ADDENDUM #2

Applicant:	Smithfield Foods
Permit Number:	SD0000078
Contact Person:	Mark Wiggs, General Manager Charles Schulz, Environmental Coordinator Mark Gerwer, Wastewater Treatment Facilities Manager 1400 N. Weber Ave Sioux Falls, SD 57103
Phone:	(605) 330-3656 – Environmental Coordinator
Permit Type:	Major Industrial – Major Modification

DESCRIPTION OF ADDENDUM

The permit is being modified in accordance with the Administrative Rules of South Dakota (ARSD), Sections 74:52:04:03 and 74:52:04:04. ARSD Section 52:04:04 (13) states that "to correct technical mistakes, such as errors in calculations, or mistaken interpretations of law made in determining permit conditions" is a cause for modification. South Dakota Department of Environment and Natural Resources (SDDENR) is proposing to modify some of the effluent limits in Smithfield Foods' Surface Water Discharge Permit, which became effective on July 1, 2020.

The current permit contains monthly chronic Whole Effluent Toxicity (WET) effluent limits in **Section 3.6, Effluent Limits – *Outfall 001***, and monthly laboratory dilution series in **Section 3.8, Whole Effluent Toxicity Testing**. At the time of permit effluent limits development for the current permit, monthly WET limits were calculated based on recent instream conditions (2005 to 2018) in the Big Sioux River, and expressed in Chronic Toxicity Units (TU_c). For the previous permit cycle, seasonal WET limits were calculated based on then-recent instream conditions (1978 to 1992) in the Big Sioux River, and expressed as 25% Inhibition Concentration (IC_{25}).

The current permit defines 25% inhibition concentration and chronic toxicity in **Section 1.0, Definitions.** The IC_{25} is "a point estimate of the toxicant concentration that would cause a 25-percent reduction in a biological measurement (e.g. reproduction, growth), calculated from a continuous model (i.e. Interpolation Method)." Chronic toxicity "occurs when in the IC_{25} test when the survival, growth, or reproduction, as applicable, for either test species, at the effluent dilution(s) designated in this permit, is significantly less (at the 95 percent confidence level) than that observed for the control specimens."

Effluent limits expressed in either TU_c or IC_{25} are equivalent, and can be converted back and forth, as shown in the equations below:

- *The IC_{25} is computed using the following equation:*

$$IC_{25} = \frac{Effluent\ Average\ Design\ Flow}{Allowable\ Streamflow\ for\ Mixing + Effluent\ Average\ Design\ Flow}$$

- *The TU_c is computed using the following equation:*

$$TU_c = \frac{100}{IC_{25}}$$

- *The Tu_c is converted back to IC_{25} using the following equation:*

$$IC_{25} = \frac{100}{TU_c}$$

As discussed in the Statement of Basis, the newly calculated monthly TU_c limits were compared with the previous permit's seasonal IC_{25} limits by conversion, and the more stringent effluent limit for each month was proposed to prevent backsliding. The calculated limits were proposed for April, August, October, and December. The previous limits were proposed for January, March, May, June, July, September, and November. The calculated and previous limits were equal for February.

The laboratory dilution series proposed in the current permit were based on the recently-calculated instream conditions for all months. The dilution series include an Instream Waste Concentration (IWC), which is defined in the permit (**Section 1.0, Definitions**) as "the concentration of a toxicant in the receiving water after mixing. It is also referred to as the receiving water concentration (RWC)." The IWC is calculated using an equation equivalent to the IC_{25}.

According to SDDENR's WET Implementation Plan, the permit IC_{25} should be set to the IWC to ensure that the effluent is not toxic. As the current permit is written now, the IC_{25} values do not match the IWC values for the months of January, March, May, June, July, September, and November.

This modification proposes that all of the monthly TU_c effluent limits that were initially calculated for the current permit are set as the final WET effluent limits in the permit. As shown in Table 1 below, this would result in an increase in the effluent limits for the months of January, March, May, June, July, September, and November. No modification is proposed for the months of February, April, August, October, or December. This modification would correct the discrepancy between the IWC and IC_{25}; update the WET TU_c limits as calculated based on recent instream conditions (2005-2018 instead of 1978-1992); and make the WET TU_c limits consistent with the laboratory dilution series.

Table 1: Proposed Modification of IC_{25} Values and Chronic WET Effluent Limits

Season	Instream Waste Conc. (IWC)	Calculated IC_{25} & TU_c		Modification Notes
		25% Inhibition Conc. (IC_{25}, %)	Chronic Toxicity Unit (TU_c)	
January 1 – 31	**44%**	**44%**	**2.3**	**Limit increased from 2.1 TU_c.** *IC_{25} decreased from 47%*
February 1 – 29	47%	47%	2.1	*Limit and IC_{25} not modified.*
March 1 – 31	**37%**	**37%**	**2.7**	**Limit increased from 2.1 TU_c.** *IC_{25} decreased from 47%*
April 1 – 30	41%	41%	2.4	*Limit and IC_{25} not modified.*
May 1 – 31	**33%**	**33%**	**3.0**	**Limit increased from 2.8 TU_c.** *IC_{25} decreased from 36%*
June 1 – 30	**29%**	**29%**	**3.5**	**Limit increased from 2.8 TU_c.** *IC_{25} decreased from 36%*
July 1 – 31	**30%**	**30%**	**3.3**	**Limit increased from 2.8 TU_c.** *IC_{25} decreased from 36%*
August 1 – 31	49%	49%	2.0	*Limit and IC_{25} not modified.*
September 1 – 30	**35%**	**35%**	**2.8**	**Limit increased from 2.1 TU_c.** *IC_{25} decreased from 48%*
October 1 – 31	50%	50%	2.0	*Limit and IC_{25} not modified.*
November 1 – 30	**32%**	**32%**	**3.1**	**Limit increased from 2.1 TU_c.** *IC_{25} decreased from 47%*
December 1 – 31	48%	48%	2.1	*Limit and IC_{25} not modified.*

With this modification, the final monthly chronic Whole Effluent Toxicity (WET) effluent limits in **Section 3.6, Effluent Limits – *Outfall 001*** would be updated to the TU_c values shown in Table 2. The dilution series (including IWC values) in **Section 3.8, Whole Effluent Toxicity Testing**, would be unchanged.

Table 2: Final Chronic WET Effluent Limits

Season	Chronic WET Limit (TU_c)
January 1 – 31	2.3
February 1 – 29	2.1
March 1 – 31	2.7
April 1 – 30	2.4
May 1 – 31	3.0
June 1 – 30	3.5
July 1 – 31	3.3
August 1 – 31	2.0
September 1 – 30	2.8
October 1 – 31	2.0
November 1 – 30	3.1
December 1 – 31	2.1

Backsliding of effluent limits is addressed in ARSD Section 74:52:03:13(13)(b).

- Part (ii) is applicable to this permit modification, given the availability of new streamflow data for permit limits development since the previous permit. "The circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued and would constitute cause for permit modification or revocation and reissuance under § 74:52:04:03."

- Part (iv) is applicable to this permit modification, given the technical error of the dilution series not matching the permit limits for all months. "Information is available which was not available at the time of permit issuance; other than revised regulations, guidance, or test methods; and which would have justified the application of a less stringent effluent limit at the time of permit issuance, or the administrator determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under § 402(a)(1)(b) of the Act."

The increase of these Chronic WET limits is considered a major modification, and public notice is required. No other permit conditions or requirements shall be changed.

ENDANGERED SPECIES

This is a modification of an existing permit. No listed endangered species are expected to be impacted by activities related to this permit.

PERMIT EXPIRATION

The current permit expiration date of June 30, 2025 shall remain in effect for this modification.

PERMIT CONTACT

Any questions pertaining to this modification can be directed to Kathleen Grigg, Engineer II for the Surface Water Quality Program, at (605) 773-3351.

February 11, 2021

ADDENDUM #1

Applicant:	Smithfield Foods
Permit Number:	SD0000078
Contact Person:	Mark Wiggs, General Manager Charles Schulz, Environmental Coordinator Mark Gerwer, Wastewater Treatment Facilities Manager 1400 N. Weber Ave Sioux Falls, SD 57103
Phone:	(605) 330-3656 – Environmental Coordinator
Permit Type:	Major Industrial – Response to Comments

DESCRIPTION OF ADDENDUM

During the 30-day public notice period, the South Dakota Department of Environment and Natural Resources (SDDENR) received comments regarding the draft Surface Water Discharge permit renewal for Smithfield Foods. Twenty-one persons submitted comment letters. The comment documents are included in Addendum #1 – Attachment 1. The Administrative Rules of South Dakota (ARSD) Section 74:52:05:20 states the following:

> *"**Response to comments.** At the time that any final permit is issued, the secretary shall issue a response to all written comments received during the period of public notice."*

This addendum provides SDDENR's response to the comments received. All permit limits and conditions in the draft permit for Smithfield Foods shall remain unchanged, except as indicated in the response to comments. The permit will be issued with an effective date of **July 1, 2020.**

RESPONSE TO COMMENTS

SDDENR received comments from 21 persons during public notice. The issues addressed in the comments are grouped by topic and summarized below, along with SDDENR's responses. For more detail, refer to the original comment documents which are compiled in Addendum #1 – Attachment 1.

Pollution Reduction

- **14 persons commented on the need for Smithfield Foods to reduce pollution, and/or to protect the Big Sioux River as a water resource.**

  According to SDDENR's *2018 South Dakota Integrated Report for Surface Water Quality*, the Big Sioux River does not support the beneficial uses of limited contact recreation, immersion recreation, or warmwater semipermanent fish life propagation in the segments upstream, at, or downstream of Smithfield Foods' wastewater treatment plant. The

recreation impairments are due to in-stream *Escherichia coli (E. coli)* levels that violate the South Dakota Surface Water Quality Standards. The fish life propagation impairment is due to Total Suspended Solids (TSS) levels that violate the South Dakota Surface Water Quality Standards.

A Total Maximum Daily Load (TMDL) has been developed for both *E. coli* and TSS in the Big Sioux River in the Sioux Falls area. These TMDLs were initially completed in 2012, and then updated in 2019 to reflect municipal and industrial growth in the Sioux Falls area. As documented in the TMDLs, point sources such as Smithfield Foods contribute effectively 0% of the *E. coli* and TSS loading to the Big Sioux River in the Sioux Falls area. Smithfield Foods' wastewater treatment plant discharges near the boundary between Reach 10 and Reach 11 in the TMDL study area. As shown in the table below, *E. coli* loading to Reach 11 of the Big Sioux River can be attributed mainly to nonpoint sources (46%), upstream Municipal Separate Storm Sewer System (MS4) stormwater sources (26%), and local MS4 stormwater sources (16%). TSS loading can be attributed mainly to the existing water quality upstream (51%), local MS4 stormwater sources (17%), and upstream bed/bank erosion (14%).

Source Loading to Big Sioux River Reach 11	***E. coli***	**TSS**
Bed/Bank Local (nonpoint source from bed and bank erosion)	N/A	2%
Bed/Bank Upstream (nonpoint source from bed and bank erosion)	N/A	14%
Big Sioux River Boundary Condition (existing water quality upstream of the study area)	3%	51%
MS4 Local (municipal separate storm sewer system)	16%	17%
MS4 Upstream (municipal separate storm sewer system)	26%	5%
Nonpoint Sources (general nonpoint sources of bacteria and sediment)	46%	3%
Point Sources (Smithfield Foods' Wastewater Treatment Plant)	**0%**	**0%**
Skunk Creek (tributary to the Big Sioux River)	9%	8%
Total	100%	100%

Wasteload allocations are assigned to point source dischargers such as Smithfield Foods. The updated TMDL for TSS includes a wasteload allocation of 1.38 tons/day assigned to Smithfield Foods; the facility's TSS loading discharged is normally less than half of this wasteload allocation. The updated TMDL for *E. coli* includes a wasteload allocation of 4.67×10^{10} cfu/day assigned to Smithfield Foods. *E. coli* monitoring is not required by the current permit; however fecal coliform monitoring results are generally well below the permit limits. The limits developed for the draft permit for TSS and *E. coli* should ensure that these wasteload allocations are not exceeded.

More information and links to the TMDLs are available through SDDENR's Watershed Protection Program (denr.sd.gov, (605) 773-4254).

Regarding nitrates, the Big Sioux River has not been identified as being impaired for nitrate-nitrogen (as N); therefore TMDL has not been proposed or developed for this parameter. The nitrate-nitrogen (as N) effluent limits included in the draft permit will ensure that Smithfield's discharge meets the applicable surface water quality standards assigned to the Big Sioux River below the discharge location.

- **1 person commented on Smithfield Foods' need to reduce air pollution.**

  The draft surface water discharge permit regulates Smithfield Foods' wastewater treatment plant's discharge to the Big Sioux River; it does not regulate air quality. Smithfield Foods' meat processing facility has an air quality permit (no. 28.0201-01). More information is available through SDDENR's Air Quality Program (denr.sd.gov, (605) 773-3151).

- **2 persons commented that Smithfield Foods should improve its existing wastewater treatment plant processes.**

  The wastewater treatment plant was completed in 1983 and has been upgraded on a regular basis (1996-2008, 2010, 2011, 2016, and 2019). The plant is in the process of upgrading again, as the draft permit contains a compliance schedule which requires Smithfield Foods to modify its operations and upgrade its wastewater treatment processes as necessary to meet updated ammonia-nitrogen (as N) and new nitrate-nitrogen (as N) effluent limits. The wastewater treatment plant must be able to meet these effluent limits for ammonia-nitrogen (as N) and nitrate-nitrogen (as N) by three years after the draft permit becomes effective.

Drinking Water Pollution

- **4 persons commented on concerns about Smithfield Foods' wastewater treatment plant discharge's effect on drinking water.**

  Smithfield Foods' outfall currently discharges to a segment of the Big Sioux River that is classified for the beneficial use of domestic water supply waters, meaning for drinking water uses. There currently are no drinking water intakes in this area. Plans are to move the wastewater treatment plant's outfall approximately 150 yards downstream of its current location; construction is tentatively scheduled for 2020. After the outfall is moved, it will be located downstream of the domestic water supply waters classification.

  SDDENR is in the process of studying the domestic water supply waters classification of the Big Sioux River. This involves investigating the geology and hydrogeology of the area to determine if surface water and groundwater interactions are affecting water quality in drinking water wells. This study will be conducted by experts from SDDENR's drinking water, surface water quality, geological survey, ground water quality, and water rights programs.

- **1 person commented that Smithfield Foods' wastewater treatment plant should be held to more restrictive Nitrate-Nitrogen (as N) limits to protect drinking water sources.**

  Smithfield Foods' outfall currently discharges to a segment of the Big Sioux River that is classified for the beneficial use of domestic water supply waters, meaning for drinking water uses. There currently are no drinking water intakes in this area. Plans are to move the wastewater treatment plant's outfall approximately 150 yards downstream of its current location; construction is tentatively scheduled for 2020. After the outfall is moved, it will be located downstream of the domestic water supply waters classification.

  The nitrate-nitrogen (as N) effluent limits of 50 mg/L (30-day average) and 88 mg/L (daily maximum) proposed in the draft permit are based on the Big Sioux River's beneficial use classification of fish and wildlife propagation, recreation, and stock watering waters. The nitrate-nitrogen (as N) surface water quality standard of 10 mg/L (daily maximum) only applies to the beneficial use of domestic water supply waters. Permit limits must be based on existing beneficial uses of the receiving stream.

  SDDENR is in the process of studying the domestic water supply waters classification of the Big Sioux River. This involves investigating the geology and hydrogeology of the area to determine if surface water and groundwater interactions are affecting water quality in drinking water wells. This study will be conducted by experts from SDDENR's drinking water, surface water quality, geological survey, ground water quality, and water rights programs.

Health and Safety

- **9 persons commented on general health and safety concerns related to Smithfield Foods' wastewater treatment plant.**

  The draft permit requires Smithfield Foods to monitor the wastewater treatment plant's discharge for effluent water quality and effluent flow. Effluent limits were developed based on SDDENR's South Dakota Surface Water Quality Standards for the Big Sioux River and U.S. EPA's Technology-Based Effluent Limits (TBELs) for the meat and poultry point source category. Effluent monitoring and limits from the current permit were also taken into consideration, as effluent limits in the draft permit cannot be less stringent than those in the current permit due to antibacksliding rules. For each parameter, the most stringent of the water-quality based effluent limit, technology-based effluent limit, or current permit limit was proposed in the draft permit.

  The Big Sioux River near Smithfield Foods' wastewater treatment plant is classified for the following beneficial uses:

(1) Domestic water supply waters;
(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.

Tentatively scheduled for 2020, Smithfield Foods plans to move the wastewater treatment plant's outfall approximately 150 yards downstream of its current location; the outfall will then be located downstream of the domestic water supply waters classification. Therefore, effluent limits were developed to protect 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.

- **5 persons commented on health and safety concerns during recreation on or near the Big Sioux River.**

The Big Sioux River near Smithfield Foods' wastewater treatment plant is classified for the recreational beneficial uses of immersion recreation (for example, swimming) and limited contact recreation (for example, boating). According to SDDENR's *2018 South Dakota Integrated Report for Surface Water Quality*, the Big Sioux River does not support these beneficial uses due to in-stream impairment of *Escherichia coli (E. coli)* levels that violate the South Dakota Surface Water Quality Standards.

A Total Maximum Daily Load (TMDL) has been developed for *E. coli* in the Big Sioux River in the Sioux Falls area. This TMDL was initially completed in 2012, and then updated in 2019 to reflect municipal and industrial growth in the Sioux Falls area. As documented in the TMDL, point sources such as Smithfield Foods contribute effectively 0% of the *E. coli* loading to the Big Sioux River in the Sioux Falls area. Smithfield Foods' wastewater treatment plant discharges near the boundary between Reach 10 and Reach 11 in the TMDL study area. As shown in the table below, *E. coli* loading to Reach 11 of the Big Sioux River can be attributed mainly to nonpoint sources (46%) and upstream Municipal Separate Storm Sewer System (MS4) stormwater sources (26%), and local MS4 stormwater sources (16%).

Source Loading to Big Sioux River Reach 11	***E. coli***
Big Sioux River Boundary Condition (existing water quality upstream of the study area)	3%
MS4 Local (municipal separate storm sewer system)	16%
MS4 Upstream (municipal separate storm sewer system)	26%

Source Loading to Big Sioux River Reach 11	*E. coli*
Nonpoint Sources (general nonpoint sources of bacteria and sediment)	46%
Point Sources (Smithfield Foods' Wastewater Treatment Plant)	**0%**
Skunk Creek (tributary to the Big Sioux River)	9%
Total	100%

Wasteload allocations are assigned to point source dischargers such as Smithfield Foods. The updated TMDL for *E. coli* includes a wasteload allocation of 4.67 x 10^{10} cfu/day assigned to Smithfield Foods. *E. coli* monitoring is not required by the current permit; however fecal coliform monitoring results are generally well below the permit limits. The limits developed for the draft permit for TSS and *E. coli* should ensure that these wasteload allocations are not exceeded.

More information and a link to the TMDL are available through SDDENR's Watershed Protection Program (denr.sd.gov, (605) 773-4254).

- **1 person commented on animal cruelty in Smithfield Foods' business model.**

  The draft surface water discharge permit regulates Smithfield Foods' wastewater treatment plant's discharge to the Big Sioux River; it does not regulate operations at the meat processing facility. More information is available through the South Dakota Animal Industry Board (https://aib.sd.gov/, (605) 773-3321).

Effluent Violations and Enforcement

- **3 persons commented on concerns about SDDENR's enforcement of Smithfield Foods' wastewater treatment plant's effluent violations.**

  The draft permit includes provisions for enforcing effluent violations in **Section 5.5, Penalties for Violations in the Permit Conditions.** Effluent violations are subject to penalties of up to $10,000 per day of violation.

  Smithfield Foods has reported effluent violations during the current permit cycle. Smithfield Foods' wastewater treatment plant's effluent violations have been addressed in warning letters and inspection report findings. SDDENR has taken formal enforcement to fine Smithfield Foods for effluent violations, including the facility's most recent Notice of Violation (NOV) in 2019 which requires stipulated penalties for Five-Day Biochemical Oxygen Demand (BOD_5) violations and chronic Whole Effluent Toxicity (WET) violations.

Location

- **3 persons commented on Smithfield Foods' downtown location, and its possible impacts to growth, development, residents, and/or recreation in the area.**

  The draft surface water discharge permit regulates Smithfield Foods' wastewater treatment plant's discharge to the Big Sioux River; it does not regulate zoning in the city. More information is available through the City of Sioux Falls Zoning Division (www.siouxfalls.org, (605) 367-8254).

