.462
Jul 2025	0.432	0.559
Aug 2025	0.437	0.535
Sep 2025	0.371	0.466
Oct 2025	0.387	0.45
Nov 2025	0.39	0.462
Dec 2025	0.404	0.457
Average	0.388	0.488
50th Percentile	0.378	0.457
80th Percentile	0.413	0.527
Average (cfs)	0.600	0.755
50th Percentile (cfs)	0.585	0.707
80th Percentile (cfs)	0.639	**0.815**

EFFLUENT FLOW RATE
SD0022128, City of Sioux Falls

	30-Day Average	Daily Maximum
	MGD	MGD
Oct 2021	17.86	21.55
Nov 2021	17.28	18.4
Dec 2021	16.87	17.81
Jan 2022	16.31	17.05
Feb 2022	16.07	16.82
Mar 2022	16.47	16.99
Apr 2022	17.19	21.21
May 2022	19.86	24.84
Jun 2022	20.06	21.97
Jul 2022	18.1	20.62
Aug 2022	18.51	29.13
Sep 2022	16.9	18.15
Oct 2022	16.28	16.83
Nov 2022	15.88	16.77
Dec 2022	15.98	17.67
Jan 2023	15.89	16.3
Feb 2023	16.68	18.1
Mar 2023	19.14	22.9
Apr 2023	21.71	24.75
May 2023	19.02	20.24
Jun 2023	17.73	22.97
Jul 2023	17.12	20
Aug 2023	18	22.59
Sep 2023	16.43	21.9
Oct 2023	16.61	19.92
Nov 2023	16.09	16.76
Dec 2023	15.97	19.88
Jan 2024	16.6	17.49
Feb 2024	17.95	18.7
Mar 2024	17.18	18.83
Apr 2024	20.33	28.71
May 2024	23.53	27.01
Jun 2024	28.6	47.88
Jul 2024	24.27	31.58
Aug 2024	20.67	24.32
Sep 2024	18.68	19.89
Oct 2024	17.24	17.78
Nov 2024	17.6	20.85
Dec 2024	17.72	18.81

	30-Day Average	Daily Maximum
	MGD	MGD
Jan 2025	17.31	17.95
Feb 2025	17.03	19.22
Mar 2025	17.61	20.99
Apr 2025	18.09	21.79
May 2025	19.1	24.07
Jun 2025	19.72	21.66
Jul 2025	21.88	26.2
Aug 2025	22.25	28.31
Sep 2025	19.8	22.45
Oct 2025	18.13	20.13
Nov 2025	17.36	18.59
Dec 2025	17.57	18.59
Jan 2026	17.41	19.36
Average	18.34	21.41
50^{th} Percentile	17.61	20.07
20^{th} Percentile	16.60	17.84
Average (cfs)	**28.38**	33.13
50^{th} Percentile (cfs)	27.24	31.05
20^{th} Percentile (cfs)	25.69	27.60

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 SD0000078, Sioux Falls WRF 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
September	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
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

Month	Standard Error of Skewness (logs)	Serial Correlation Coefficient (logs)	Coefficient of Variation (logs)	Non-Exceedance Probability
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