  The draft permit renewal is for the existing wastewater treatment plant at Smithfield Foods. The meat processing facility has been operating in Sioux Falls since 1909. The wastewater treatment plant was completed in 1983 and has been upgraded on a regular basis (1996-2008, 2010, 2011, 2016, and 2019).

- **2 persons commented on Smithfield Foods' wastewater treatment plant's discharge's impact on the falls at Falls Park.**

  Discharge from Smithfield Foods' wastewater treatment facility does not reach the falls at Falls Park because Falls Park is located upstream of Smithfield Foods' discharge outfall. Smithfield Foods' discharge flows downstream, not upstream, in the Big Sioux River; therefore, the discharge will not impact the falls at Falls park.

- **2 persons commented that moving the outfall 150 yards upstream would not protect drinking water sources.**

  Smithfield Foods' outfall currently discharges to a segment of the Big Sioux River that is classified for the beneficial use of domestic water supply waters, meaning for drinking water uses. There currently are no drinking water intakes in this area. Plans are to move the wastewater treatment plant's outfall approximately 150 yards downstream of its current location; construction is tentatively scheduled for 2020. After the outfall is moved, it will be located downstream of the domestic water supply waters classification. Smithfield Foods' discharge flows downstream, not upstream, in the Big Sioux River; therefore, the discharge will not impact the Big Sioux River where it is classified as domestic water supply waters.

  SDDENR is in the process of studying the domestic water supply waters classification of the Big Sioux River. This involves investigating the geology and hydrogeology of the area to determine if surface water and groundwater interactions are affecting water quality in drinking water wells. This study will be conducted by experts from SDDENR's drinking water, surface water quality, geological survey, ground water quality, and water rights programs.

Permit Renewal

- **6 persons commented that SDDENR should not renew or issue the draft permit, and/or should not allow Smithfield Foods' wastewater treatment plant to discharge.**

  The draft permit renewal is for the existing wastewater treatment plant at Smithfield Foods. The meat processing facility has been operating in Sioux Falls since 1909. The wastewater treatment plant was completed in 1983 and has been upgraded on a regular basis (1996-2008, 2010, 2011, 2016, and 2019).

  As was public noticed, the draft permit has been updated with permit conditions that were developed based on current regulations, meat processing plant production, and wastewater treatment plant configuration. Smithfield Foods' current permit became effective on April 1, 2000 and expired on March 31, 2005. Prior to expiration, the permittee submitted an application for permit renewal as required, which SDDENR approved. However, because SDDENR did not re-issue the permit prior to its expiration, the permit has been administratively continued. The administratively continued permit in effect today contains permit conditions that were based on regulations, production, and wastewater treatment from approximately 20 years go. Upon re-issuance, the new permit would replace the administratively continued permit with up-to-date effluent limits and requirements based on current conditions in the Big Sioux River, and current and expected future operations at Smithfield Foods. SDDENR cannot refuse to issue a permit to a facility that can meet all of the requirements in the permit.

- **2 persons commented on concerns about the renewed permit conditions if Smithfield Foods were to expand operations, given SDDENR's history of administratively continuing permits.**

  As was public noticed, the draft permit has been updated with permit conditions that were developed based on current regulations, meat processing plant production, and wastewater treatment plant configuration. Smithfield Foods' current permit became effective on April 1, 2000 and expired on March 31, 2005. Prior to expiration, the permittee submitted an application for permit renewal as required, which SDDENR approved. However, because SDDENR did not re-issue the permit prior to its expiration, the permit has been administratively continued. The administratively continued permit in effect today contains permit conditions that were based on regulations, production, and wastewater treatment from approximately 20 years go. Upon re-issuance, the new permit would replace the administratively continued permit with a permit with up-to-date limits and requirements based on current conditions in the Big Sioux River and current and expected future operations at Smithfield Foods. SDDENR cannot refuse to issue a permit to a facility that can meet all of the requirements in the permit.

  A meat processing facility expansion that would significantly increase loadings or flows to the wastewater treatment facility would require Smithfield Foods to submit an updated permit application. If the expansion were to be implemented prior to permit expiration, there are re-opener provisions in the draft permit to modify or revoke-and-reissue the

permit with updated conditions. If the expansion were to be implemented while the permit was administratively continued, Smithfield Foods would still be held to the effluent limits that were calculated based on production current as of 2019; the production-based effluent limits would not be re-calculated until the permit was renewed.

- **1 person commented on appreciating SDDENR renewing and updating the discharge permits for the major facilities in the city of Sioux Falls.**

  The SDDENR Surface Water Quality Program's surface water discharge permit team thanks the city of Sioux Falls for the comment.

- **1 person commented that Smithfield Foods should build a wastewater treatment plant on-site, or the permit should not be renewed.**

  The draft permit renewal is for the existing wastewater treatment plant at Smithfield Foods. The wastewater treatment plant was completed in 1983 and has been upgraded on a regular basis (1996-2008, 2010, 2011, 2016, and 2019).

Requests for Information

- **1 person commented to request information about the types and quantities of compounds to be disposed of to the surface.**

  During public notice, both the draft permit and an accompanying Statement of Basis were made available for public comment. As public noticed, the Statement of Basis and its attachments provided the following information to address this request for information:

  Statement of Basis. The *Description* section details the meat processing operations and wastewater treatment plant processes at the Smithfield Foods facility. The *Approved Chemicals* section includes the chemicals used for wastewater treatment. The *Monitoring Data* section summarizes effluent violations that have been reported during the current permit cycle. The *Effluent Limits* and *Self Monitoring Requirements* sections summarize the parameters to be monitored, as well as their monitoring frequencies and effluent limits as applicable.

  Attachment 3: Discharge Monitoring Report (DMR) Data. Smithfield Foods is required to submit DMRs that summarize effluent monitoring data. All monitoring data reported in DMRs and submitted during the current permit cycle are included in this attachment. This information is also available at EPA's Enforcement and Compliance History Online (ECHO) website, https://echo.epa.gov/.

  Attachment 4: Reasonable Potential Analysis. This analysis is conducted to determine which parameters in Smithfield Foods' wastewater treatment plant's effluent have reasonable potential to violate South Dakota's Surface Water Quality Standards

(SDSWQS). Results of the Reasonable Potential Analysis are presented in this attachment.

Statement of Basis Attachment 10: Technology-Based Effluent Limit (TBEL) Development for Smithfield WWTP. The Environmental Protection Agency (EPA) has established effluent guidelines for establishing TBELs for various industries, including the "Meat and Poultry Products Point Source Category" which applies to Smithfield Foods. These effluent guidelines are available through eCFR at https://ecfr.io/Title-40/cfr432_main. The TBELs calculated for the draft permit are presented in this attachment.

- **1 person commented to request more details about the proposal and alternatives.**

During public notice, both the draft permit and an accompanying Statement of Basis were made available for public comment. As public noticed, the Statement of Basis and its attachments provided the following information to address this request for information:

Statement of Basis. This document provides guidance to aid in complying with the permit requirements. The sections addressed in the Statement of Basis include: *Description*; *Approved Chemicals*; *Receiving Waters*; *Total Maximum Daily Load*; *Antidegradation*; *Inspections*; *Compliance Schedule*; *Effluent Limits*; *Self Monitoring Requirements*; *Whole Effluent Toxicity*; *Sludge*; *Storm Water*; *Endangered Species*; *Permit Expiration*; and *Permit Contact*.

Attachment 1: Facility Site Diagram. A flow diagram to illustrate how wastewater is transferred between treatment processes at Smithfield Foods' wastewater treatment plant is presented in this attachment.

Attachment 2: Antidegradation Review. Because the permit does not authorize an increase in effluent limits, a formal antidegradation review is not required. An informal antidegradation review is presented in this attachment.

Attachment 3: Discharge Monitoring Report (DMR) Data. Smithfield Foods is required to submit DMRs that summarize effluent monitoring data. All monitoring data reported in DMRs and submitted during the current permit cycle are included in this attachment. This information is also available at EPA's Enforcement and Compliance History Online (ECHO) website, https://echo.epa.gov/.

Attachment 4: Reasonable Potential Analysis. This analysis is conducted to determine which parameters in Smithfield Foods' wastewater treatment plant's effluent have reasonable potential to violate South Dakota's Surface Water Quality Standards (SDSWQS). Results of the Reasonable Potential Analysis are presented in this attachment.

Attachment 5: Ammonia Limits Development for the Smithfield Wastewater Treatment Plant and Sioux Falls Water Reclamation Facility in the Big Sioux River near Sioux

Falls, South Dakota. Water-quality based effluent limits for ammonia-nitrogen (as N) were developed and presented in this attachment.

Attachment 6: QUAL2Kw Modeling for Ammonia-Nitrogen, Five-Day Biochemical Oxygen Demand (BOD_5), and Dissolved Oxygen (DO) Limits Development for the Smithfield Wastewater Treatment Plant and the Sioux Falls Water Reclamation Facility. Water quality modeling methodology and results used in limits development are included in this attachment.

Attachment 7: Water Quality Monitoring (WQM) Site Data Statistics. SDDENR maintains a network of WQM sites to monitor ambient water quality in lakes and streams in the state. Data from sites on the Big Sioux River were used to develop water quality based effluent limits for the draft permit. Statistics from the data used are presented in this attachment.

Attachment 8: Receiving Streamflow Data. The United States Geological Survey (USGS) maintains stream gages on the Big Sioux River. Data from these stream gages were used to calculate the 7Q5 low flows to develop water quality based effluent limits for the draft permit. The monthly 7Q5 low flows and statistics are presented in this attachment.

Attachment 9: Discharge Monitoring Data (DMR) Effluent Data Statistics. DMR data from both Smithfield Foods' wastewater treatment plant and the city of Sioux Falls' water reclamation facility were used to develop effluent limits for the draft permit. The DMR data statistics for each facility are presented in this attachment.

Attachment 10: Technology Based Effluent Limit (TBEL) Development for Smithfield WWTP. The Environmental Protection Agency (EPA) has established effluent guidelines for establishing TBELs for various industries, including the "Meat and Poultry Products Point Source Category" which applies to Smithfield Foods. These effluent guidelines are available through eCFR at https://ecfr.io/Title-40/cfr432_main. The TBELs calculated for the draft permit are presented in this attachment.

Typographical Errors

- **1 person commented on typographical errors in the draft permit compliance schedule and final effluent limits effective dates.**

  In the draft permit **Section 3.6, Effluent Limits – *Outfall 001***, a typographical error was found in the effluent limits table. As public noticed, nitrate-nitrogen (as N) should have been reported without effluent limits, effective through March 31, 2023. This date was incorrectly public noticed as May 31, 2023 in the draft permit. *As the final permit effective date has been moved from April 1, 2020 to July 1, 2020, the nitrate-nitrogen (as N) effluent limits of 50 mg/L (30-day average) and 88 mg/L (daily maximum) will become effective on **July 1, 2023**. Also, the final ammonia-nitrogen (as N) effluent limits will become effective*

on July 1, 2023. *The effluent limits table in the permit* **Section 3.6** *has been updated to reflect these changes.*

In the draft permit **Section 3.5, Compliance Schedule**, a typographical error was found in one of the compliance schedule's interim milestone dates. Milestone "c" should have read: "By March 31, 2023, the facility shall complete any necessary adjustments to the wastewater treatment processes and operations to comply with the final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N)." This date was incorrectly public noticed as May 31, 2023 in both the draft permit and the Statement of Basis. *As the final permit effective date has been moved from April 1, 2020 to July 1, 2020, the compliance schedule has been updated as follows, with a final compliance date of* ***July 1, 2023****:*

3.5 Compliance Schedule

1. The permittee shall achieve compliance with the effluent limits specified for discharges in accordance with the following schedule:

    a. Starting on the first effective day of the permit (**July 1, 2020**), nitrate-nitrogen (as N) and ammonia-nitrogen (as N) shall be monitored during a discharge, according to the sampling requirements in **Section 3.6** of the permit. There shall be no interim nitrate-nitrogen (as N) limits. There shall be interim ammonia-nitrogen (as N) limits carried over from the previous permit.

    b. The permittee shall investigate treatment and operational options for reducing nitrate-nitrogen (as N) and ammonia-nitrogen (as N) levels in the discharge. The permittee shall submit compliance progress reports on a quarterly basis to SDDENR starting on **October 1, 2020**. These reports shall include details on evaluating the treatment system, hiring an engineer, and determining what changes are needed to come into compliance with the final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N).

    c. By **June 30, 2023**, the facility shall complete any necessary adjustments to the wastewater treatment processes and operations to comply with the final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N).

    d. On **July 1, 2023**, the final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N) in **Section 3.6** of the permit shall become effective.

- **Additional typographical errors were found in the effluent limits table in Section 3.6, Effluent Limits – *Outfall 001*. These errors have been corrected as follows:**

In addition to the mass-based effluent limits with units of pounds per day (lb/d) as public noticed, the concentration results should also be reported in units of milligrams per liter (mg/L) for Five-Day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), and Ammonia-Nitrogen (as N). For these parameters, the mass-based effluent limits

sample type is "Calculated," and the concentration results sample type is "24-Hour Composite."

In addition to the concentration-based effluent limit with units of milligrams per liter (mg/L) as public noticed, the mass-based results should also be calculated and reported in units of pounds per day (lb/d) for Oil and Grease Hexane Extraction Method (HEM). For this parameter, the concentration-based effluent limit sample type is "Grab," and the mass loading sample type is "calculated."

The *Escherichia coli* (*E. coli*) limits are to be effective from May 1 to September 30; not May 1 to September 1 as public noticed.

PERMIT EXPIRATION

The permit will be issued as public noticed, with an expiration date of **June 30, 2025**.

PERMIT CONTACT

Any questions pertaining to this response to comments can be directed to Kathleen Grigg, Engineer II for the Surface Water Quality Program, at (605) 773-3351.

April 16, 2020

ADDENDUM #1 – ATTACHMENT 1

Comments Received During Public Notice

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, December 18, 2019 7:08 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/18/2019 19:08:10

Commenter Info:
Joe Kirby
350 S. Main Avenue
Sioux Falls SD, 57104
Email: joekirby31@gmail.com **Phone:**

Comments :
As a resident of downtown Sioux Falls, I would like to see a reduction in the air and water pollution caused by Smithfield Foods in our neighborhood. While the downtown location of this plant may have once made sense, it no longer does. Downtown is growing rapidly in terms of residences and activity. The pollution caused by Smithfield is an inhibitor to the economic success of some parts of downtown and perhaps to the health and safety of citizens.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, December 18, 2019 8:34 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/18/2019 20:33:34

Commenter Info:
Craig Markhardt
421 N. Phillips Ave Unit 411
Sioux Falls SD, 57104
Email: Craigmarkhardt@gmail.com **Phone:** 6053767468

Comments :
Please provide all compounds that will be disposed of on the surface as well as the measurable quantities of those materials.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, December 18, 2019 10:04 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/18/2019 22:04:22

Commenter Info:
Barbara B Johnson
421 N Phillips Ave #444
Sioux Falls SD, 57104
Email: Phone:

Comments :
Please stop permitting the discharge of pollutants from Smithfield Foods (and any other facility discharging pollutants). Our water is our most precious resource. It is our responsibility to protect our environment and our community. This is a great opportunity to ask Smithfield to invest in resources to address this problem.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, December 18, 2019 10:20 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/18/2019 22:19:53

Commenter Info:
Melissa McCauley
806 S 1st Ave
Sioux Falls SD, 57104
Email: m.McCauley09@gmail.com **Phone:** 6053596032

Comments :
I cannot say enough how much i am not in favor of this. Isn't it sad that we can't use our river in the way it was meant to be used?! So many times i run through the falls and look at how much damage has been done by this company. With no regard for the well being of our community we let Smithfield come in and pollute our city, community, our future and all we do is "fine" them if they dump to much waste into our river. It is with DEEP dismay that money means more than our health. Let's actually care about the health of our river and not the money lost.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, December 18, 2019 10:32 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/18/2019 22:32:18

Commenter Info:
Emily Eisenhauer
112 S Duluth Ave
Sioux Falls SD, 57104
Email: emily.eisenhauer86@gmail.com **Phone:** 6059401888

Comments :
I kayak in the Big Sioux every year. I'd love to feel safe knowing that I wouldn't get an infection free shipping my feet in the water.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, December 18, 2019 10:45 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the

Comment Deadline:
01/12/2020

Date Comment Filed:
12/18/2019 22:45:17

Commenter Info:
Meagan Goens
533 Aana Ave
Baltic SD South Dakota, 57003
Email: meg.goens@gmail.com **Phone:**

Comments :
Please stop polluting our river. It's so sad how gross our river has become over the years because you treat it as your own personal dumping area. Please do the right thing and stop the pollution and start doing your part to reverse the damage you have done.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, December 18, 2019 11:19 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/18/2019 23:19:03

Commenter Info:
Bernadette Sorenson
600 north main ave
Sioux Falls Sd, 57104
Email: Bsorenson@midco.net **Phone:**

Comments :
I'm concerned with the pollutants being deposited in the river water. I'd like more details on the proposal and what alternatives need to be discussed. Thank you

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Thursday, December 19, 2019 5:33 AM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the

Comment Deadline:
01/12/2020

Date Comment Filed:
12/19/2019 05:33:15

Commenter Info:
Andrea Bennett
2704 S. 9th
Sioux Falls SD, 57105
Email: andreaebennett@yahoo.com **Phone:** 6059414199

Comments :
I've canoed and kayaked in our river and do not want it polluted. My husband's kayak tipped while he was going through Sioux Falls last year, and who knows what kind of toxins he was exposed to. Please keep our water safe and free of contamination.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Thursday, December 19, 2019 9:47 AM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/19/2019 09:47:27

Commenter Info:
Ivy Oland
231 S. Phillips Avenue
Sioux Falls SD, 57104
Email: ivy.oland@gmail.com **Phone:**

Comments :
I was recently alerted to the fact that Smithfield Foods has applied to renew its permit for Surface Water Discharge into the Big Sioux River. As a resident of Sioux Falls, and especially as a resident of Downtown Sioux Falls, this is highly concerning. As our downtown transforms into an increasingly mixed use population, our commercial and industrial neighbors must be held to a higher standard of conduct as stewards of the neighborhood and the environment. There have been significant efforts over the past several years to increase awareness of the fact that all waste water and runoff leads to the Big Sioux to highlight the importance of keeping the water as uncontaminated as possible (contact the City of Sioux Falls and the Sioux Falls Design Center for information). This is all for naught if we allow Smithfield and others to dump their polluted and water into the River. Our family, small children and pets regularly use the bike trail system and spend time at the City's namesake and foremost tourist destination - the Falls. I'm concerned for their health and safety and would strongly advise and request that the SDDENR NOT renew this permit, and further, that they require Smithfield to improve their waste removal practices to significantly reduce or eliminate their contaminates from the Big Sioux River.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Thursday, December 19, 2019 10:38 AM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/19/2019 10:37:52

Commenter Info:
Julia Collins
617 S Phillips
Sioux Falls SD, 57104
Email: juliaecollins@aol.com **Phone:** 6058389134

Comments :
It is time for a change Our water system is in crisis. Please do not renew the permit. Smithfield is an eyesore and is not good for Sioux Falls. Smithfield needs better pollution control and should be sure down because they won't do it.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Thursday, December 19, 2019 11:35 AM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/19/2019 11:35:17

Commenter Info:
Jared Pomranky
421 N Phillips Ave, #302
Sioux Falls SD, 57104
Email: jareddetroit@gmail.com **Phone:** 6059061806

Comments :
I have great concerns over pollutant discharge by Smithfield Foods into the Big Sioux River. Downtown is thriving and growing and part of this is the recreational use of the Big Sioux River. Allowing discharge into the river to continue is short-sighted and is the opposite direction we should go to continue building our community. There should be a focus on river cleanup. Allowing this to continue will hinder development beyond Smithfield and will create future cleanup costs that we will have to bear. I oppose this renewal.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Friday, December 20, 2019 11:30 AM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/20/2019 11:29:49

Commenter Info:
David Hrusivsky
617 s Phillips
Sioux falls SD, 57104
Email: davehrusovsky@aol.com **Phone:** 6052703425

Comments :
Please stop Smithfield from polluting our water. Have them build a waste water cleaning plant on premises or do not renew license for discharge. It time to change status quo.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Monday, December 30, 2019 1:56 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
12/30/2019 13:55:54

Commenter Info:
Rachael Roberts
7605 S Rose Crest Cir
Sioux Falls SD, 57108
Email: kringenr@gmail.com **Phone:**

Comments :
The Big Sioux is a major part of our city's natural beauty, but its dirty, contaminated water is not so beautiful, and we should be ashamed that it is known as one of our nation's dirtiest rivers. Continuing to allow practices such as Smithfield's will only further contribute to this problem. I can only imagine how beautiful our city would be if we cleaned up the river. I hope this dream eventually becomes a reality, but it won't if we continue to let Smithfield and others pollute it. Residents of Sioux Falls love to be active, and kayaking is one activity that more people would participate in if there weren't such a fear of the health hazards present in the river water (see article below). Please keep in mind as you consider this matter that the health of a community is priceless.
https://www.argusleader.com/story/news/2018/08/29/studies-reveal-health-hazards-big-sioux-river-rapid-creek-south-dakota-waterways/1134418002/

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Monday, December 30, 2019 6:58 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River

Comment Deadline:
01/12/2020

Date Comment Filed:
12/30/2019 18:58:05

Commenter Info:
Dustin
5704 s southwind Ave
Sioux Falls SD, 57106
Email: dustin13548@gmail.com **Phone:** 6052610186

Comments :
At what point can we put the environment ahead of the corporations. What purpose does this even serve

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Monday, December 30, 2019 5:04 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River

Comment Deadline:
01/12/2020

Date Comment Filed:
12/30/2019 17:04:25

Commenter Info:
Daniel Berry
213 E 13th Street
Sioux Falls SD, 57104
Email: Mr.daniel.berry@gmail.com **Phone:** 6056816139

Comments :
In what possible way is this best for Sioux Falls. We need to focus on our rivers more than making it easier for Smithfield Foods.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Thursday, January 2, 2020 1:24 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River

Comment Deadline:
01/12/2020

Date Comment Filed:
01/02/2020 13:24:23

Commenter Info:
Stacey J Berry
213 E 13th Street
Sioux Falls SD, 57104
Email: ms.stacey.berry@gmail.com **Phone:** 6053895954

Comments :
I think it's absolutely disgusting that Smithfield is allowed to continue operations to dump wastewater into our rivers. They have shown blatant disregard for the Surface Water Permit, and the $46,260 fine is not even a slap on the wrist for the large corporation. It's insulting to the Citizens of Sioux Falls to think we are okay with the disgusting pollution created by Smithfield. The pollution they are creating gets into our water system, and eventually into our drinking water. It kills entire ecosystems, and makes the town smell like feces. Renewing this permit will only continue this devastating pollution within our water and our city.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Wednesday, January 8, 2020 2:14 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
01/08/2020 14:14:29

Commenter Info:
Travis Entenman
201 N. Weber Ave. Suite 1
Sioux Falls SD, 57103
Email: director@friendsofthebigsiouxriver.org **Phone:** 605-940-8803

Comments :
Secretary Roberts, On behalf of the Friends of the Big Sioux River and myself, as Managing Director, thank you for this opportunity to comment on the Surface Water Discharge (NPDES) for Smithfield Foods in Sioux Falls, SD. As a water advocacy organization, we find it essential to understand our wastewater discharge permits and the effects these discharges have on our natural systems, public health, and economy. At a high level, the permit is more restrictive than in the past and DENR does tighten up Ammonia-Nitrogen, Nitrate, and e. Coli. However, below are the concerns we have. 1. The permit does not address how the DENR will counter Smithfield's continued violations. The past violations are mentioned, however, the standards on enforcement are not aggressive enough. If we let Smithfield Foods continue their habitual violations, they do not have an incentive to change, as history continues to show. 2. One of their current outputs does discharge into a portion of the BSR that is designated as a drinking source. So, their remedy is to close that source and discharge 150 yards upstream as if water pollution follows arbitrary lines. This gives Smithfield a giant loophole and weakened pollution restrictions. 3. There is no mention of Smithfield's planned expansion. Given DENR's history of "administrative approval" of permits without full renewal and Smithfield's continued violations, we are concerned that once an expansion is in place, the permit will not be updated to account for the increased discharge. Our hope is that this trend is reversed. I want to close with this thought. Our waterways continue to be polluted with no real solution in place. Yes, there are some remedial improvements in water

quality, but not the large reduction in pollutants that will alleviate public health concerns. As we continue to see, economic concerns trump public health and water resource issues, essentially handicapping any real change. Sioux Falls has been a willing participant for decades to allow Smithfield Foods to use our waters for economic growth. But, with the change in industry and growth of the city, Smithfield is no longer the biggest economic driver. It is time this subsidy is paid back to the community with a cleaner river. In the past, DENR has been seen to not operate in the best interest of the people but of industry, losing the community's trust. We look forward to that trend shifting. Our ask is simple: that our State officials operate in the best interest of the public, do their job in administering permits, and hold industry accountable to the pollution they discharge. Sincerely, Travis Entenman Managing Director, Friends of the Big Sioux River

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Thursday, January 9, 2020 6:23 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
01/09/2020 18:23:11

Commenter Info:
Jennifer Kirby
350 S. Main Ave., #701
Sioux Falls SD, 57104
Email: jenkirby31@gmail.com **Phone:** 605-321-3525

Comments :
I am concerned that Smithfield's continued water discharge violations will continue and worsen as they expand. As you know, there have been past violations, but their standards on enforcement don't seem to be aggressive. One of Smithfield's current outputs does discharge into a portion of the BSR that is designated as a drinking source. Their remedy is to close that source and discharge 150 yards upstream as if water pollution follows arbitrary lines. This results in the same level of unacceptable pollution. Given DENR's history of "administrative approval" of permits without full renewal and Smithfield's continued violations, I am very concerned that the permit will not be updated to account for the increased discharge. The Big Sioux River is a valuable resource for Sioux Falls and other communities downstream. We need to protect our drinking water and our ecosystem that is affected by pollution.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Friday, January 10, 2020 11:53 AM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
01/10/2020 11:52:42

Commenter Info:
City of Sioux Falls (Jesse Neyens)
4500 N Sycamore Avenue
Sioux Falls SD, 57104
Email: jneyens@siouxfalls.org **Phone:** 6053678278

Comments :
The City of Sioux Falls appreciates the SDDENR renewing and updating the discharge permits for the major facilities located in the City of Sioux Falls.

From: no-reply@caspio.com <no-reply@caspio.com>
Sent: Sunday, January 12, 2020 6:45 PM
To: DENR-INTERNET INFORMATION <DENRINTERNET@state.sd.us>
Subject: [EXT] Public Notice Comments

Public Notice Category:
sw_npdes

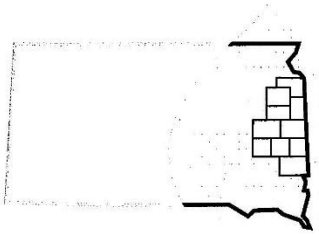
Public Notice:
Smithfield Foods
The renewal of the Surface Water Discharge permit will allow the discharge of pollutants from the Smithfield Foods wastewater treatment facility. Any discharge from this facility will enter the Big Sioux River.

Comment Deadline:
01/12/2020

Date Comment Filed:
01/12/2020 18:44:42

Commenter Info:
Jess Eiesland
2908 S 7th Ave
Sioux Falls SD, 57105
Email: eiesland77@yahoo.com **Phone:**

Comments :
The state of South Dakota should be ashamed of it's failure to protect the natural resources of the state. Protecting our natural resources is your duty. Smithfield is a Chinese corporation that cares nothing about South Dakota or its people. Not to mention the animal cruelty its business model is based on. DENR: step up and take responsibility for your duty to protect the citizens' natural resources. You have been and are failing.



EAST DAKOTA
WATER
DEVELOPMENT
DISTRICT

January 12, 2020

Kathleen Grigg
SD DENR Surface Water Quality Program
523 East Capitol Avenue
Pierre, South Dakota 57501-3181

Dear Ms. Grigg:

I am writing on behalf of the East Dakota Water Development District (District) with regard to the DRAFT Surface Water Discharge Permit (SD0000078) which would allow Smithfield Foods to discharge treated waste water into the Big Sioux River. The waste water would be generated and treated at the Smithfield Foods production facility in Sioux Falls, and then discharged into the river at a point just upstream from the diversion return. As per the 2018 Integrated Report for Surface Water Quality Assessment (Table 22, page 67), the segment of the Big Sioux River into which the effluent will be released has been assigned the following beneficial uses:**(1) Domestic water supply; (5) Warmwater semipermanent fish life propagation waters; (7) Immersion recreation; (8) Limited contact recreation waters; (9) Fish and wildlife propagation, recreation, and stock watering waters**; and **(10) Irrigation waters**.

The District's concern with the DRAFT Permit pertains to the amount of Nitrate as Nitrogen (NO3-N) that would be allowed in the discharge water. Under the conditions of the DRAFT Permit (see page 16 of 33), Smithfield Foods would be required to measure (weekly), record and report NO3-N, measured in milligrams per liter (mg/L) until May 31, 2023 (should this be March 31st?). Testing is to be completed on samples collected near the end of the treatment process, prior to being piped to the point of discharge. However, during this period, there are **no limitations** in the DRAFT Permit on the actual concentration of NO3-N contained within the discharge.

Starting on April 1, 2023, Smithfield Foods would be required to measure (weekly), record and report NO3-N, measured in milligrams per liter (mg/L), through the end of the permit. Again, tested samples are to be collected near the end of the treatment process, prior to being piped to the point of discharge. Beginning on this date, limitations are applied to the NO3-N concentrations in the effluent. Any given sample may not contain in excess of 88 mg/L, and the 30-day average value may not exceed 50 mg/L. The effluent standards contained within the DRAFT permit are equivalent to the NO3-N standard applied to the **(9) Fish and wildlife propagation, recreation, and stock watering waters** beneficial use.

While we would have prefered that the effluent standards be set at much lower levels, the Department is to be commended for establishing a NO3-N effluent standard for this permit. At present, no such limitation is in effect, and as the data presented in the Statement of Basis notes, the

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facility has generated waste water containing NO3-N in excess of 100 mg/L on multiple occasions. Under the best of circumstances (nominal NO3-N in the receiving waters), the resulting, post-discharge water quality in the Big Sioux River has been significantly altered. Even if the resulting water chemistry does not exceed the applicable standards, the overall load of nitrate entering the Big Sioux River at the point of discharge is substantial. Further, while a percentage of the nitrate entering the river system at this point will eventually degrade/breakdown, the cumulative impacts of the loading must be considered.

For the past five field seasons (2015 thru 2019), the District has been conducting regular water quality sampling for NO3-N at a variety of points along the course of the Big Sioux River, from its headwaters near Summit to the confluence with the Missouri River at North Sioux City. In general, observed concentrations have been low (below 2 mg/L), but elevated concentrations have been found consistently below Watertown and metropolitan Sioux Falls. The elevated NO3-N concentrations have been shown to persist downstream for many miles, particularly during periods of lower overall stream flow.

With rare exceptions, there are no constraints placed on the amount of NO3-N contained in any discharges to the Big Sioux River, or other waters of the state. Long-term testing suggests that overall NO3-N concentrations are rising, although the current levels are mostly well below State water quality standards. However, the fact that nitrate levels haven't yet reached critical action levels is no basis for ignoring a looming problem. The Big Sioux River does not have an unlimited capacity to absorb an unlimited amount of NO3-N. Loadings from facilities operating under the auspices of a State-issued Surface Water Discharge permits, as well as agricultural drainage waters, have had demonstrable impacts on our water resources. A few years back, this problem prompted a major public water supplier in central Iowa to bring legal actions against presumed sources, in an effort to recover the substantial costs involved in NO3-N removal.

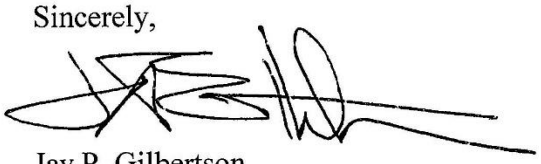
Public water suppliers (PWSs) in the Big Sioux River basin, including those below the metropolitan Sioux Falls area, by-in-large draw their water from shallow glacial outwash aquifers, many of which are located adjacent to present day rivers and streams, like the Big Sioux River. Such shallow aquifers are highly vulnerable and susceptible to contamination from activities that take place at the land surface. Elevated nitrate concentrations are unfortunately fairly common, and many smaller communities have lost use of one or more wells as a result. In recognition of the critical nature of these resources, counties all along the Big Sioux River watershed have adopted zoning ordinances aimed at protecting shallow aquifers. Many PWSs have further engaged in efforts to protect their particular well fields, working to restore impaired areas, and protect un-impacted parts of the aquifer.

As a result of their close proximity to the Big Sioux River, the PWSs well fields often induce river water to enter the adjacent shallow aquifers, supplementing natural recharge. Because the river water has historically been low in nitrate, the net result is a blending of surface- and ground-water, and a reduction of NO3-N entering the wells. By law, PWSs in South Dakota may not distribute water containing NO3-N (nitrates) in excess of 10 mg/L, and this induced dilution has benefitted water suppliers and users alike. Given these circumstances, any increase in the NO3-N concentrations in the Big Sioux River represents a potential problem for these PWSs.

The District would respectfully request that lower limitations be placed on the concentration of nitrate (as nitrogen) allowed in the effluent to be discharged from the Smithfield Foods facility. Our preference would be for the receiving waters to be treated as domestic water supply waters (which they technically are at the actual point of discharge), and that NO3-N be limited to less than 10 mg/L. We believe that it is irresponsible to presume that just because the effluent does not technically exceed the established water quality standard that there is no adverse and harmful impact. The cumulative effect of the impact of this facility, along with all of the other permitted and un-permitted discharges in the Big Sioux River, will continue the long-term degradation of this critical water resource. As with most things, it is far better to recognize and work to prevent problems before they develop, rather than to have to address them through remediation after the fact. We believe that the axiom attributed to Benjamin Franklin, "an ounce of prevention is worth a pound of cure," is as true today as it was in the late 1700s.

If you have any questions about the material presented herein, or the District's position on this matter, please do not hesitate to contact me.

Sincerely,



Jay P. Gilbertson
Manager/Treasurer

cc: District Board of Directors

STATEMENT OF BASIS

Applicant:	Smithfield Foods
Permit Number:	SD0000078
Contact Person:	Mark Wiggs, General Manager Charles Schulz, Environmental Coordinator Mark Gerwer, Wastewater Treatment Facilities Manager 1400 N. Weber Ave Sioux Falls, SD 57103
Phone:	(605) 330-3656 – Environmental Coordinator
Permit Type:	Major Industrial – 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.

DESCRIPTION

Smithfield Foods (Smithfield) operates a meat packing facility and wastewater treatment plant (WWTP), located in Sioux Falls in the Southeast ¼ and the Southwest ¼ of Section 9, Township 101 North, Range 49 West in Minnehaha County, South Dakota (Latitude 43.565152°, Longitude -96.719948°, satellite map estimation). Prior to October 30, 2017, the facility was called John Morrell & Company.

Smithfield is a complex slaughterhouse with a full line of meat processing, where approximately 19,500 hogs are slaughtered per day. The hogs are killed, and the carcasses are trimmed, washed, and hung in cooling rooms where they are later processed into bacon, hams, and franks. The production of sausages, canning of meat, and other edible and inedible products are also included in the production processes.

Skins are removed from the pigs, cured, and shipped to tanners. All other byproducts are rendered onsite, including the blood. In addition, some outside products are brought in for rendering or processing.

Production has two nine-hour shifts plus five hours of cleaning per day, operating Monday through Friday with occasional Saturdays. The wastewater treatment facility is operated 24/7 with 12-hour shifts.

Smithfield processes 3.0 million gallons per day (MGD) of influent to the wastewater treatment plant (WWTP) during its daily operations when the plant runs processing, typically Monday through Friday and some Saturdays. On weekends, influent flow is approximately 1.0 MGD. The weekly average flow is approximately 2.37 MGD and is equalized through the WWTP over the week. Attachment 1 includes a WWTP flow diagram.

The Smithfield WWTP has an average design flow of 3.5 MGD; this flow will be used for effluent limits development. Peak design flow has been reassessed due to recent heavy rainfall

events and stormwater treatment; it has increased from 4.2 MGD (current permit) to 4.350 MGD (facility email correspondence, July 2019).

A breakdown of the daily wastewater production is as follows (2017 inspection):

	Flow (MGD)
Meat Processing Operations	
Meat Processing	2.095
Cooling Water/Boiler Blowdown	0.085
Defrosting wastewater	0.050
Sanitary wastewater	0.075
Total Meat Processing Flow	2.305
Rendering/Stockyard Operations	
Rendering	0.550
Spray Water/Stockyard Cleanup	0.125
Sanitary wastewater	0.010
Total Rendering/Stockyard Flow	0.685
Other Plant Operations	
Engine/Boiler Blowdown	0.010
Total Other Plant Operations	0.010
Total Plant Flow	***3.000***

The wastewater treatment facility was completed in 1983 and has been upgraded over the years (1996-2008, 2010, 2011, 2016, and 2019). Combined influent from plant production processes, plant domestic wastewater, and core stormwater areas flows by gravity to two screw pumps, which alternate daily unless both are needed. Preliminary treatment includes one mechanical 0.75-inch bar screen with one manual bar screen for backup, a grit classifier, influent flow measurement via 24-inch Parshall Flume and HydroRanger ultrasonic flowmeter, and two 0.004-inch rotary screens. The screenings are landfilled.

After preliminary treatment, primary treatment includes two rectangular Dissolved Air Flotation (DAF) units and five covered anaerobic lagoons. Wastewater can be directed from the DAF to the city of Sioux Falls Wastewater Reclamation Facility (WRF), as Smithfield has an industrial pretreatment permit from the city; however typical operation is from the DAF to the anaerobic lagoons. Solids from the DAF are sent to the belt press. A portion of the lagoon flow can be directed to the lagoon clarifier, though typical operation is directly from the lagoons to secondary treatment.

Secondary treatment includes four aeration basins with fine bubble diffusers and two final clarifiers. Waste Activated Sludge (WAS) from the aeration basin is sent to the lagoon clarifier. Return Activated Sludge (RAS) from the final clarifiers is sent to the head of the aeration basins. The aeration basin operates with a 1:1 ratio of waste and return. Approximately 1/3 of wastewater from the final clarifiers is routed to sand filters prior to chlorine disinfection; the remaining 2/3 of wastewater bypasses the sand filters to chlorine disinfection.

Tertiary treatment includes four gravity sand filter cells, a chlorine contact chamber for sodium hypochlorite disinfection, effluent flow measurement via a 41-inch rectangular weir with end contraction and HydroRanger ultrasonic flowmeter, dechlorination with sodium bisulfite, and post aeration.

Solids treatment includes one lagoon clarifier and two belt presses. The lagoon clarifier is used for WAS thickening, and receives some solids from the anaerobic lagoons. One belt press receives materials from the DAF, and the other receives sludge from the final clarifiers. The waste streams can be alternated to the presses. Approximately 30 tons of belt press cake per day is produced and then land applied in Iowa (Iowa Sludge Permit 00-SDP-06-13P-LAN). Belt press filtrate goes to the anaerobic lagoons influent pit.

Chemicals are added to wastewater treatment processes for chlorination, dechlorination, pH adjustment, disinfection, and belt press polymers. A list of approved chemicals is included in the section below.

APPROVED CHEMICALS

South Dakota Department of Environment and Natural Resources (SDDENR) reviewed the following chemical Safety Data Sheets. Based on this review, the SDDENR did not find any reasonable potential for the use of the chemicals to violate water quality standards if the chemicals are used in accordance with manufacturer's guidelines. The following chemicals have been approved by SDDENR for Smithfield WWTP's use:

Product Name	Chemical Components (% by wt)	Use
Dixichlor Max (Bleach, Sodium Hypochlorite 12.5 %)	• 12.5-15.6% Sodium hypochlorite • 9-10% Sodium chloride • 0.5-2% Sodium hydroxide	Disinfection (water treatment chemical)
FloMagH (Magnesium Hydroxide Slurry, $Mg(OH)_2$)	• 50-65% Magnesium hydroxide • 35-50% Water • Unknown % Magnesium oxide fume may be generated if product is heated to volatilization	pH adjustment (acid neutralization, waste treatment)
Hydrosolution 3D8030	• 20-30% Distillates (petroleum), hydrotreated light • <5% Poly(oxy-1,2-ethanediyl), a-tridecyl-w-hydroxy-, branched	Polymer (processing aid for industrial applications)
Hydrosolutions 4A4839	• Contains no reportable hazardous substances	Polymer (processing aid for industrial applications)
Sodium Bisulfite 2% FG	• ~2% Sodium bisulfite	Chlorination / Dechlorination (sulfonation agent, antichlor)

Product Name	Chemical Components (% by wt)	Use
Sodium Hydroxide 50% Diaphragm	• 49-51% Sodium hydroxide • 0-1.2% Sodium chloride • Balance water	pH adjustment (industrial use)

With written permission from SDDENR, additional chemicals may be approved for use without additional public notice.

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:

(1) Domestic water supply waters;
(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.

Approximately 150 yards downstream below the discharge outfall, the Big Sioux River is classified by the SDSWQS, 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.