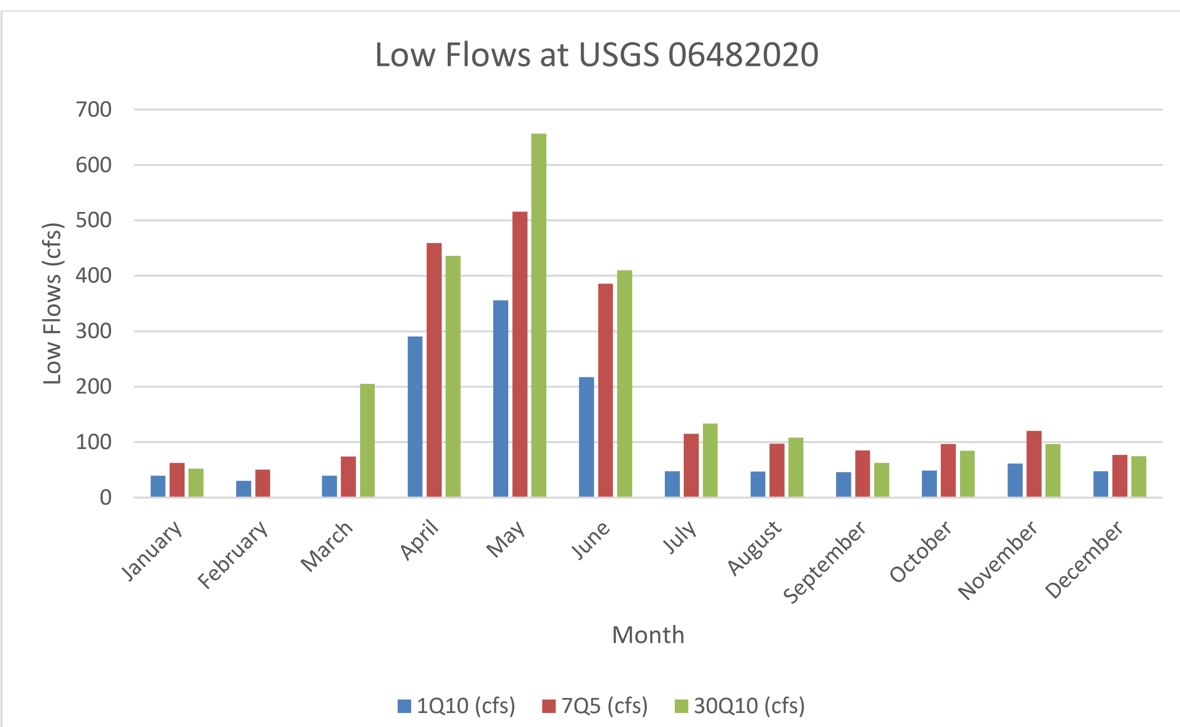
**** - Note -- Could not complete analysis for 30Low10 Review source data for missing or zero flows.**

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	--	**

USGS Station	Month	Probability	Recurrence Interval	1-Day (1Q10) (cfs)	7-Day (7Q5) (cfs)	30-Day (30Q10) (cfs)
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 Effluent Flow

The Sioux Falls WRF is a major discharging facility that has an average flow of 18.34 MGD (30-Day Average effluent flows from October 2021 through January 2026) (28.38 cfs). 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	57.651	81.088	70.499
February	48.71	68.911	**
March	58.123	92.639	223.81
April	309.03	477.55	454.46
May	374.42	533.99	674.69
June	235.48	404.22	428.27
July	66.027	133.73	151.94
August	65.558	115.606	126.67
September	64.505	103.261	81.061
October	67.428	114.973	102.68
November	79.668	138.51	114.866
December	65.797	95.629	93.036

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	30Q10 + SFWRF (cfs)	70.499	0.25	**17.625**
February	7Q5 + SFWRF (cfs)	68.911	0.5	**34.456**
March	7Q5 + SFWRF (cfs)	92.639	0.5	**46.320**
April	30Q10 + SFWRF (cfs)	454.46	0.25	**113.615**
May	7Q5 + SFWRF (cfs)	533.99	0.5	**266.995**
June	7Q5 + SFWRF (cfs)	404.22	0.5	**202.110**
July	7Q5 + SFWRF (cfs)	133.73	0.5	**66.865**
August	7Q5 + SFWRF (cfs)	115.606	0.5	**57.803**
September	30Q10 + SFWRF (cfs)	81.061	0.25	**20.265**
October	30Q10 + SFWRF (cfs)	102.68	0.25	**25.670**
November	30Q10 + SFWRF (cfs)	114.866	0.25	**28.717**
December	30Q10 + SFWRF (cfs)	93.036	0.25	**23.259**