There are no drinking water intakes protected by the domestic water supply waters classification of the Big Sioux River in the 150-yard classified stream segment below Smithfield's discharge outfall. Smithfield plans to construct an outfall located downstream of the domestic water supply waters classification, tentatively scheduled for construction in 2020. Therefore, effluent limits will not be based on this beneficial use.

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. TMDLs are necessary for waters that do not meet or are not expected to meet water quality standards with the application of technology-based controls for point sources. 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.

This segment of the receiving waterbody has been identified as being impaired for Total Suspended Solids (TSS) and *Escherichia coli* (*E. coli*). A TMDL for each of these parameters was completed and approved by EPA in 2012 and updated in 2019 to incorporate wasteload allocations for municipal and industrial growth in the area.

The updated TMDL for TSS includes a wasteload allocation of 1.38 tons/day assigned to Smithfield Foods. The updated TMDL for *E. coli* includes a wasteload allocation of 4.67×10^{10} cfu/day assigned to Smithfield Foods. The limits developed for the draft permit for TSS and *E. coli* should ensure that these wasteload allocations are not exceeded.

ANTIDEGRADATION

SDDENR has fulfilled the antidegradation review requirements for this permit. In accordance with South Dakota's Antidegradation Implementation Procedure and the SDSWQS, no further review is required. The results of SDDENR's review are included in Attachment 2.

MONITORING DATA

Smithfield has been submitting Discharge Monitoring Reports (DMRs) as required under the current permit. As shown in Attachment 3, during the current permit cycle of April 2000 to present, this facility has reported the following violations: twenty-six violations of fecal coliform; seventeen violations of ammonia-nitrogen (as N); eight violations of total residual chlorine (TRC); ten violations of total suspended solids (TSS); four violations of pH; four violations of five-day biochemical oxygen demand (BOD_5); one violation of oil and grease; and one violation of chronic Whole Effluent Toxicity (WET). The department has addressed these violations through formal enforcement actions.

DMR data were compiled for analysis through June 30, 2019. DMR data and violations from July 1, 2019 and later were not included in this Statement of Basis. Public access to the facility's monitoring data is available at EPA's Enforcement and Compliance History Online (ECHO) website: https://echo.epa.gov/.

INSPECTIONS

Personnel from SDDENR conducted a Compliance Inspection of Smithfield's wastewater treatment facility on August 27, 2019. The following comments and corrective actions were required in order to come into compliance with the facility's Surface Water Discharge (SWD) permit:

COMMENTS	REQUIRED CORRECTIVE ACTIONS
The facility has had numerous effluent violations for BOD, TSS, Fecal Coliform, and Ammonia. These violations have led to enforcement actions which one has been finalized and the second is in process.	These violations are not acceptable and can lead to further enforcement actions which can include fines and penalties. The facility has made modifications to ensure adequate treatment of the wastewater.

COMPLIANCE SCHEDULE

Nitrate-nitrogen (as N) monitoring and limits will be added to Outfall 001 of the draft permit based on the reasonable potential for Smithfield's discharge to violate the nitrate-nitrogen (as N) standards in the Big Sioux River downstream of the discharge location (see Attachment 4, Reasonable Potential Analysis). Nitrate-nitrogen (as N) monitoring during the last permit cycle shows that the proposed limits in the draft permit would not be met using current operations and treatment. Nitrate-nitrogen (as N) monitoring without a limit will be required until the completion of a compliance schedule for the facility to meet the final effluent limits.

The ammonia-nitrogen (as N) effluent limits proposed in the draft permit are more stringent than those in the current permit for some months (Attachment 5, Ammonia Limits Development). The ammonia-nitrogen limits in the current permit will be carried over as interim limits until completion of a compliance schedule for the facility to meet the final effluent limits.

The final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N) shall become effective according to the following compliance schedule (**Section 3.5** of the draft permit), in accordance with the SDSWQS, ARSD Section 74:52:03:22:

1. Starting on the first effective day of the permit (**April 1, 2020**), nitrate-nitrogen (as N) and ammonia-nitrogen (as N) shall be monitored during a discharge, according to the sampling requirements in **Section 3.6** of the permit. There shall be no interim nitrate-nitrogen (as N) limits. There shall be interim ammonia-nitrogen (as N) limits carried over from the previous permit.
2. The permittee shall investigate treatment and operational options for reducing nitrate-nitrogen (as N) and ammonia-nitrogen (as N) levels in the discharge. The permittee shall submit compliance progress reports on a **quarterly** basis to SDDENR starting on **July 1, 2020.** These reports shall include details on evaluating the treatment system, hiring an engineer, and determining what changes are needed to come into compliance with the final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N).
3. By **May 31, 2023**, the facility shall complete any necessary adjustments to the wastewater treatment processes and operations to comply with the final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N).
4. On **April 1, 2023**, the final effluent limits for nitrate-nitrogen (as N) and ammonia-nitrogen (as N) in **Section 3.6** of the permit shall become effective.

The milestones must be completed by the date specified. The permittee shall submit to the SDDENR a written notice of compliance or noncompliance with each milestone by the date specified above. If the permittee is not in compliance with the milestone, the notice shall include the cause of any noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

EFFLUENT LIMITS

Outfall 001 Effluent Limits

Outfall 001 – Any discharge from the discharge structure located north of the wastewater treatment plant to the Big Sioux River (Latitude 43.566679°, Longitude -96.720198°, satellite map estimate).

During any discharge, the permittee shall comply with the effluent limits specified below which are based on the SDSWQS, permit writer's judgment, the current effluent limits, and the Technology-Based Effluent Limits (TBELs) based on Best Practicable Control Technology (BPT) currently available in 40 CFR 432.22 (Title 40, Protection of the Environment; Chapter I, Environmental Protection Agency; Subchapter N, Effluent Guidelines and Standards; Part 432, Meat and Poultry Point Source Category; Subpart B, Complex Slaughterhouses; Section 22, Effluent limitations attainable by application of the best practicable control technology currently available (BPT)). A reasonable potential analysis is included in Attachment 4.

Supporting documentation for effluent limits development is included in the attachments to this Statement of Basis. Due to the proximity of the Smithfield and Sioux Falls discharges, the same instream data and modeling were used for both facilities. Attachments 5 through 9 are cross-referenced in the statements of basis for both Smithfield WWTP and Sioux Falls WRF. Water-quality based effluent limits for Ammonia-Nitrogen (as N) are developed in Attachment 5. Water quality modeling simulations using QUAL2Kw are presented in Attachment 6. Instream water quality modeling data statistics are presented in Attachment 7. Streamflow statistics calculated with the USGS modeling program SWToolobx are presented in Attachment 8. DMR effluent data statistics are presented in Attachment 9. Smithfield WWTP's TBEL's for BOD_5, TSS, *E. coli*, oil and grease, and Ammonia-Nitrogen are discussed and developed as applicable in Attachment 10.

1. The Five-Day Biochemical Oxygen Demand (BOD_5) concentration shall not exceed the limits in the table below. These limits are based on the BPT in 40 CFR 432.22 with a Live Weight Killed (LWK) of 5,299,895 lb/d, the current permit limits developed in *Total Maximum Daily Load for Ammonia and Dissolved Oxygen in the Big Sioux River near Sioux Falls, South Dakota* (SDDENR 1999), the minimum dissolved oxygen SDSWQS of 5.0 mg/L for the Big Sioux River at the discharge location, and the permit writer's judgement. These limits are being included because SDDENR has determined there is reasonable potential for BOD_5 to be present in the discharge at levels that may violate the SDSWQS for dissolved oxygen. For more information, see Attachment 6, QUAL2Kw Modeling, and Attachment 10, TBEL Development.

Season	Five-Day Biochemical Oxygen Demand (BOD_5) Limits	
	30-Day Average (lb/d)	Daily Maximum (lb/d)
September 1 – May 31	1,113	2,226
June 1 – August 31	779	2,226

2. The Total Suspended Solids (TSS) concentration shall not exceed 1,325 lb/day (30-day average) and 2,650 lb/d (daily maximum). These limits are based on the current permit limits, the BPT in 40 CFR 432.22 with a LWK of 5,299,895 lb/d, the warmwater semipermanent fish life propagation waters classification of the Big Sioux River, the SDSWQS (ARSD Section 74:51:01:48), and permit writer's judgment. These limits are being included because SDDENR has determined there is a reasonable potential for TSS to be present in the discharge at levels that may violate the SDSWQS. These limits are protective of the TMDL for TSS, which includes a wasteload allocation of 1.38 tons/day assigned to the WWTP. For more information, see Attachment 10, TBEL development.

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 the warmwater semipermanent fish life propagation waters classification of the Big Sioux River, the SDSWQS (ARSD Section 74:51:01:48), and the permit writer's judgement. These limits are being included because SDDENR has determined there is a reasonable potential for the pH of the effluent to violate the SDSWQS.

   Note: SDDENR 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. *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 May 1 to September 30.*

   In addition, the *E. coli* organisms shall not exceed 235 per 100 milliliters in any one sample from May 1 to September 30. These limits are based on the immersion recreation beneficial use classification of the Big Sioux River and the SDSWQS (ARSD Section 74:51:01:50), and are being included because SDDENR has determined there is a reasonable potential for *E. coli* to be present in the discharge at levels that may violate the SDSWQS.

   These limits are protective of the TMDL for *E. coli*, which includes a wasteload allocation of 4.67×10^{10} cfu/day assigned to the WWTP.

The BPT limit in 40 CFR 432.22 Subpart B for daily maximum fecal coliform is 400 per 100 milliliters year-round. South Dakota no longer has a fecal coliform surface water quality standard and has adopted *E. coli* standards. SDDENR has developed a translator equation method to convert between fecal coliform and *E. coli*. Paired fecal and *E. coli data* (n=10,686) from across the state were compared to determine the existence and strength of a relationship. According to this translator, a fecal coliform value of 400 per 100 mL is equivalent to an *E. coli* value of 304 per 100mL. Therefore, a daily maximum *E. coli* limit of 235 per 100 milliliters based on the *E. coli* standard is protective of the BPT limit.

5. Fecal coliform shall not exceed a concentration of 400 per 100 milliliters in any one sample. *This limit is applicable year-round*, and is based on the BPT in 40 CFR 432.22 and the permit writer's judgment.

6. The Total Residual Chlorine (TRC) concentration in any one sample shall not exceed 0.019 mg/L. This limit is based on the warmwater semipermanent fish life propagation waters classification of the Big Sioux River and the SDSWQS (ARSD Section 74:51:01:55 and 74:51:01 Appendix B), and is being included because SDDENR 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: SDDENR 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, "NODI B – Below Detection Limit/No Detection" shall be used for reporting purposes.

7. The ammonia-nitrogen (as N) concentration shall not exceed the limits specified in the table below. These limits are based on the BPT in 40 CFR 432.22, the warmwater semipermanent fish life propagation waters classification of the Big Sioux River, the SDSWQS (ARSD Section 74:51:01:48), the current permit limits developed in *Total Maximum Daily Load for Ammonia and Dissolved Oxygen in the Big Sioux River near Sioux Falls, South Dakota* (SDDENR 1999), and permit writer's judgment. These limits are being included because SDDENR has determined there is a reasonable potential for ammonia-nitrogen to be present in the discharge at levels that may violate the SDSWQS.

   The BPT limits in 40 CFR 432 Subpart B for ammonia-nitrogen (as N) are 4.0 mg/L for 30-day average and 8.0 mg/L for daily maximum. The water-quality based effluent limits developed for this permit are more stringent and will be proposed in this draft permit as daily mass loading limits (lb/d). For more information, see Attachment 5, Ammonia Limits Development; Attachment 6, QUAL2Kw Modeling; and Attachment 10, TBEL Development.

   Note: Because the ammonia-nitrogen (as N) limits developed for the draft permit are more stringent for some months, a compliance schedule has been added to the draft permit to allow three years of interim limits carried over from the current permit before the final limits become effective on **April 1, 2023.**

INTERIM EFFLUENT LIMITS – *Effective through March 31, 2023*		
Season	**Ammonia Limit (as N)**	
	30-Day Average (lb/d)	**Daily Maximum (lb/d)**
April 1 – May 31	70	123
June 1 – August 31	58	102
September 1 – October 31	75	131
November 1 – March 31	163	285

FINAL EFFLUENT LIMITS – *Effective starting on April 1, 2023*		
Season	**Ammonia Limit (as N)**	
	30-Day Average (lb/d)	**Daily Maximum (lb/d)**
January 1 – 31	117	234
February 1 – 29	117	234
March 1 – 31	73	234
April 1 – 30	81	143
May 1 – 31	82	143
June 1 – 30	67	117
July 1 – 31	53	117
August 1 – 31	37	117
September 1 – 30	61	155
October 1 – 31	61	155
November 1 – 30	117	234
December 1 – 31	117	234

8. The oil and grease concentration shall not exceed 10 mg/L (daily maximum), or impart a visible film or sheen to the surface or to the adjoining shorelines. These limits are based on the SDSWQS, ARSD Sections 74:51:01:10 and 74:51:01:52, the current permit limits, BPT in 40 CFR 432.22 with a LWK of 5,299,895 lb/d, and the permit writer's judgement.

   The BPT limits in 40 CFR 432 Subpart B for oil and grease are based on a LWK of 5,299,895 lb/d, resulting in limits of 424 lb/d (30-day average) and 848 lb/d (daily maximum). Because the SDSWQS concentration-based daily maximum standard of 10 mg/L is more stringent than both the 30-day average and daily maximum mass-based limits, the daily maximum limit of 10 mg/L is proposed in the draft permit. For more information, see Attachment 10, TBEL Development.

9. The Dissolved Oxygen (DO) daily minimum concentration shall not be less 5.0 mg/L (daily minimum). This limit is based on the warmwater semipermanent fish life propagation waters classification of the Big Sioux River, the SDSWQS (ARSD Section 74:51:01:48), and the current permit limits developed in *Total Maximum Daily Load for Ammonia and Dissolved Oxygen in the Big Sioux River near Sioux Falls, South Dakota* (SDDENR 1999). This limit is included because SDDENR has determined there is reasonable potential for DO to be present in the discharge at low levels that may violate the SDSWQS. For more information, see Attachment 6, QUAL2Kw Modeling.

10. There shall be no chronic toxicity, as measured by the Whole Effluent Toxicity (WET) test. The results shall be reported in chronic toxic units (TU_c), where $TU_c=100/IC_{25}$. The 25% inhibition concentration (IC_{25}) shall be calculated on the basis of test organism survival and growth or survival and reproduction. Chronic toxicity occurs when the TU_c in the effluent is greater than the effluent limits specified in the table below. These limits are based on the SDSWQS (ARSD Section 74:51:01:12), *SDDENR Guidance Document for Whole Effluent Toxicity (WET)* (v. 2/24/2017), and permit writer's judgement. The chronic WET limits development is discussed below in the "Whole Effluent Toxicity" section of this Statement of Basis.

Season	Chronic Whole Effluent Toxicity (WET) Limit
	Chronic Toxicity Unit (TU_c)
January 1 – 31	2.1
February 1 – 29	2.1
March 1 – 31	2.1
April 1 – 30	2.4
May 1 – 31	2.8
June 1 – 30	2.8
July 1 – 31	2.8
August 1 – 31	2.0
September 1 – 30	2.1
October 1 – 31	2.0
November 1 – 30	2.1
December 1 – 31	2.1

In addition, for all Chronic tests, at any effluent dilutions, there shall be no Acute toxicity (LC_{50}). This is not a separate Acute WET test unless specified in the permit, but an analysis that is conducted based on daily observations as outlined in the current version of the *"Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," 4th Edition, October 2002 (as allowed by Sections 11.1.2 for Method 1000.0 and 13.1.2 for Method 1002.0).*

The Acute WET limit shall be <1.0 TU_a, which is equivalent to LC_{50} at any dilution of effluent. Acute test failure is defined as mortality to 50% or more of the test organisms at any dilution effluent or ≥1.0 TU_a. The effluent value must be <1.0 TU_a to indicate a passing test. Any effluent value ≥1.0 TU_a will constitute a failure.

11. The nitrate-nitrogen (as N) concentration shall not exceed 50 mg/L (30-day average) or 88 mg/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 Section 74:51:01:52), and are being included because SDDENR has determined there is a reasonable potential for nitrate-nitrogen (as N) to be present in the discharge at levels that may violate the SDSWQS.

Note: Because nitrate-nitrogen (as N) limits were not included in the current permit, a compliance schedule has been added to the draft permit to allow three years of

interim monitoring without a limit before the final limits become effective on **April 1, 2023.**

12. No chemicals, such as corrosion inhibitors, biocides, descalers, etc., shall be added to the discharge without prior written permission from SDDENR. This limit is based on the permit writer's judgment. Chemicals already identified in the permit application process are considered permissible for purposes of this limit.

    Note: With written permission from SDDENR, additional chemical additives may be approved for use without additional public notice.

SDDENR 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 Smithfield WWTP's discharge.

SELF MONITORING REQUIREMENTS

Outfall 001 Monitoring

The draft permit requires the permittee to monitor all discharges for BOD_5 (mg/L and lb/d), TSS (mg/L and lb/d), pH (su), *E. coli* (#/100 mL), fecal coliform (#/100mL), TRC (mg/L), nitrate-nitrogen (as N) (mg/L), ammonia-nitrogen (as N, mg/L and lb/d), oil and grease (visual, mg/L and lb/d), DO (mg/L), and Chronic Whole Effluent Toxicity (TU_c). These monitoring requirements are based on the limits in the draft permit for these parameters. Effluent water temperature (°C), total nitrogen (mg/L), total phosphorus (mg/L), Carbonaceous Five-Day Biochemical Oxygen Demand ($CBOD_5$, 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.

Smithfield shall sample the effluent at the frequency specified in the draft permit for the following parameters. The effluent flow rate (MGD) shall be measured **continuously**. The pH (su), temperature (°C), oil and grease (visual and contingent grab (mg/L)), and TRC (mg/L) shall be monitored on a **daily** basis. The BOD_5 (mg/L), DO (mg/L), TSS (mg/L), fecal coliform (#/100mL), and *E. coli* (#/100 mL) shall be monitored at least **five days per week**. The ammonia-nitrogen (as N, mg/L) shall be monitored at least **three days per week**. Oil and grease (mg/L) and nitrate-nitrogen (as N) (mg/L) shall be monitored at least on a **weekly** basis. Total phosphorus (mg/L), total nitrogen (mg/L), and $CBOD_5$ shall be monitored on at least a **monthly** basis. Chronic Whole Effluent Toxicity (TU_c) shall be monitored **semiannually**. All samples collected during the 30-day period shall be used in determining the averages. The permittee always has the option of collecting additional samples if appropriate.

Smithfield was approved to electronically submit DMRs through NetDMR on June 24, 2011. Effluent monitoring results shall be summarized for each month and recorded on a DMR to be submitted via NetDMR to SDDENR on a **monthly** basis. Chronic WET results shall be summarized and recorded on a DMR to be submitted via NetDMR on a **quarterly** basis.

On October 22, 2015, the Environmental Protection Agency (EPA) published in the federal register a rule that makes electronic reporting of permit reporting requirements mandatory for all

SWD permits. Phase 1 of the rule requires that all DMRs must be submitted electronically as of December 21, 2016. Currently, SDDENR is approved to accept DMRs electronically via NetDMR. EPA's rule will require all permit reporting requirements (such as permit applications and violation reports) to be submitted electronically. SDDENR is working on programs to meet this requirement and will notify facilities as they become available.

Monitoring shall consist of **daily** inspections of the facility and the outfall to verify that proper operation and maintenance procedures are being practiced. Documentation of each of these visits shall be kept in a notebook to be reviewed by SDDENR or EPA personnel when an inspection occurs.

WHOLE EFFLUENT TOXICITY

The SDDENR *Reasonable Potential Implementation Procedure for SWD Permits* was reviewed to determine if WET testing is applicable to Smithfield. Following the guidance document, Smithfield's WWTP has reasonable potential to cause or contribute to an exceedance of the SDSWQS for toxicity.

Smithfield's current permit includes chronic WET testing and monitoring requirements; the facility currently monitors WET and reported a WET violation in April 2019 during the current permit cycle. Due to the WWTP's major discharger status, and the potential presence of toxic compounds in the discharge, the draft permit will include WET monitoring and limits.

Since 2003, WET sampling frequency has been reduced to once every 6 months (semiannually). Smithfield tests for both *Ceriodaphnia dubia* and *Pimephales promelas* chronic WET in the same sample. This alternative method will be continued in the draft permit.

SDDENR is switching from a WET limit of Pass/Fail to Toxic Units (TU_c = Chronic Toxic Units). One of the advantages to switching to TU's is that it will allow labs, facilities, and SDDENR to use statistics to help eliminate false negatives and false positives, providing more accurate results. The facility will be required to report in TU_c.

The SDDENR *Guidance Document for Whole Effluent Toxicity (WET)* (v. 2/24/2017) was followed to determine the limits, sampling & monitoring frequency and types, dilution water, dilution series, hardness of the dilution water, test methods and temperatures, IC_{25} concentrations in TU_C, and other WET testing procedures to use. Most of the monthly ratios of the critical low flows of the Big Sioux River to the Smithfield WWTP effluent average design flow were <10:1, indicating that chronic WET limits need to be developed for the proposed permit. The allowable streamflows for mixing were calculated in Attachment 5, Ammonia Limits Development. The 7Q5 streamflows for the Big Sioux River were developed in Attachment 8, Receiving Streamflow Data. Below is a summary of the chronic WET limit development.

The IC_{25} is computed using the following equation:

$$IC_{25} = \frac{Effluent\ Average\ Design\ Flow}{Allowable\ Streamflow\ for\ Mixing + Effluent\ Average\ Design\ Flow}$$

The TU_c is computed using the following equation:

$$TUc = \frac{100}{IC_{25}}$$

Season	Stream and Effluent Flows				Calculated IC_{25} & TU_c	
	7Q5 Low Flow (cfs)	Effluent Average Design Flow (cfs)	Ratio of 7Q5: Effluent	Allowable Streamflow for Mixing (cfs)	25% Inhibition Concentration (IC_{25}, %)	Chronic Toxicity Unit (TU_c)
January 1 – 31	13.81	5.42	2.55	6.90	44%	2.3
February 1 – 29	12.40	5.42	2.29	6.20	47%	2.1
March 1 – 31	18.68	5.42	3.45	9.34	37%	2.7
April 1 – 30	77.70	5.42	14.35	7.77	41%	2.4
May 1 – 31	110.20	5.42	20.35	11.02	33%	3.0
June 1 – 30	134.26	5.42	24.79	13.43	29%	3.5
July 1 – 31	50.87	5.42	9.39	12.72	30%	3.3
August 1 – 31	56.78	5.42	10.48	5.68	49%	2.0
September 1 – 30	39.56	5.42	7.31	9.89	35%	2.8
October 1 – 31	54.91	5.42	10.14	5.49	50%	2.0
November 1 – 30	45.35	5.42	8.37	11.34	32%	3.1
December 1 – 31	23.92	5.42	4.42	5.98	48%	2.1

The calculated IC_{25} values above will be used as the Instream Waste Concentration (IWC) in the permit. The current permit has the following IC_{25}-based chronic WET limits: 36% in the spring (April 1 – May 31) and summer (June 1 – August 31); 48% in the fall (September 1 – October 31); and 47% in winter (November 1 – March 31). These seasons would have the following TU_c-equivalent limits: 2.8 TU_c in the spring and summer; and 2.1 TU_c in the fall and winter. The more stringent limits TU_c-based limits for each month are proposed in the draft permit.

Season	25% Inhibition Concentration	Proposed Chronic WET Limit	Reference
	(IC_{25}, %)	Chronic Toxicity Unit (TU_c)	
January 1 – 31	47%	**2.1**	Current Permit
February 1 – 29	47%	**2.1**	Draft / Current Permit
March 1 – 31	47%	**2.1**	Current Permit
April 1 – 30	41%	**2.4**	Draft Permit
May 1 – 31	36%	**2.8**	Current Permit
June 1 – 30	36%	**2.8**	Current Permit
July 1 – 31	36%	**2.8**	Current Permit
August 1 – 31	49%	**2.0**	Draft Permit
September 1 – 30	48%	**2.1**	Current Permit
October 1 – 31	50%	**2.0**	Draft Permit
November 1 – 30	47%	**2.1**	Current Permit
December 1 – 31	48%	**2.1**	Draft Permit

SLUDGE

Smithfield has a sludge permit through the state of Iowa, which is where the facility land-applies treated sludge (Permit 00-SDP-06-13P-LAN). Therefore, the draft Surface Water Discharge permit shall not contain sludge disposal requirements.

If sludge disposal is necessary in South Dakota, SDDENR's Waste Management Program regulates sludge from industrial facilities. The facility is required to contact the Waste Management Program at (605) 773-3153 **prior** to the removal and disposal of sludge.

STORM WATER

Smithfield has obtained coverage under the General Permit for Storm Water Discharges Associated with Industrial Activity, Permit Number SDR00A023. Smithfield must comply with all requirements in the Storm Water permit. Therefore, storm water requirements will not be included in this permit.

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 Smithfield's geographic area.

COUNTY	GROUP	SPECIES	CERTAINTY OF OCCURRENCE
MINNEHAHA	FISH	SHINER, TOPEKA	KNOWN

This information was accessible at the following US Fish and Wildlife Service website as of December 9, 2019, and was last updated by the US Fish and Wildlife Service January 11, 2017: https://www.fws.gov/southdakotafieldoffice/SpeciesByCounty_Jan2017.pdf.

PERMIT EXPIRATION

A five-year permit is recommended.

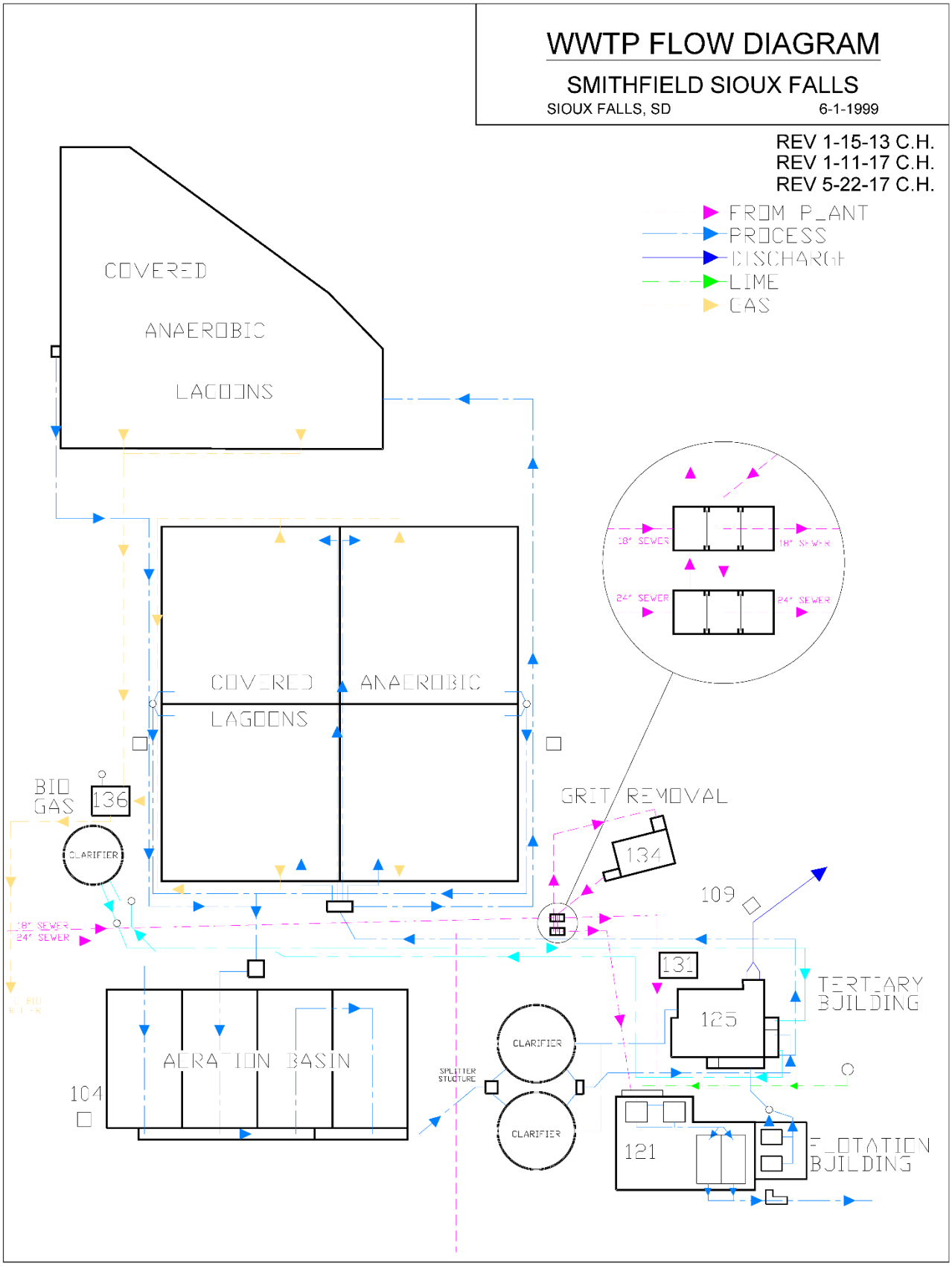
PERMIT CONTACT

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

December 9, 2019

ATTACHMENT 1

Facility Site Diagram


WWTP FLOW DIAGRAM
SMITHFIELD SIOUX FALLS
SIOUX FALLS, SD
6-1-1999
REV 1-15-13 C.H.
REV 1-11-17 C.H.
REV 5-22-17 C.H.
FROM PLANT
PROCESS
DISCHARGE
LIME
GAS
COVERED
ANAEROBIC
LAGOONS
COVERED ANAEROBIC
LAGOONS
18" SEWER
18" SEWER
24" SEWER
24" SEWER
BIO GAS
136
CLARIFIER
GRIT REMOVAL
134
109
18" SEWER
24" SEWER
131
TERTIARY BUILDING
125
AERATION BASIN
104
SPLITTER STUCTURE
CLARIFIER
CLARIFIER
121
FLOTATION BUILDING

ATTACHMENT 2

Antidegradation Review

Permit Type:	**Major Industrial – Renewal**	Applicant:	**Smithfield Foods, Inc. (John Morrell and Company)**
Date Received:	**10/1/2004**	Permit #:	**SD0000078**
County:	**Minnehaha**	Legal Description:	**SE ¼ and SW ¼ of Sec. 9, T 101 N, R 49 W**
Receiving Stream:	**Big Sioux River**	Classification:	**1, 5, 7, 8, 9, 10**

If the discharge affects a downstream waterbody with a higher use classification, list its name and uses: **150 yards downstream, the Big Sioux River is 5, 7, 8, 9, 10**

APPLICABILITY

1. Is the permit or the stream segment exempt from the antidegradation review process under ARSD 74:51:01? Yes ☒ No ☐ If no, go to question #2. If yes, check those reasons why the review is not required:

- ☐ Existing facility covered under a surface water discharge permit is operating at or below design flows and pollutant loadings;
- ☐ *Existing effluent quality from a surface water discharge permitted facility is in compliance with all discharge permit limits;
- ☐ *Existing surface water discharge permittee was discharging to the current stream segment prior to March 27, 1973, and the quality and quantity of the discharge has not degraded the water quality of that segment as it existed on March 27, 1973;
- ☐ *The existing surface water discharge permittee, with DENR 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 DENR 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: This permit does not authorize an increase in effluent limits.

*An antidegradation review is not required where the proposal is to maintain or improve the existing effluent levels and conditions. Proposals for increased effluent levels, in these categories of activities are subject to review.

No further review required.

ANTIDEGRADATION REVIEW SUMMARY

2. 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: _____

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

Kathleen Grigg — Reviewer
December 9, 2019 — Date

Albert Spangler, P.E. — Team Leader
December 9, 2019 — Date

ATTACHMENT 3

Discharge Monitoring Report (DMR) Data

Smithfield Foods' WWTP DMR Data

These monitoring data were obtained from Smithfield Foods' WWTP's Discharge Monitoring Reports (DMRs), and retrieved through the ICIS database, accessed on July 24, 2019. The data span the current permit cycle of April 1, 2000 to June 30, 2019. Public access to the facility's monitoring data is available at EPA's Enforcement and Compliance History Online (ECHO) website: https://echo.epa.gov/.

NODI B: Below Detection Limit / No Detection
NODI C: No Discharge *
*likely coded in error prior to NetDMR, as the facility discharges continuously
NODI E: Analysis Not Conducted / No Sample
NODI 9: Conditional Monitoring - Not Required This Period
NODI Q: Not Quantifiable

Five-Day Biochemical Oxygen Demand (BOD_5), Carbonaceous BOD_5 ($CBOD_5$), and Dissolved Oxygen (DO)

Parameter & Limit / DMR Date	BOD_5				$CBOD_5$		DO
	30-Day Av		Daily Max		30-Day Av	Daily Max	Daily Min
	N/A, mg/L	Varies, lb/d	N/A, mg/L	1,849 lb/d	N/A, mg/L	N/A, mg/L	5 mg/L
04/30/2000	5.4	89	7.7	138	4.1	4.1	6.91
05/31/2000	3.5	61.3	5.8	100.2	0	0	6.51
06/30/2000	2.3	43	6.2	111	2.9	2.9	6.34
07/31/2000	3.7	59	7.5	118	3.7	3.7	5.98
08/31/2000	4.3	82	10	170	3.4	3.4	5.87
09/30/2000	4.1	74	6.3	127	3.1	3.1	6.35
10/31/2000	5.8	111	12	251	4.2	4.2	6.8
11/30/2000	4.5	84	7.1	146	5.1	5.1	7.36
12/31/2000	6.8	118	10	182	3.7	3.7	8.28
01/31/2001	7.9	138	14	237	4.1	4.1	7.53
02/28/2001	6.4	111	9.1	194	5.8	5.8	7.48
03/31/2001	5.8	101	8.9	155	5.1	5.1	5.95
04/30/2001	6.3	108	16	260	0	0	7.71
05/31/2001	3.5	55	7.9	118	2.3	2.3	7.26
06/30/2001	2.5	46	5.3	112	0	0	6.25
07/31/2001	1.5	26	4.1	80	0	0	6.11
08/31/2001	3.7	66	5.4	102	1.9	1.9	6.04
09/30/2001	3.5	59	6	81	2.5	2.5	6.65
10/31/2001	3.3	62	5.2	111	2.9	2.9	7.3
11/30/2001	3.3	56	5	102	2.3	2.3	7.47
12/31/2001	2.6	42	4	81	2.4	2.4	7.94
01/31/2002	5.3	85	13	217	1.7	1.7	7.63
02/28/2002	4.9	80	6.2	120	3	3	7.84
03/31/2002	2.8	48	3.9	72	2.9	2.9	8.2

Parameter & Limit / DMR Date	BOD_5				$CBOD_5$		DO
	30-Day Av		Daily Max		30-Day Av	Daily Max	Daily Min
	N/A, mg/L	Varies, lb/d	N/A, mg/L	1,849 lb/d	N/A, mg/L	N/A, mg/L	5 mg/L
04/30/2002	3.8	65	6.3	100	4	4	7.48
05/31/2002	2.9	50	4.5	69	0	0	7.25
06/30/2002	3.5	60	6.6	113	0	0	6.82
07/31/2002	4.3	74	7.7	137	3	3	6.77
08/31/2002	5.1	94	6.9	138	3	3	6.36
09/30/2002	3.5	55	5.7	110	3.2	3.2	6.96
10/31/2002	2.9	51	5.1	87	2.7	2.7	7.51
11/30/2002	3.2	56	5	94	2.6	2.6	7.62
12/31/2002	2.7	43	4.7	96	2.5	2.5	7.73
01/31/2003	4.9	90	6.9	133	5.2	5.2	7.7
02/28/2003	5.1	93	7.1	139	3.1	3.1	7.5
03/31/2003	5.3	97	12	223	5.3	5.3	7.56
04/30/2003	3.1	54	4.6	91	0	0	7.14
05/31/2003	3	56	7.4	144	0	0	7.24
06/30/2003	2.7	52	7.3	112	2.7	2.7	7.02
07/31/2003	3	56	6.1	119	0	0	6.97
08/31/2003	3	57.4	7.8	164	0	0	6.72
09/30/2003	2	37	4.1	94	2.1	2.1	7.24
10/31/2003	0.8	16	2.9	65	0	0	7.31
11/30/2003	2.7	49	6.6	124	0	0	7.93
12/31/2003	3.3	59	5.7	120	3.1	3.1	7.62
01/31/2004	4.3	72	14	180	2.7	2.7	7.56
02/29/2004	2.5	43	3.8	69	2	2	7.91
03/31/2004	2.6	47	5.3	97	0	0	7.51
04/30/2004	2	36	3.9	71	2.1	2.1	7.48
05/31/2004	2.8	50	3.8	64	2.4	2.4	7.48
06/30/2004	3.7	65	6.8	118	2	2	5.57
07/31/2004	2.6	48	3.8	64	2	2	5.43
08/31/2004	5.2	94	7.6	161	2	2	7.03
09/30/2004	5.8	112	10	186	2.2	2.2	7.1
10/31/2004	3.8	74	7.5	147	3	3	7.01
11/30/2004	3.7	65	8	141	2	2	7.7
12/31/2004	5.3	99	7.7	161	3.5	3.5	7.62
01/31/2005	8.9	156	23	457	3.5	3.5	7.44
02/28/2005	1.8	48	3.3	70	3.1	3.1	7.46
03/31/2005	2.7	68	5.8	122	2	2	7.31
04/30/2005	3.7	69	6	115	4.1	4.1	6.62
05/31/2005	2.8	67	6	124	2.8	2.8	7.27
06/30/2005	2.5	46	3.6	67	2	2	6.62
07/31/2005	3.2	54	7.9	80	2.7	2.7	6.79
08/31/2005	3.8	72	7.3	148	2	2	6.87

Parameter & Limit / DMR Date	BOD_5				$CBOD_5$		DO
	30-Day Av		Daily Max		30-Day Av	Daily Max	Daily Min
	N/A, mg/L	Varies, lb/d	N/A, mg/L	1,849 lb/d	N/A, mg/L	N/A, mg/L	5 mg/L
09/30/2005	2.4	48	3.8	61	2.2	2.2	7.1
10/31/2005	2.8	52	5.8	80	2	2	7.38
11/30/2005	2.3	46	3.1	65	2.7	2.7	7.67
12/31/2005	2.4	41	3.5	59	2	2	7.7
01/31/2006	3.5	59	15	274	2	2	7.36
02/28/2006	3.6	66	6.3	123	3.6	3.6	7.84
03/31/2006	2.5	47	9.1	200	2	2	7.87
04/30/2006	2.1	39	2.4	49	2	2	7.04
05/31/2006	3.2	58	7.7	107	2	2	7.14
06/30/2006	2.3	45	3.9	79	2	2	6.8
07/31/2006	2.1	39	3	63	2	2	6.81
08/31/2006	2.8	56	6	89	2	2	6.99
09/30/2006	2.3	41	3.2	67	2	2	6.8
10/31/2006	2.5	47	4.5	93	2	2	7.52
11/30/2006	2.6	48	3.6	73	2.3	2.3	7.58
12/31/2006	3	49	5.7	116	2.6	2.6	7.45
01/31/2007	6.1	113	14	196	2.4	2.4	7.93
02/28/2007	6.1	106	12	231	3.3	3.3	7.91
03/31/2007	5.1	89	11	195	2.8	2.8	7.29
04/30/2007	11.9	204	19	353	6.7	6.7	7.24
05/31/2007	5.6	99	11	216	4	4	6.98
06/30/2007	2.9	58	3.9	81	2.1	2.1	6.69
07/31/2007	2.7	64	5	99	2.5	2.5	6.54
08/31/2007	4.8	85	7.4	130	2	2	6.39
09/30/2007	2.5	44	5.1	66	2.8	2.8	6.6
10/31/2007	4	72	11	124	3.5	3.5	6.64
11/30/2007	3.1	42	6	108	3.2	3.2	7.17
12/31/2007	2.8	39	4	53	2	2	7.45
01/31/2008	3.4	67	5.6	107	2.4	2.4	6.77
02/29/2008	4.7	80	12	178	2	2	7.22
03/31/2008	8.6	137	24	323	2.6	2.6	7.26
04/30/2008	4.8	84	12	200	5.5	5.5	7.1
05/31/2008	4.6	83	12	298	3.7	3.7	6.94
06/30/2008	4.9	98	10	203	2	2	6.81
07/31/2008	6.1	129	9.1	214	3.5	3.5	6.35
08/31/2008	4.6	90	11	235	2.5	2.5	6.34
09/30/2008	6.3	115	14	228	2.1	2.1	6.62
10/31/2008	7.2	148	14	315	2.8	2.6	6.47
11/30/2008	7	135.1	20	463	3.8	3.8	6.5
12/31/2008	12.4	225	18	355	5.1	5.1	7.47
01/31/2009	9.2	198.4	17	390.2	4.1	4.1	7.19