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)	57.651	0.025	**1.441**
February	1Q10 + SFWRF (cfs)	48.71	0.025	**1.218**
March	1Q10 + SFWRF (cfs)	58.123	0.025	**1.453**
April	1Q10 + SFWRF (cfs)	309.03	0.025	**7.726**
May	1Q10 + SFWRF (cfs)	374.42	0.025	**9.361**
June	1Q10 + SFWRF (cfs)	235.48	0.025	**5.887**
July	1Q10 + SFWRF (cfs)	66.027	0.025	**1.651**
August	1Q10 + SFWRF (cfs)	65.558	0.025	**1.639**
September	1Q10 + SFWRF (cfs)	64.505	0.025	**1.613**
October	1Q10 + SFWRF (cfs)	67.428	0.025	**1.686**
November	1Q10 + SFWRF (cfs)	79.668	0.025	**1.992**
December	1Q10 + SFWRF (cfs)	65.797	0.025	**1.645**

ATTACHMENT 7

Reasonable Potential Analysis

Reasonable Potential Methods:

The following reasonable potential analyses were completed to determine if parameters found in city of Harrisburg'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).

As explained in SDDANR's *Mixing Zone and Dilution Implementation Procedures* (1998), effluent mixing with the receiving waters is allowed for some chronic (30-day average) parameters with the permit writer's judgment. Nitrate-Nitrogen (as N) was not allowed a mixing zone.

For the conventional pollutants, reasonable potential values were calculated from the DMR data (Attachment 2) for Nitrate-Nitrogen (as N) and Dissolved Oxygen (DO).

Acute Standards Reasonable Potential Analysis (RPA)
City of Harrisburg
February 2026
South Dakota Department of Agriculture and Natural Resources
Non-Metals

DMR Date	Nitrate-Nitrogen (as N)	DO
	mg/L	mg/L
Oct 2021		7.9
Nov 2021	3.8	7.9
Dec 2021	8	8
Jan 2022	8.7	8.5
Feb 2022	11.1	8.8
Mar 2022	5.8	8.4
Apr 2022	2.3	8.2
May 2022	4.9	7.5
Jun 2022	4	7.9
Jul 2022	5.1	7.7
Aug 2022	4.8	7.6
Sep 2022	3.4	7.7
Oct 2022	3.2	7.8
Nov 2022	11.6	8
Dec 2022	8.7	8.3
Jan 2023	1.3	7.6
Feb 2023	2.3	8
Mar 2023	2.2	8.5
Apr 2023	3	8.7
May 2023	7.8	8.2
Jun 2023	7.1	7.8
Jul 2023	4.4	8
Aug 2023	5	7.7
Sep 2023	4.1	7.3
Oct 2023	3.4	7.2
Nov 2023	2.7	8.1
Dec 2023	2.5	8.2
Jan 2024	8.2	8.5

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DMR Date	Nitrate-Nitrogen (as N)	DO
Feb 2024	2.9	8.3
Mar 2024	2.8	8.1
Apr 2024	1.8	8.2
May 2024	3.8	8.1
Jun 2024	5.8	8
Jul 2024	8.3	7.2
Aug 2024	7.3	7.7
Sep 2024	6.2	7.2
Oct 2024	6.9	7.8
Nov 2024	6	7.5
Dec 2024	4.8	8
Jan 2025	4.6	7.7
Feb 2025	4	7.9
Mar 2025	1.6	8.1
Apr 2025	1.6	7.7
May 2025	3.4	7.4
Jun 2025	4.7	7.2
Jul 2025	5.9	7.2
Aug 2025	5.5	7.8
Sep 2025	4.6	7.2
Oct 2025	6.6	6.2
Nov 2025	5.1	7.4
Dec 2025	3.8	7.7

Statistics	Nitrate-Nitrogen	DO
	mg/L	mg/L
Number of Samples (n)	50	51
Mean	4.95	7.84
Variance	5.71	0.22
Standard Deviation	2.39	0.47
Minimum	1.30	6.20
Maximum	11.60	8.80
Coefficient of Variation [1]	0.48	0.06
Multiplying factor [2]	1.03	1.00
Calculations		
Highest RP Concentration [3, 4]	12.00	6.18
SDSWQ Standard or TBEL	88.00	5.00
Tests		
Is the Maximum Value > the SDSWQS?	No	No
Is the Highest RP Concentration > the SDSWQS?	No	No
Is the Maximum Value > 50% of SDSWQS?	No	Yes
Is the Highest RP Concentration > 50% of SDSWQS?	No	Yes
Decisions		
Current Acute Limit	None	5.00