Parameter & Limit / DMR Date	BOD_5				$CBOD_5$		DO
	30-Day Av		Daily Max		30-Day Av	Daily Max	Daily Min
	N/A, mg/L	Varies, lb/d	N/A, mg/L	1,849 lb/d	N/A, mg/L	N/A, mg/L	5 mg/L
02/28/2009	18.5	397	27	560	8.5	8.5	7.19
03/31/2009	14	278.7	23	497.2	7.9	7.9	6.47
04/30/2009	8.3	136.9	24	327.9	4.6	4.6	6.73
05/31/2009	10	189.5	25	547.1	6	6	6.36
06/30/2009	7.5	154.7	14	335	4.4	4.4	6.21
07/31/2009	5.5	110.4	13	284	4	4	6.37
08/31/2009	11	208.9	20	409.5	3.9	3.9	5.78
09/30/2009	7.4	136.3	27	541.1	9	9	5.85
10/31/2009	3.9	75.5	7.2	149.3	3.2	3.2	6.45
11/30/2009	3.3	57.7	5.3	93.5	2.5	2.5	6.84
12/31/2009	17.4	335.7	55	1,159.70	4.9	4.9	6.1
01/31/2010	15.2	266.4	37	739	19	19	6.32
02/28/2010	16.6	236.5	58	436.5	3.2	3.2	6.73
03/31/2010	16.1	277.2	51	857.9	15	15	6.24
04/30/2010	7.4	154.5	12	274.3	4.2	4.2	6.37
05/31/2010	13.4	265	22	565	3.7	3.7	6.16
06/30/2010	12.8	295	27	581	11	11	6.2
07/31/2010	10.1	204	14	301	8	8	6
08/31/2010	15.6	325	31	692	6.3	6.3	6.1
09/30/2010	41.7	650	170	**2,024**	17	17	6
10/31/2010	17.5	322	51	783	7.3	7.3	6
11/30/2010	20	395	33	705	6	6	6.24
12/31/2010	21	353	46	672	25	25	6.09
01/31/2011	28.8	518	57	1,128	9	9	6.41
02/28/2011	23	420	59	1,088	10	10	7.1
03/31/2011	22	418	34	763	19	19	6
04/30/2011	15	291	22	489	13	13	6.19
05/31/2011	12	230	15	356	6.4	6.4	6.26
06/30/2011	12.6	280	23	636	9	9	6.1
07/31/2011	9.1	203	16	430	4.2	4.2	5.9
08/31/2011	20.5	449.1	44	1,080	12	12	6.7
09/30/2011	15.6	327.4	27	514.4	10	10	6.8
10/31/2011	11.1	234.4	25	438	13	13	6.05
11/30/2011	19.7	316.5	33	712	6	6	6.3
12/31/2011	36	586	74	1,517	17	17	5.8
01/31/2012	10.8	185	19	351	7	7	6
02/29/2012	13	250	21	468	11	11	6
03/31/2012	13	231	26	463	7	7	5.7
04/30/2012	13	267	28	672	6	6	6.4
05/31/2012	9	174	14	337	7	7	6
06/30/2012	8	138	18	393	2	2	6.4

Parameter & Limit / DMR Date	BOD_5				$CBOD_5$		DO
	30-Day Av		Daily Max		30-Day Av	Daily Max	Daily Min
	N/A, mg/L	Varies, lb/d	N/A, mg/L	1,849 lb/d	N/A, mg/L	N/A, mg/L	5 mg/L
07/31/2012	6.6	120	14	206	5	5	5.7
08/31/2012	6	75	12	226	3	3	7
09/30/2012	12.5	251	30	622	4	4	5.4
10/31/2012	22	322	36	655	19	19	5.7
11/30/2012	17	292	33	516	6	6	6.4
12/31/2012	23.3	417	49	1,105	10	10	6
01/31/2013	33	607	61	1,198	10	10	5.9
02/28/2013	24	441	42	835	8	8	6.6
03/31/2013	19	339	35	726	8	8	5.5
04/30/2013	15	225	26	481	15	15	6.3
05/31/2013	16	294	33	534	12	12	6.3
06/30/2013	17	303	36	572	12	12	6
07/31/2013	11	197	16	340	9	9	5.7
08/31/2013	11.9	229	22	395	NODI E	NODI E	5.6
09/30/2013	15	295	34	799	6	6	6
10/31/2013	20	355	50	798	14	14	6.2
11/30/2013	13.7	246	25	460	7	7	7
12/31/2013	20.7	336	46	752	6	6	6
01/31/2014	18	298.2	27	454.9	8	8	6.1
02/28/2014	25.6	402.3	46	680	39	39	5.7
03/31/2014	21	349.2	51	886	13	13	7
04/30/2014	14.8	241.5	29	401	11	11	7
05/31/2014	10.3	172.1	18	263	7	7	6.6
06/30/2014	12.5	243	32	628	9	9	6.3
07/31/2014	10.5	175.9	21	332	6	6	5.9
08/31/2014	17.3	313	40	725	13	13	6.4
09/30/2014	12	221	35	637	6	6	6.5
10/31/2014	11.9	218.6	23	519	7	7	6.4
11/30/2014	16.1	288.3	25	480	8	8	6.6
12/31/2014	21.1	361.5	39	731	16	16	6.6
01/31/2015	14.5	263.8	21	407.4	10	10	6.8
02/28/2015	16.2	276.3	31	557	15	15	6.6
03/31/2015	13.5	249.6	24	452	9	9	6.9
04/30/2015	17	340.2	41	918	11	11	6.9
05/31/2015	12	216.4	23	332	8	8	6.6
06/30/2015	12.1	236.2	22	380	8.2	8.2	6.4
07/31/2015	14.1	282.2	23	536.5	13	13	5.4
08/31/2015	13.5	293.2	27	574.7	10	10	5.9
09/30/2015	13.4	276.1	25	604	9	9	6.1
10/31/2015	18.2	374.9	30	575.5	12	12	6.6
11/30/2015	15	308	27	550	8	8	6.7

Parameter & Limit / DMR Date	BOD_5				$CBOD_5$		DO
	30-Day Av		Daily Max		30-Day Av	Daily Max	Daily Min
	N/A, mg/L	Varies, lb/d	N/A, mg/L	1,849 lb/d	N/A, mg/L	N/A, mg/L	5 mg/L
12/31/2015	19.3	361.6	32	659.7	2	2	6.5
01/31/2016	25.2	487.1	45	909.4	11	11	6.5
02/29/2016	18.1	344.7	31	628	9	9	6.3
03/31/2016	15.3	285.4	29	504	9	9	6.4
04/30/2016	13	235.6	23	381	6	6	6.8
05/31/2016	13.1	236.1	23	363	8	8	6.6
06/30/2016	17.1	327.7	42	742	6	6	6.1
07/31/2016	14.2	288.3	31	602	5	5	6
08/31/2016	22	459.4	44	935	6	6	6
09/30/2016	18.2	396	34	805	8	8	6.2
10/31/2016	15.8	340.1	32	668	13	13	6.6
11/30/2016	23.4	505.9	50	1,178	17	17	6.6
12/31/2016	28.9	546.8	65	1,319	12	12	6.7
01/31/2017	22.7	440.9	41	837.1	12	12	6
02/28/2017	19.7	392	37	745	13	13	5.6
03/31/2017	16.2	345.3	26	565.3	10	10	6
04/30/2017	15.7	308	33	684.7	10	10	6
05/31/2017	23	489.1	60	1,292.50	11	11	5.2
06/30/2017	11	243.8	13	357	10	10	5.4
07/31/2017	11.4	240.3	19	427.4	7	7	5.7
08/31/2017	13.3	301	22	624	15	15	5.7
09/30/2017	13.1	296.2	19	455.3	5	5	5.5
10/31/2017	17.9	409	40	1,021	22	22	5.6
11/30/2017	17.7	386	56	1,287.60	10	10	5.6
12/31/2017	20	440	37	837	6.6	6.6	5.6
01/31/2018	13.2	294	19	483	13	13	5.8
02/28/2018	19.9	423.5	36	768	10	10	6
03/31/2018	14	289	22	449	12	12	6
04/30/2018	18.9	400.6	29	723.2	13	13	5.5
05/31/2018	19.3	405.4	38	918.8	18	18	5.1
06/30/2018	19.5	424.4	36	939.8	15	15	5.8
07/31/2018	18.4	376.4	66	1,611.70	3	3	5.5
08/31/2018	19.9	384	65	1,061.10	15	15	5.63
09/30/2018	16.1	358.3	41	889.7	11	11	5.9
10/31/2018	12	260	36	725	6	6	5.8
11/30/2018	12.8	263	29	616	11	11	5.9
12/31/2018	11.4	243	32	627.7	6	8	6.9
01/31/2019	27.8	581.9	56	1330.1	7	7	7
02/28/2019	36	807	150	**3,908**	23	23	5.8
03/31/2019	23.5	599.8	73	**2,003.6**	13	13	6.8
04/30/2019	23.2	476.2	45	969	13	13	6.4

Parameter & Limit / DMR Date	BOD_5				$CBOD_5$		DO
	30-Day Av		Daily Max		30-Day Av	Daily Max	Daily Min
	N/A, mg/L	Varies, lb/d	N/A, mg/L	1,849 lb/d	N/A, mg/L	N/A, mg/L	5 mg/L
05/31/2019	22	452	122	**2,565**	20	20	5.4
06/30/2019	6.9	142.3	11	250.2	8	8	5.8

Oil & Grease, pH, and Total Residual Chlorine (TRC)

Parameter & Limit / DMR Date	Oil & Grease				pH		TRC
	30-Day Av	Daily Max (grab)		Daily Max (visual)	Daily Min	Daily Max	Daily Max
	352 lb/d	10 mg/L	N/A, lb/d	VYes=1, No=0	6.5 su	9.0 su	.019 mg/L
04/30/2000	20	2.7	49	0	7.12	7.56	0
05/31/2000	0	0	0	0	7.14	7.74	0
06/30/2000	0	0	0	0	7.01	7.58	0
07/31/2000	0	0	0	0	7.02	7.63	0
08/31/2000	27	4.7	92	0	7.3	7.77	0
09/30/2000	14	1.7	34	0	7.13	7.82	0
10/31/2000	11	2.2	45	0	7.14	7.66	0
11/30/2000	8	1.9	39	0	7.01	7.48	0
12/31/2000	30	2.9	55	0	7.01	7.73	0
01/31/2001	5.8	1.2	23.2	0	6.79	7.43	0
02/28/2001	18	3.9	74	0	6.89	7.61	0
03/31/2001	39	7.9	148	0	7.23	7.81	0
04/30/2001	0	0	0	0	6.91	7.84	0
05/31/2001	26	5.6	109	0	**6.39**	7.44	0
06/30/2001	45	5.7	109	0	6.63	7.43	0
07/31/2001	5	1.4	20	0	6.88	7.61	0
08/31/2001	62	5.3	96	0	7	7.62	0
09/30/2001	33	3.6	76	0	6.89	7.76	0
10/31/2001	0	0	0	0	7.28	7.71	0
11/30/2001	5	1.2	11	0	7.04	7.69	0
12/31/2001	0	0	0	0	6.93	7.84	0
01/31/2002	50	5.2	97	0	7.1	7.62	0
02/28/2002	41	8.3	164	0	7.24	7.53	0
03/31/2002	25	3.1	58	0	7.07	7.55	0
04/30/2002	27	3.7	71	0	6.85	7.55	0
05/31/2002	19	3.3	69	0	6.74	7.99	0
06/30/2002	7	1.5	29	0	6.71	7.67	0
07/31/2002	16	2.5	50	0	6.95	7.65	0
08/31/2002	11	2.7	56	0	7.12	7.7	0
09/30/2002	14.42	3.6	58	0	**4.56**	7.83	0
10/31/2002	16	2.9	56	0	7.19	7.72	0
11/30/2002	14	4.9	57	0	7.3	7.87	0
12/31/2002	49	8.1	129	0	7.07	7.73	0
01/31/2003	55	5.8	118	0	7	7.54	**0.73**

Parameter & Limit / DMR Date	Oil & Grease				pH		TRC
	30-Day Av	Daily Max (grab)		Daily Max (visual)	Daily Min	Daily Max	Daily Max
	352 lb/d	10 mg/L	N/A, lb/d	VYes=1, No=0	6.5 su	9.0 su	.019 mg/L
02/28/2003	32	3.8	70	0	6.86	7.42	0
03/31/2003	27	4.1	82	0	6.57	7.47	**0.09**
04/30/2003	102	**17**	371	0	6.8	7.5	0
05/31/2003	33	7.5	163	0	**6.44**	7.47	0
06/30/2003	6	1.2	25	0	**6.35**	7.93	**0.07**
07/31/2003	20	2.4	52	0	6.92	7.36	0
08/31/2003	0	0	0	0	6.63	7.56	0
09/30/2003	8	1.4	31	0	6.83	7.39	**0.06**
10/31/2003	23	3.6	83	0	6.77	7.63	0
11/30/2003	63	5.5	115	0	6.81	8.04	**0.15**
12/31/2003	23	2.2	47	0	6.98	7.8	0
01/31/2004	0	0	0	0	6.85	7.5	0
02/29/2004	7.08	1.3	28.3	0	6.77	7.74	0
03/31/2004	23	2.3	50	0	7.2	7.79	0
04/30/2004	26	2.9	59	0	7	7.7	0
05/31/2004	16	3.1	63	0	7	7.53	0
06/30/2004	28	2.9	50	0	6.99	7.4	0
07/31/2004	24	1.3	29	0	6.87	7.62	0
08/31/2004	50	6.9	117	0	6.83	7.61	0
09/30/2004	23	1.5	28	0	6.63	7.32	0
10/31/2004	27	1.9	45	0	6.83	7.58	0
11/30/2004	19	1	1	0	6.96	7.54	0
12/31/2004	21	1	22	0	6.85	7.7	0
01/31/2005	61	8.8	187	0	6.72	7.33	0
02/28/2005	25	1.7	38	0	7	7.42	0
03/31/2005	21	1	22	0	7	7.4	0
04/30/2005	21	1	21	0	7	7.58	0
05/31/2005	25	1.8	38	0	7	7.52	0
06/30/2005	20	1	21	0	7	7.77	0
07/31/2005	21	1	21	0	7.07	7.76	0
08/31/2005	21	1	21	0	7.21	7.81	0
09/30/2005	24	1.5	32	0	7.01	7.73	0
10/31/2005	21	1	22	0	7	7.62	0
11/30/2005	21	1.3	28	0	6.96	7.76	0
12/31/2005	23	1.4	30	0	7	7.45	0
01/31/2006	36	3.7	68	0	6.51	7.46	0
02/28/2006	27	1.8	37	0	6.86	7.41	0
03/31/2006	38	4.8	106	0	7	7.59	0
04/30/2006	20	1	21	0	6.88	7.51	0
05/31/2006	21	1	22	0	7	7.48	0
06/30/2006	21	1	23	0	7	7.93	0

Parameter & Limit / DMR Date	Oil & Grease				pH		TRC
	30-Day Av	Daily Max (grab)		Daily Max (visual)	Daily Min	Daily Max	Daily Max
	352 lb/d	10 mg/L	N/A, lb/d	VYes=1, No=0	6.5 su	9.0 su	.019 mg/L
07/31/2006	35	2.8	63	0	6.95	7.68	0
08/31/2006	25	1.9	40	0	7.14	7.49	0
09/30/2006	21	1	22	0	7.05	7.67	0
10/31/2006	24	1.9	37	0	7.14	7.74	0
11/30/2006	21	1.3	26	0	7.49	7.92	0
12/31/2006	21	1.3	23	0	7.4	7.86	0
01/31/2007	36	2.9	56	0	7.39	7.76	0
02/28/2007	48	4.1	84	0	7.43	7.86	0
03/31/2007	18	1	20	0	7.49	7.88	**0.06**
04/30/2007	31	2.3	43	0	7.41	7.96	0
05/31/2007	19	1	21	0	7.31	7.83	0
06/30/2007	24	1.5	34	0	7.16	7.82	0
07/31/2007	22	1.2	24	0	7.35	7.95	0
08/31/2007	23	1.8	36	0	7.23	7.94	0
09/30/2007	18	1	20	0	7.64	8.06	0
10/31/2007	21	1	21	0	7.25	7.98	0
11/30/2007	16	1	18	0	7.17	7.8	0
12/31/2007	16	1.3	18	0	7.25	7.72	0
01/31/2008	20	1	23	0	7.19	7.7	0
02/29/2008	20	1	21	0	7.37	7.74	0
03/31/2008	17	1	19	0	7.23	7.88	0
04/30/2008	25	1.6	29	0	6.78	7.5	0
05/31/2008	20	1	25	0	6.55	7.69	0
06/30/2008	21	1	23	0	7.2	7.86	0
07/31/2008	22	1	23	0	6.76	7.9	0
08/31/2008	19	1	24	0	7.61	8.19	0
09/30/2008	20	1	23	0	7.46	8.37	0
10/31/2008	24.4	1.6	34.3	0	7.36	8.02	0
11/30/2008	19.4	1.2	26.3	0	7.39	7.99	0
12/31/2008	18.6	1	21.3	0	7.12	7.8	0
01/31/2009	22.9	1.5	34.7	0	7.12	7.64	0
02/28/2009	20.8	NODI B	21.45	0	7.34	7.7	0
03/31/2009	21.7	NODI B	24.9	0	7.35	8	0
04/30/2009	19.6	1.3	29	0	7.02	8.11	0
05/31/2009	21.2	NODI B	22.3	0	7.35	7.9	0
06/30/2009	23.3	1.5	31.3	0	7.46	7.93	0
07/31/2009	22.3	NODI B	23.4	0	7.23	7.98	0
08/31/2009	19.2	NODI B	22.7	0	7.29	7.97	0
09/30/2009	19.6	NODI B	22.5	0	7.31	7.95	**0.22**
10/31/2009	21.1	NODI B	22.4	0	7.27	7.85	0
11/30/2009	20.8	NODI B	22.6	0	7.33	7.88	0

Parameter & Limit / DMR Date	Oil & Grease				pH		TRC
	30-Day Av	Daily Max (grab)		Daily Max (visual)	Daily Min	Daily Max	Daily Max
	352 lb/d	10 mg/L	N/A, lb/d	VYes=1, No=0	6.5 su	9.0 su	.019 mg/L
12/31/2009	20.1	NODI B	21.6	0	7.47	7.84	0
01/31/2010	20	NODI B	21.1	0	7.45	7.85	**0.06**
02/28/2010	17.7	1.8	18.5	0	7.62	8.03	0
03/31/2010	18.1	NODI B	22.9	0	7.33	7.97	0
04/30/2010	22	NODI B	23	0	7.09	7.83	NODI B
05/31/2010	24	NODI B	26	0	6.7	7.9	NODI B
06/30/2010	NODI B	NODI B	NODI B	0	6.5	7.9	0
07/31/2010	NODI B	NODI B	NODI B	0	6.7	7.8	NODI B
08/31/2010	NODI B	NODI B	NODI B	0	7.3	8.1	NODI B
09/30/2010	NODI B	NODI B	NODI B	0	7.6	8.4	NODI B
10/31/2010	20.1	1	21.7	0	7.3	8.1	NODI B
11/30/2010	21	NODI B	24	0	6.9	7.9	NODI B
12/31/2010	NODI B	NODI B	NODI B	0	6.6	8	NODI B
01/31/2011	NODI B	NODI B	NODI B	0	6.6	7.9	NODI B
02/28/2011	NODI B	NODI B	NODI B	0	6.6	7.4	NODI B
03/31/2011	NODI B	NODI B	NODI B	0	6.5	7.7	NODI B
04/30/2011	NODI B	NODI B	NODI B	0	6.6	7.4	NODI B
05/31/2011	NODI B	NODI B	NODI B	0	6.6	7.7	NODI B
06/30/2011	22.4	1	25.2	0	6.5	7.9	NODI B
07/31/2011	26.2	1	29.3	0	6.6	7.7	NODI B
08/31/2011	23.5	1	26.1	0	6.6	7.6	NODI B
09/30/2011	22.9	1	24.5	0	6.5	7.4	NODI B
10/31/2011	24.1	1	25.5	0	6.8	7.5	NODI B
11/30/2011	21.7	1	25	0	7	7.5	NODI B
12/31/2011	20.4	1	22.8	0	6.9	7.6	NODI B
01/31/2012	20	1	21	0	6.9	7.4	NODI B
02/29/2012	20	1	21	0	6.9	7.3	NODI B
03/31/2012	21	1	24	0	6.7	7.3	NODI B
04/30/2012	22	1	24	0	6.5	7.3	NODI B
05/31/2012	21	1	24	0	6.7	7.4	NODI B
06/30/2012	22	1	23	0	6.7	7.3	NODI B
07/31/2012	21	1	24	0	6.7	7.8	NODI B
08/31/2012	18	1	20	0	7.2	7.7	NODI B
09/30/2012	22	1	23	0	7.1	7.9	NODI B
10/31/2012	21	1	23	0	7.3	7.8	NODI B
11/30/2012	16	1	21	0	7.1	8	NODI B
12/31/2012	19	1	23	0	7.1	7.8	NODI B
01/31/2013	19	1	22	0	7.1	7.8	NODI B
02/28/2013	19	1	21	0	6.8	7.6	NODI B
03/31/2013	19	1	19	0	7	7.5	NODI B
04/30/2013	18	1	20	0	6.9	7.3	NODI B

Parameter & Limit / DMR Date	Oil & Grease				pH		TRC
	30-Day Av	Daily Max (grab)		Daily Max (visual)	Daily Min	Daily Max	Daily Max
	352 lb/d	10 mg/L	N/A, lb/d	VYes=1, No=0	6.5 su	9.0 su	.019 mg/L
05/31/2013	19	1	21	0	6.7	7.3	NODI B
06/30/2013	20	1	22	0	6.6	7.2	NODI B
07/31/2013	18	1	23	0	6.6	7.3	NODI B
08/31/2013	20.2	1	21.6	0	6.5	7.2	NODI B
09/30/2013	21	1	22	0	6.5	7.2	NODI B
10/31/2013	16	1	20	0	6.6	7.4	NODI B
11/30/2013	18	1	20	0	6.6	7.1	NODI B
12/31/2013	16	1	19	0	6.6	7.1	NODI B
01/31/2014	16.9	1	18.4	0	6.6	7.2	NODI B
02/28/2014	16.3	1	18	0	6.53	7.29	NODI B
03/31/2014	17.2	1	20.9	0	6.5	7.7	NODI B
04/30/2014	17.1	1	19.3	0	6.6	7.4	NODI B
05/31/2014	17.5	1	18.4	0	6.5	7.3	NODI B
06/30/2014	17.3	1	18.4	0	6.5	7.6	NODI B
07/31/2014	17.1	1	18.6	0	6.5	8.3	NODI B
08/31/2014	18.8	1	20.2	0	6.5	7.5	NODI B
09/30/2014	21	1.3	26	0	6.5	7.1	NODI B
10/31/2014	17.7	1	20.2	0	6.5	7.1	NODI B
11/30/2014	16.4	1	18.9	0	6.7	7.2	NODI B
12/31/2014	17.6	1	20.8	0	6.5	7.1	NODI B
01/31/2015	18.1	1	18.8	0	6.5	7.1	NODI B
02/28/2015	18.5	1	20.2	0	6.51	7.13	NODI B
03/31/2015	19.2	1	21.1	0	6.5	7.1	NODI B
04/30/2015	19.4	1	21.1	0	6.6	7.1	NODI B
05/31/2015	18.3	1	24.3	0	6.5	7.1	NODI B
06/30/2015	19.6	1	20.5	0	6.5	7.1	NODI B
07/31/2015	20.4	1	21.1	0	6.5	7.2	NODI B
08/31/2015	21.8	1	23.5	0	6.6	7	NODI B
09/30/2015	21.6	1	24.9	0	6.5	7.2	NODI B
10/31/2015	21.3	1	23.2	0	6.5	7.3	NODI B
11/30/2015	21.1	1	23	0	6.5	7.2	NODI B
12/31/2015	18.5	1	19.5	0	6.5	7.1	NODI B
01/31/2016	20.4	1	22.1	0	6.5	7.1	NODI B
02/29/2016	18.9	1	20.9	0	6.5	7.5	NODI B
03/31/2016	20.1	1	20.7	0	6.5	7.5	NODI B
04/30/2016	19.6	1	21.8	0	6.5	7	NODI B
05/31/2016	18.5	1	20.3	0	6.6	7.4	NODI B
06/30/2016	20.1	1	21.5	0	6.6	7.1	NODI B
07/31/2016	20.3	1	21.5	0	6.6	7.2	NODI B
08/31/2016	20.8	1	24.7	0	6.9	7.4	NODI B
09/30/2016	23.3	1	27.8	0	6.6	7.4	NODI B

Parameter & Limit / DMR Date	Oil & Grease				pH		TRC
	30-Day Av	Daily Max (grab)		Daily Max (visual)	Daily Min	Daily Max	Daily Max
	352 lb/d	10 mg/L	N/A, lb/d	VYes=1, No=0	6.5 su	9.0 su	.019 mg/L
10/31/2016	22.1	1	23.4	0	6.6	7.1	NODI B
11/30/2016	22.4	1	24.7	0	6.9	7.3	NODI B
12/31/2016	20	1	23.1	0	6.8	7.4	NODI B
01/31/2017	20.5	1	21.4	0	6.8	7.3	NODI B
02/28/2017	20.4	1	20.8	0	6.7	7.2	NODI B
03/31/2017	21.5	1	22.7	0	6.8	7.1	NODI B
04/30/2017	20.9	1	23	0	6.7	7.2	NODI B
05/31/2017	22	1	24.6	0	6.8	7.3	NODI B
06/30/2017	21.9	1	22.9	0	6.7	7.1	NODI B
07/31/2017	22.2	1	23.5	0	6.6	7.2	NODI B
08/31/2017	22.5	1	26.4	0	6.7	7.2	NODI B
09/30/2017	23	1	24.3	0	6.6	7.2	NODI B
10/31/2017	22	1	24	0	6.6	7.1	NODI B
11/30/2017	21.3	1	22.1	0	6.7	7.1	NODI B
12/31/2017	23	1	23	0	6.9	7.2	NODI B
01/31/2018	23	1	23	0	6.7	7.1	NODI B
02/28/2018	14.9	1	22.4	0	6.58	7.13	NODI B
03/31/2018	21.2	1	22.7	0	6.6	7.5	NODI B
04/30/2018	23.4	1	24.6	0	6.9	7.4	NODI B
05/31/2018	22.1	1	24.2	0	6.7	8.3	NODI B
06/30/2018	23.6	1	27.1	0	6.7	7.2	NODI B
07/31/2018	21	1	25.6	0	6.7	8	NODI B
08/31/2018	21	1	27.5	0	7	7.6	NODI B
09/30/2018	26.1	1	31.6	0	6.6	7.3	NODI B
10/31/2018	24	1	25	0	6.5	7.1	NODI B
11/30/2018	22.9	1.2	28.3	0	6.7	7.3	NODI B
12/31/2018	27.1	1.6	36.8	0	6.9	7.4	NODI B
01/31/2019	21.7	1	26.5	0	7.1	7.5	NODI B
02/28/2019	26.8	1.3	27.5	0	6.91	7.66	NODI B
03/31/2019	48.5	4.8	130.5	0	7	7.6	NODI B
04/30/2019	23.6	1.4	30.5	0	7.2	7.6	NODI B
05/31/2019	36.1	3.7	95.4	0	7	7.5	NODI B
06/30/2019	20.8	1	24.1	0	6.8	7.4	NODI B

Temperature, Fecal Coliform, Flow Rate

Parameter & Limit / DMR Date	Temperature		Fecal Coliform		Flow rate	
	30-Day Av	Daily Max	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	N/A, ° C	N/A, ° C	200 #/100mL May-Sept.	400 #/100mL	N/A, MGD	N/A, MGD
04/30/2000	26.2	29	1.87	6	1.97	2.51
05/31/2000	29	31	2.63	10	1.98	2.44

Parameter & Limit / DMR Date	Temperature		Fecal Coliform		Flow rate	
	30-Day Av	Daily Max	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	N/A, ° C	N/A, ° C	200 #/100mL May-Sept.	400 #/100mL	N/A, MGD	N/A, MGD
06/30/2000	30.9	34	2.1	24	2.17	2.56
07/31/2000	33.5	35	2.41	12	2.12	2.58
08/31/2000	34.3	36	2.14	10	2.3	2.66
09/30/2000	31.1	34	3.46	17	2.22	2.55
10/31/2000	29.5	32	7.96	140	2.26	2.57
11/30/2000	24.9	30	4.59	21	2.22	2.51
12/31/2000	21.6	25	2.9	24	1.98	2.51
01/31/2001	24.3	27	7.98	98	2.09	2.52
02/28/2001	23.4	25	7.33	150	2.01	2.56
03/31/2001	26.1	28	9.45	**1,100**	2.09	2.48
04/30/2001	27	30	21.19	**420**	1.98	2.59
05/31/2001	29.1	32	28	**2,300**	1.92	2.41
06/30/2001	32.1	36	52	**27,000**	2.13	2.52
07/31/2001	34.4	37	4.46	120	2.05	2.53
08/31/2001	35.1	37	14	260	2.16	2.53
09/30/2001	32.3	34	6.4	270	2.12	2.54
10/31/2001	28.9	32	19.21	**3,700**	2.2	2.56
11/30/2001	26.8	30	2.75	50	2.01	2.6
12/31/2001	23.6	27	1.82	75	1.86	2.6
01/31/2002	24	27	2.48	40	1.88	2.4
02/28/2002	24.2	27	1.44	15	1.91	2.37
03/31/2002	23.5	27	2.5	15	1.97	2.45
04/30/2002	27.5	31	1.28	15	2.04	2.45
05/31/2002	29	34	1.66	70	1.93	2.59
06/30/2002	33.5	37	1.99	85	2.04	2.72
07/31/2002	35.6	38	1.57	30	2.06	2.52
08/31/2002	34.6	37	3.47	80	2.16	2.8
09/30/2002	33.4	36	4.52	**570**	1.98	2.42
10/31/2002	28.7	31	4.01	330	2.1	2.47
11/30/2002	27.4	29	10.9	**930**	2.07	2.39
12/31/2002	25.3	27	3.19	250	1.96	2.53
01/31/2003	24.8	28	9.02	110	2.2	2.57
02/28/2003	24	27	2.65	11	2.1	2.45
03/31/2003	26.6	29	3.1	74	2.18	2.57
04/30/2003	27.6	30	1.65	12	2.11	2.66
05/31/2003	30	33	2.94	50	2.09	2.68
06/30/2003	31.8	35	5.58	66	2.19	2.81
07/31/2003	33.9	36	5.02	250	2.19	2.69
08/31/2003	34.6	37	7.04	150	2.25	2.78
09/30/2003	30.2	32	7.09	260	2.24	3.13
10/31/2003	29.6	33	16.38	**1,400**	2.27	2.81

Parameter & Limit / DMR Date	Temperature		Fecal Coliform		Flow rate	
	30-Day Av	Daily Max	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	N/A, ° C	N/A, ° C	200 #/100mL May-Sept.	400 #/100mL	N/A, MGD	N/A, MGD
11/30/2003	26.6	29	6.77	320	2.15	2.7
12/31/2003	26.6	28	5.65	130	2.18	2.83
01/31/2004		29	3.22	170	2.13	2.75
02/29/2004	24.9	29	2.92	12	2.04	2.76
03/31/2004	26.8	30	12.1	86	2.16	2.77
04/30/2004	28.2	30	2.94	57	2.18	2.87
05/31/2004	28.9	31	5.27	120	2.18	2.77
06/30/2004	30.3	33	12.29	**780**	2.23	3.29
07/31/2004	33.5	36	35.67	360	2.34	2.89
08/31/2004	32.8	35	13.19	210	2.21	2.83
09/30/2004	31.7	33	16	260	2.32	2.75
10/31/2004	29.8	32	6.64	90	2.15	2.82
11/30/2004	27.9	29	1.68	30	2.41	2.76
12/31/2004	25.7	27	1.62	5	2.31	2.77
01/31/2005	23.8	25	1.61	3	2.04	2.55
02/28/2005	25.9	28	1.79	8	2.32	2.7
03/31/2005	25.5	28	2.27	7	2.21	2.65
04/30/2005	28.7	31	1.22	5	2.17	2.55
05/31/2005	29.3	32	2.98	18	2.06	2.56
06/30/2005	33.1	36	2.92	29	2.22	2.56
07/31/2005	33.9	37	1.07	2	2.21	2.66
08/31/2005	34	36	1.15	3	2.25	2.72
09/30/2005	32.7	34	2.42	180	2.43	2.8
10/31/2005	30.2	33	5.6	350	2.38	2.76
11/30/2005	27.8	30	6.29	45	2.39	2.64
12/31/2005	25.7	29	1.79	6	2.22	2.67
01/31/2006	26.8	28	2.47	61	2.14	2.67
02/28/2006	26.2	28	2.1	23	2.17	2.58
03/31/2006	26.7	29	2.73	12	2.2	2.64
04/30/2006	28.3	31	2.56	17	2.24	2.8
05/31/2006	30.1	33	2.33	19	2.11	2.67
06/30/2006	33.7	37	2.15	120	2.21	2.79
07/31/2006	34.6	37	2.33	34	2.18	2.68
08/31/2006	34.2	36	1.53	50	2.38	2.72
09/30/2006	30.3	34	2.92	31	2.15	2.67
10/31/2006	28.5	31	3.71	13	2.22	2.55
11/30/2006	27.5	30	8.86	23	2.22	2.72
12/31/2006	25.5	28	4.32	70	2.03	2.62
01/31/2007	24.5	27	4.55	12	2.15	2.59
02/28/2007	24.5	27	5.28	30	1.94	2.45
03/31/2007	27.5	31	4.23	39	2.06	2.66

Parameter & Limit / DMR Date	Temperature		Fecal Coliform		Flow rate	
	30-Day Av	Daily Max	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	N/A, ° C	N/A, ° C	200 #/100mL May-Sept.	400 #/100mL	N/A, MGD	N/A, MGD
04/30/2007	27.3	30	2.58	17	2.07	2.45
05/31/2007	30.1	32	2.3	15	2.03	2.54
06/30/2007	32.7	35	1.86	15	2.38	2.72
07/31/2007	34.1	36	3.36	31	2.19	2.74
08/31/2007	34.3	36	3.41	50	2.19	2.8
09/30/2007	32.5	35	1.99	39	2.23	2.68
10/31/2007	31	34	6.18	**9,000**	2.3	2.63
11/30/2007	26.6	29	4.15	120	1.76	2.23
12/31/2007	25.2	27	1.58	14	1.76	2.46
01/31/2008	25.5	28	3.7	25	2.4	2.8
02/29/2008	25.2	28	3.68	40	2.19	2.76
03/31/2008	26.5	28	5.91	**1,200**	1.98	2.6
04/30/2008	26.8	30	3.96	39	2.12	2.66
05/31/2008	28.6	31	2.93	90	2.06	2.98
06/30/2008	31.9	34	3.65	240	2.36	2.88
07/31/2008	33.8	36	5.48	37	2.4	2.94
08/31/2008	33.9	36	6.67	45	2.26	2.89
09/30/2008	31.8	34	2.52	170	2.25	2.94
10/31/2008	29.3	32	4.12	36	2.44	2.96
11/30/2008	27.6	32	2.84	21	2.23	2.78
12/31/2008	23.2	26	2.1	24	2.18	2.82
01/31/2009	24.5	27	4.5	35	2.57	2.96
02/28/2009	25.6	28	16.21	53	2.43	2.85
03/31/2009	26.1	29	7.5	60	2.31	2.98
04/30/2009	26.9	30	13.43	240	2.05	2.83
05/31/2009	30.4	33	43.59	**1,500**	2.26	2.82
06/30/2009	32.5	36	19.24	**500**	2.38	2.87
07/31/2009	33	34	15.5	380	2.27	2.85
08/31/2009	33.7	36	21.56	170	2.23	2.81
09/30/2009	32.6	35	6.75	50	2.3	2.89
10/31/2009	28.5	31	25.7	80	2.37	2.88
11/30/2009	28.3	30	25.71	310	2.33	2.86
12/31/2009	24.7	28	194.5	**3,450**	2.23	2.76
01/31/2010	23.9	26	48.13	**455**	2.13	2.61
02/28/2010	23.8	26	3.17	46	1.77	2.62
03/31/2010	27.7	31	9.88	**620**	2.07	2.86
04/30/2010	30.7	33	3.97	115	2.38	2.99
05/31/2010	30	33	NODI B	21	2.2	3.08
06/30/2010	32.6	35	NODI B	22	2.72	3.36
07/31/2010	34	36	NODI B	120	2.49	3.38
08/31/2010	34	36	2.89	**2,100**	2.52	3.26

Parameter & Limit / DMR Date	Temperature		Fecal Coliform		Flow rate	
	30-Day Av	Daily Max	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	N/A, ° C	N/A, ° C	200 #/100mL May-Sept.	400 #/100mL	N/A, MGD	N/A, MGD
09/30/2010	32	34	6.89	**19,200**	2.24	3.49
10/31/2010	30.8	34	4.53	46	2.26	3.03
11/30/2010	29	32	3.56	45	2.43	3.09
12/31/2010	27	24	2.95	101	2.15	2.87
01/31/2011	26	29	NODI B	**530**	2.1	2.86
02/28/2011	27	29	3.22	**540**	2.19	2.73
03/31/2011	28	30	2.7	29	2.23	2.94
04/30/2011	28	30	2.94	22	2.25	3.01
05/31/2011	29	32	2.15	84	2.27	3.05
06/30/2011	32	33	1.44	51	2.51	3.43
07/31/2011	34	36	1.83	**430**	2.55	3.56
08/31/2011	34	36	1.65	26	2.59	3.21
09/30/2011	32	35	1.44	19	2.48	3.02
10/31/2011	31	33	1.23	5	2.65	3.1
11/30/2011	29	30	3.83	340	2.52	3
12/31/2011	27	30	1.67	12	2.26	2.79
01/31/2012	25	28	1.05	3	2.1	2.6
02/29/2012	25	27	1.07	1	2.19	2.68
03/31/2012	28	31	1	1	2.2	2.9
04/30/2012	28	30	1.18	8	2.3	3.25
05/31/2012	30	32	1.2	21	2.23	2.98
06/30/2012	32	35	1.26	12	2.26	2.71
07/31/2012	35	37	1.57	42	2.23	2.86
08/31/2012	34	36	1.51	8	2.22	2.7
09/30/2012	32	35	2.03	120	2.43	2.8
10/31/2012	30	33	4.1	23	2.41	2.78
11/30/2012	30	32	2.39	60	2.02	2.54
12/31/2012	29	32	4.5	120	2.18	2.71
01/31/2013	26	29	4.59	53	2.17	2.97
02/28/2013	26	28	2.65	10	2.19	2.77
03/31/2013	28	30	2.3	6	2.15	2.67
04/30/2013	28	31	3.96	**940**	2.17	2.7
05/31/2013	30	32	2	8	2.18	2.78
06/30/2013	32	34	3	21	2.3	2.83
07/31/2013	34	35	5.94	**710**	2.15	2.78
08/31/2013	34	37	3	18	2.34	2.96
09/30/2013	33	35	1.71	14	2.26	2.82
10/31/2013	29	33	1.51	9	2.03	2.47
11/30/2013	28	30	1.5	19	2.15	2.6
12/31/2013	26.6	28.6	1.43	7	2.02	2.44
01/31/2014	25	30	1.36	39	2.02	2.49

Parameter & Limit / DMR Date	Temperature		Fecal Coliform		Flow rate	
	30-Day Av	Daily Max	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	N/A, ° C	N/A, ° C	200 #/100mL May-Sept.	400 #/100mL	N/A, MGD	N/A, MGD
02/28/2014	26	28	1.46	4	1.94	2.32
03/31/2014	28	30	1.63	10	1.93	2.51
04/30/2014	28	30	2.45	10	1.91	2.44
05/31/2014	30	33	1.77	14	1.97	2.48
06/30/2014	32	34	2.11	12	2.24	3.38
07/31/2014	33	34	2.04	14	2.01	2.54
08/31/2014	33	35	5.13	100	2.15	2.42
09/30/2014	32	34	3	37	2.22	2.96
10/31/2014	31	33	3.02	55	2.16	2.71
11/30/2014	27	30	2.19	11	2.12	2.53
12/31/2014	27	30	2.54	12	2.02	2.49
01/31/2015	27	29	2.5	17	2.14	2.53
02/28/2015	25	28	2.72	27	2.01	2.43
03/31/2015	28	31	2.62	22	2.23	2.73
04/30/2015	30	32	2.84	28	2.35	3.06
05/31/2015	32	34	2.2	12	2.2	3.18
06/30/2015	34	35	3.33	51	2.38	2.99
07/31/2015	35	37	5.82	120	2.34	2.89
08/31/2015	34	37	3.17	28	2.57	3.35
09/30/2015	34	36	1.96	29	2.47	3
10/31/2015	32	33	3.49	130	2.55	3.82
11/30/2015	30	33	1.48	22	2.4	2.9
12/31/2015	27	30	1.23	8	2.23	2.54
01/31/2016	26	28	2.56	29	2.27	2.65
02/29/2016	27	29	1.1	4	2.25	2.54
03/31/2016	28	31	2.08	248	2.24	2.64
04/30/2016	29	32	1.13	12	2.27	2.62
05/31/2016	31	34	1.23	100	2.16	2.58
06/30/2016	33	35	1.57	20	2.38	3.05
07/31/2016	34	36	1.51	19	2.38	2.95
08/31/2016	35	36	1.74	214	2.52	2.96
09/30/2016	32	34	1.76	40	2.54	3.33
10/31/2016	30	31	2.87	179	2.55	2.93
11/30/2016	30	32	1	1	2.54	3.2
12/31/2016	26	29	1.39	167	2.31	2.91
01/31/2017	25	29	3.56	70	2.36	2.62
02/28/2017	27	29	1.13	4	2.31	2.71
03/31/2017	27	30	1	1	2.47	2.85
04/30/2017	29	30	1.16	21	2.36	2.96
05/31/2017	30	31	1	1	2.52	2.95
06/30/2017	33	34	1.63	19	2.63	3.3