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DMR Date	Nitrate-Nitrogen (as N)	DO
Proposed Acute Limit	None	None
Current Monitoring Frequency	Monthly	3/week
Proposed Monitoring Frequency	None	3/week
Limit & Monitoring Justification	RP	RP

[1] The coefficient of variation where n>10 is calculated as standard deviation/mean. When n<10, the coefficient of variation is estimated to be 0.6.
[2] The multiplying factor is computed in accordance with EPA's reasonable potential determination, page 6, *Reasonable Potential Implementation Procedure for SWD Permits, April 2013. The DO minimum values are divided by the multiplying factor.*
[3] The maximum observed effluent concentration is multiplied by the multiplying factor to determine the highest effluent concentration which can reasonably be expected, based on the observed data, a 99% confidence level, and a 95% probability basis.
[4] Minimum DO are the lowest RP. For DO, is the SDSWQ > 50% of Lowest RP?

Chronic Standards Reasonable Potential Analysis (RPA)
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DMR Date	Nitrate-Nitrogen
	mg/L
Nov 2021	3.8
Dec 2021	6.6
Jan 2022	6.7
Feb 2022	8.4
Mar 2022	3.1
Apr 2022	1.6
May 2022	2.5
Jun 2022	1.8
Jul 2022	4
Aug 2022	2.9
Sep 2022	2.8
Oct 2022	2.7
Nov 2022	4.8
Dec 2022	4.7
Jan 2023	1.2
Feb 2023	1.8
Mar 2023	1.5
Apr 2023	2.4
May 2023	5.3
Jun 2023	6.5
Jul 2023	3.7
Aug 2023	4.2
Sep 2023	3.8

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DMR Date	Nitrate-Nitrogen
Oct 2023	3
Nov 2023	2.3
Dec 2023	2.3
Jan 2024	3.7
Feb 2024	2.3
Mar 2024	2.4
Apr 2024	1.7
May 2024	3.2
Jun 2024	4.7
Jul 2024	6.7
Aug 2024	6
Sep 2024	5.4
Oct 2024	5.9
Nov 2024	4.5
Dec 2024	4.2
Jan 2025	3.7
Feb 2025	2.8
Mar 2025	1.4
Apr 2025	1.3
May 2025	2
Jun 2025	3.9
Jul 2025	5
Aug 2025	5.1
Sep 2025	4.1
Oct 2025	5.6
Nov 2025	3.8
Dec 2025	3.5

Statistics	Nitrate-Nitrogen mg/L
Number of Samples (n)	50
Mean	3.75
Variance	2.85
Standard Deviation	1.69
Minimum	1.20
Maximum	8.40
Coefficient of Variation [1]	0.45
Multiplying factor [2]	1.03
Calculations	
80th Percentile Upstream Concentration	N/A
Is Mixing Granted for Parameter? [3]	no
Maximum Instream Concentration if mixing [3]	N/A
Highest RP Concentration [3]	8.67
SDSWQ Standard or TBEL	50.00
Tests	

Chronic Standards Reasonable Potential Analysis (RPA)
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DMR Date	**Nitrate-Nitrogen**
Is the Maximum Instream Concentration > the SDSWQS?	No
Is the Highest RP Concentration > the SDSWQS?	No
Is the Maximum Instream Concentration > 50% of SDSWQS?	No
Is the Highest RP Concentration > 50% of SDSWQS?	No
Decisions	
Current Chronic Limit	None
Proposed Chronic Limit	None
Current Monitoring Frequency	Monthly
Proposed Monitoring Frequency	None
Limit & Monitoring Justification	RP

[1] The coefficient of variation where n>10 is calculated as standard deviation/mean. When n<10, the coefficient of variation is estimated to be 0.6.

[2] The multiplying factor is computed in accordance with EPA's reasonable potential determination, page 6, *Reasonable Potential Implementation Procedure for SWD Permits, April 2013.*

[3] In the case of no mixing, the maximum observed effluent concentration is multiplied by the multiplying factor to determine the highest effluent concentration which can reasonably be expected, based on the observed data, a 99% confidence level, and a 95% probability basis. In the case of mixing, the maximum instream concentration is multiplied by the multiplying factor.