Parameter & Limit / DMR Date	Temperature		Fecal Coliform		Flow rate	
	30-Day Av	Daily Max	30-Day Geo Mean	Daily Max	30-Day Av	Daily Max
	N/A, ° C	N/A, ° C	200 #/100mL May-Sept.	400 #/100mL	N/A, MGD	N/A, MGD
07/31/2017	35	36	1.8	17	2.52	2.93
08/31/2017	33	35	1.15	25	2.69	3.4
09/30/2017	33	34	1.12	5	2.67	3.16
10/31/2017	32	33	1	1	2.62	3.3
11/30/2017	31	32	1.11	5	2.57	2.94
12/31/2017	27	30	1.45	12	2.56	2.93
01/31/2018	24	25	1.56	9	2.58	3.11
02/28/2018	25	27	1.93	16	2.47	2.89
03/31/2018	27	29	1	1	2.49	2.98
04/30/2018	27	29	1.58	21	2.53	2.99
05/31/2018	30	34	2.03	26	2.42	2.91
06/30/2018	32	34	1.3	31	2.59	3.51
07/31/2018	35	37	1.91	397	2.31	3.08
08/31/2018	34.9	36.9	2.76	**1,553**	2.48	3.3
09/30/2018	35	37	1	1	2.84	3.83
10/31/2018	33	34	1	1	2.75	3.24
11/30/2018	29	33	1.11	9	2.49	3.03
12/31/2018	29	31	5.04	205	2.57	2.98
01/31/2019	26	30	2.64	30	2.63	3.29
02/28/2019	24	25	5.92	157	2.71	3.31
03/31/2019	27	30	3.66	**1,733**	2.77	3.54
04/30/2019	29	29	2.29	57	2.52	3.08
05/31/2019	29	32	3	1.08	2.46	3.2
06/30/2019	32	34	3.2	**727**	2.51	3.26

Ammonia and Nitrate

Parameter & Limit / DMR Date	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
	30-Day Av		Daily Max		30-Day Av	Daily Max
	N/A, mg/L	Varies, lb/d	N/A, mg/L	Varies, lb/d	N/A, mg/L	N/A, mg/L
04/30/2000	0.12	2.04	0.23	4.03	96	96
05/31/2000	0.16	2.94	0.4	7.8	37	37
06/30/2000	0.11	1.99	0.18	3.27	43	43
07/31/2000	0.07	1.13	0.23	4.77	160	160
08/31/2000	0.11	1.99	0.36	6.11	54	54
09/30/2000	0.11	2.01	0.34	6.29	92	92
10/31/2000	0.16	3	0.27	5.49	57	57
11/30/2000	0.22	4.08	0.32	6.53	41	41
12/31/2000	0.33	5.67	0.46	7.96	79	79
01/31/2001	0.34	5.86	0.59	9.25	96	96
02/28/2001	0.32	5.36	0.4	6.84	69	69

Parameter & Limit / DMR Date	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
	30-Day Av		Daily Max		30-Day Av	Daily Max
	N/A, mg/L	Varies, lb/d	N/A, mg/L	Varies, lb/d	N/A, mg/L	N/A, mg/L
03/31/2001	1.84	32	20	**335**	83	83
04/30/2001	0.22	3.39	1.8	28.94	52	52
05/31/2001	0.53	9.23	5.9	104.2	90	90
06/30/2001	0.13	2.4	0.26	5.47	100	100
07/31/2001	0.13	2.13	0.39	5.38	56	56
08/31/2001	0.19	3.43	0.26	5.49	62	62
09/30/2001	0.16	2.71	0.3	4.01	52	52
10/31/2001	0.2	3.68	0.33	5.96	93	93
11/30/2001	0.2	3.3	0.31	4.33	93	93
12/31/2001	0.12	1.87	0.22	3.78	99	99
01/31/2002	0.2	3.27	0.4	7.35	93	93
02/28/2002	0.16	2.67	0.25	4.44	88	88
03/31/2002	0.15	2.5	0.21	3.85	25	25
04/30/2002	0.16	2.71	0.62	6.53	81	81
05/31/2002	0.25	4.51	1.4	27.43	85	85
06/30/2002	0.13	2.25	0.28	4.67	120	120
07/31/2002	0.09	1.49	0.16	2.86	130	130
08/31/2002	0.14	2.58	0.24	4.43	21	21
09/30/2002	0.21	3.37	0.32	5.78	110	110
10/31/2002	0.13	2.3	0.27	4.46	90	90
11/30/2002	0.13	2.14	0.28	4.61	110	110
12/31/2002	0.19	3.01	0.32	5.28	74	74
01/31/2003	0.31	5.7	0.5	10.17	84	84
02/28/2003	0.24	4.34	0.41	8.03	86	86
03/31/2003	0.23	4.1	0.34	6.98	128	128
04/30/2003	0.17	3.04	0.66	10.39	130	130
05/31/2003	0.17	3.17	0.28	6.02	100	100
06/30/2003	0.16	2.93	0.26	5.18	110	110
07/31/2003	0.12	2.31	0.16	3.49	110	110
08/31/2003	0.11	2.11	0.2	4.22	100	100
09/30/2003	0.12	2.29	0.2	4.58	96	96
10/31/2003	0.13	2.43	0.2	4.03	92	92
11/30/2003	0.15	2.85	0.77	17.33	100	100
12/31/2003	0.12	2.24	0.3	5.91	110	110
01/31/2004	0.17	3.13	0.75	16.65	93	93
02/29/2004	0.05	0.92	0.12	2.76	57	57
03/31/2004	0.08	1.42	0.17	3.27	71	71
04/30/2004	0.07	1.36	0.15	3.33	105	105
05/31/2004	0.16	2.56	0.95	5.93	85	85
06/30/2004	0.12	2.35	0.24	4.94	105	105
07/31/2004	0.1	2	0.18	3.91	98	98

Parameter & Limit / DMR Date	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
	30-Day Av		Daily Max		30-Day Av	Daily Max
	N/A, mg/L	Varies, lb/d	N/A, mg/L	Varies, lb/d	N/A, mg/L	N/A, mg/L
08/31/2004	0.1	1.83	0.23	3.86	97	97
09/30/2004	0.16	2.98	0.29	6.36	125	125
10/31/2004	0.08	1.45	0.13	2.32	140	140
11/30/2004	0.09	1.43	0.18	3.23	130	130
12/31/2004	0.12	1.55	0.3	5.49	126	126
01/31/2005	0.18	3.12	0.33	6.32	120	120
02/28/2005	0.06	1.09	0.09	1.94	120	120
03/31/2005	0.06	1.4	0.21	4.07	100	100
04/30/2005	0.07	1.33	0.19	3.97	86	86
05/31/2005	0.05	1.17	0.16	2.02	98	98
06/30/2005	0.07	1.3	0.13	2.55	82	82
07/31/2005	0.07	1.38	0.12	2.6	115	115
08/31/2005	0.08	1.5	0.15	2.9	112	112
09/30/2005	0.64	10.62	10	**155.79**	123	123
10/31/2005	0.08	1.52	0.14	3.06	130	130
11/30/2005	0.35	7	2.21	44	114	114
12/31/2005	0.97	9.11	15.8	129.8	89	89
01/31/2006	0.14	2.46	0.37	6.76	120	120
02/28/2006	0.52	10.87	7.51	161.59	120	120
03/31/2006	0.15	2.36	0.7	8.79	130	130
04/30/2006	0.09	1.7	0.14	2.75	76	76
05/31/2006	0.11	1.89	0.34	4.25	76	76
06/30/2006	0.11	2.12	0.17	3.44	131	131
07/31/2006	0.11	1.98	0.19	3.36	115	115
08/31/2006	0.08	1.6	0.24	5.15	81	81
09/30/2006	0.13	2.43	0.81	16.45	110	110
10/31/2006	0.14	2.68	0.36	6.76	91	91
11/30/2006	0.08	1.45	0.26	5.23	76	76
12/31/2006	0.11	1.82	0.4	7.69	27	27
01/31/2007	0.17	3.05	0.32	5.73	78	78
02/28/2007	0.19	3.27	0.34	6.95	45	45
03/31/2007	3.72	66.14	23.5	**412.24**	46	46
04/30/2007	1.18	21.06	13.8	**282.44**	77	77
05/31/2007	0.35	5.56	2.7	30.26	92	92
06/30/2007	0.2	4.07	0.27	6	122	122
07/31/2007	0.35	6.44	3.1	55.15	124	124
08/31/2007	0.23	4.13	0.6	11.93	105	105
09/30/2007	0.35	6.75	4.9	97.67	107	107
10/31/2007	0.22	3.99	0.52	9.68	56.7	56.7
11/30/2007	0.46	6.86	5.9	91.62	89	89
12/31/2007	0.22	3.01	0.79	9.64	72	72

Parameter & Limit / DMR Date	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
	30-Day Av		Daily Max		30-Day Av	Daily Max
	N/A, mg/L	Varies, lb/d	N/A, mg/L	Varies, lb/d	N/A, mg/L	N/A, mg/L
01/31/2008	0.22	4.3	0.34	7.78	71	71
02/29/2008	0.29	5.01	0.49	8.46	54	54
03/31/2008	0.51	7.77	2.6	34.98	54	54
04/30/2008	0.35	6.18	0.57	10.2	77	77
05/31/2008	0.22	3.81	0.64	6.38	89	89
06/30/2008	0.19	3.88	0.29	6.45	74	74
07/31/2008	0.2	4.42	0.36	8.6	74	74
08/31/2008	1.2	18.21	14.4	**161.05**	44	44
09/30/2008	0.91	16.96	12.4	**244.27**	48	48
10/31/2008	0.6	10.65	5.1	71.03	49	49
11/30/2008	0.33	6.32	1.87	33.14	21	21
12/31/2008	0.42	7.5	0.6	11.6	160	160
01/31/2009	0.44	9.37	0.57	11.49	46	46
02/28/2009	0.35	9.9	0.75	17.7	50	50
03/31/2009	0.28	5.45	0.61	14.69	2	20
04/30/2009	1.91	23.73	15.1	**206.3**	33	33
05/31/2009	0.56	10.49	0.89	19.48	47	47
06/30/2009	0.37	7.71	0.55	13.16	42	42
07/31/2009	0.35	6.87	0.46	10.7	39	39
08/31/2009	0.67	11.85	3.1	36.22	50	50
09/30/2009	0.69	12.19	4.1	59.77	23	23
10/31/2009	0.38	7.47	1.2	24.88	44	44
11/30/2009	0.36	6.89	0.88	18.94	45	45
12/31/2009	0.51	9.66	1.3	24.53	34	34
01/31/2010	4.49	55.06	69	**753.28**	6	6
02/28/2010	72	**1,125.60**	109	**2,269.90**	6.4	6.4
03/31/2010	0.71	12.15	1.7	24.63	9.1	9.1
04/30/2010	0.47	9.4	0.67	15.2	48	48
05/31/2010	0.62	12	1.4	34	52	52
06/30/2010	1.21	26	9	**194**	90	90
07/31/2010	0.66	13.42	0.87	19.47	79	79
08/31/2010	1.02	22	2.7	72	44	44
09/30/2010	13.36	**178**	62	**1,047**	37	37
10/31/2010	1.1	20.2	2.9	52.8	29	29
11/30/2010	1.01	20	1.8	37	75	75
12/31/2010	0.91	15.6	1.5	25.4	83	83
01/31/2011	1.2	22	4.5	96	57	57
02/28/2011	0.92	17	1.3	27	75	75
03/31/2011	1.59	28	8.8	93	114	114
04/30/2011	0.92	17	1.2	27	108	108
05/31/2011	0.62	12.2	0.83	18.1	109	109

Parameter & Limit / DMR Date	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
	30-Day Av		Daily Max		30-Day Av	Daily Max
	N/A, mg/L	Varies, lb/d	N/A, mg/L	Varies, lb/d	N/A, mg/L	N/A, mg/L
06/30/2011	0.52	11.1	0.63	15.27	141	141
07/31/2011	0.69	14.85	2.9	53.89	140	140
08/31/2011	0.72	15.6	1.2	28.93	85	85
09/30/2011	0.67	14.38	1.3	29.51	126	126
10/31/2011	0.51	10.57	0.88	15.76	71	71
11/30/2011	0.54	8.81	0.68	15.62	54	54
12/31/2011	0.8	13.28	1.3	23.89	92	92
01/31/2012	0.54	9	0.77	14	82	82
02/29/2012	0.5	10	0.87	14	70	70
03/31/2012	0.47	9	0.61	13	60	60
04/30/2012	0.46	9	0.64	14	102	102
05/31/2012	0.42	8	0.57	13	64	64
06/30/2012	0.49	8	0.88	15	54	54
07/31/2012	1.02	20	3.9	86	54	54
08/31/2012	0.47	6	0.91	15	59	59
09/30/2012	1.05	20	4.4	85	45	45
10/31/2012	1.94	29	9.1	**167**	49	49
11/30/2012	0.81	14	1.2	21	44	44
12/31/2012	1.08	19	2.9	47	19	19
01/31/2013	1.13	21	1.9	37	56	56
02/28/2013	1.05	18.89	1.5	27.82	40	40
03/31/2013	0.91	16	1.3	27	54	54
04/30/2013	0.94	14	1.5	28	74	74
05/31/2013	0.86	15	1.6	21	110	110
06/30/2013	0.88	16	1.5	23	43	43
07/31/2013	0.72	13	0.95	20	116	116
08/31/2013	0.67	13	0.93	17	112	112
09/30/2013	0.72	14	1.3	31	115	115
10/31/2013	0.8	14	1.4	22	140	140
11/30/2013	0.77	14	1.1	22	156	156
12/31/2013	1.12	19	2	33	159	159
01/31/2014	0.6	9.88	1.1	15.84	125	125
02/28/2014	1.3	18.6	2.8	40.24	129	129
03/31/2014	0.94	15.53	1.5	26.07	70	70
04/30/2014	0.9	14.64	1.2	20.94	61	61
05/31/2014	0.62	10.33	1.3	19	113	113
06/30/2014	0.52	9.9	0.8	17.81	92	92
07/31/2014	0.58	9.83	1.2	18.46	133	133
08/31/2014	0.74	13.41	1.3	23.71	94	94
09/30/2014	0.66	12	1.4	26	45	45
10/31/2014	0.72	13.23	1.2	27.09	121	121

Parameter & Limit / DMR Date	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
	30-Day Av		Daily Max		30-Day Av	Daily Max
	N/A, mg/L	Varies, lb/d	N/A, mg/L	Varies, lb/d	N/A, mg/L	N/A, mg/L
11/30/2014	0.77	13.88	0.99	18.05	135	135
12/31/2014	2.24	36.6	11.7	196.13	85	85
01/31/2015	0.86	15.66	1.2	22.72	100	100
02/28/2015	0.99	16.76	1.7	30.54	144	144
03/31/2015	1.04	19.78	1.7	33.38	85	85
04/30/2015	0.85	16.97	1.1	23.46	126	126
05/31/2015	0.84	15.47	1.3	23.51	129	129
06/30/2015	0.8	14.98	1.8	23.24	107	107
07/31/2015	1.18	22.74	2.1	42.61	135	135
08/31/2015	0.97	20.75	1.6	32.21	116	116
09/30/2015	0.77	15.67	1.3	23.15	84	84
10/31/2015	0.91	18.18	1.4	25.32	113	113
11/30/2015	0.57	11.47	0.85	19.4	71	71
12/31/2015	0.76	14.09	0.97	19.69	89	89
01/31/2016	1.02	19.59	1.5	30.31	73	73
02/29/2016	0.84	15.97	1.2	24.3	113	113
03/31/2016	0.7	13.42	1	20.38	112	112
04/30/2016	0.88	15.73	1.1	21.24	138	138
05/31/2016	0.83	14.84	1.2	19.04	121	121
06/30/2016	0.89	17.52	1.4	24.74	97	97
07/31/2016	1.06	20.94	1.3	29.39	72	72
08/31/2016	1.43	29.34	3.8	66.55	35	35
09/30/2016	0.92	19.91	1.1	26.94	69	69
10/31/2016	0.98	20.76	1.2	25.88	85	85
11/30/2016	0.99	21.8	1.4	30.62	54	54
12/31/2016	1.07	20	1.6	30	53	53
01/31/2017	1.25	25.14	1.8	36.79	94	94
02/28/2017	1.04	20.33	1.4	25.19	80	80
03/31/2017	0.94	19.79	1.2	24.84	87	87
04/30/2017	1.15	22.2	1.6	33.2	96	96
05/31/2017	1.42	28.86	1.8	38.27	96	96
06/30/2017	0.87	18.93	1.1	25.59	78	78
07/31/2017	0.87	17.53	1.2	22.27	119	119
08/31/2017	1.19	26.57	1.6	40.27	111	111
09/30/2017	1.23	27.88	1.6	38.34	99	99
10/31/2017	1.35	30	2	47	94	94
11/30/2017	0.95	20.38	1.2	24.04	113	113
12/31/2017	1.27	28	1.8	41	97	97
01/31/2018	1	22	1.2	29	84	84
02/28/2018	1.12	23.08	1.5	33.06	110	110
03/31/2018	1.06	22	1.4	29	118	118

Parameter & Limit / DMR Date	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
	30-Day Av		Daily Max		30-Day Av	Daily Max
	N/A, mg/L	Varies, lb/d	N/A, mg/L	Varies, lb/d	N/A, mg/L	N/A, mg/L
04/30/2018	1.51	30.91	2.3	54.36	72	72
05/31/2018	1.57	31.44	2.4	48.36	53	53
06/30/2018	1.13	22.47	1.5	32.69	57	57
07/31/2018	1.13	21	2.9	43.95	83	83
08/31/2018	17.4	**428.6**	82	**2,199.40**	18	18
09/30/2018	1.03	17.94	1.8	40.5	71	71
10/31/2018	0.99	22	1.5	33	109	109
11/30/2018	0.88	18	1.2	27	149	149
12/31/2018	0.72	14	1.6	31	103	103
01/31/2019	2.63	52	9.6	159	32	32
02/28/2019	2	44.5	4.2	99	59	59
03/31/2019	1.51	36.18	3.1	85.09	39	39
04/30/2019	1.68	33.81	2.6	48.03	29	29
05/31/2019	2.77	54.31	19	**317.2**	48	48
06/30/2019	0.62	12.72	0.73	17.1	39	39

Total Suspended Solids (TSS) and Whole Effluent Toxicity (WET)

Parameter & Limit / DMR Date	TSS				IC_{25} Chronic Chrceriodaphnia WET	IC_{25} Chronic Chrpimephales WET
	30-Day Av		Daily Max		Minimum	Minimum
	N/A, mg/L	1,100 lb/d	N/A, mg/L	2,200 lb/d	Varies, %	Varies, %
04/30/2000	8.9	152	16	281		
05/31/2000	5.4	95.6	12	174.1	43.9	100
06/30/2000	4.4	84	12	216	NODI 9	NODI 9
07/31/2000	4.1	72	9.2	184		
08/31/2000	5.6	110	8.8	161	90.2	100
09/30/2000	9.2	176	12	249	NODI 9	NODI 9
10/31/2000	10.1	194	15	294	85.1	100
11/30/2000	8	152	14	284		
12/31/2000	9.3	163	15	286	NODI 9	NODI 9
01/31/2001	13.5	242	23	470		
02/28/2001	10.3	185	14	298		
03/31/2001	12.5	225	59	1,168	63.8	100
04/30/2001	9.5	167	19	323		
05/31/2001	4.3	74	11	208	NODI 9	NODI 9
06/30/2001	3.6	67	6.8	143	82.1	100
07/31/2001	2.4	46	7.6	153		
08/31/2001	4.7	88	10	189	NODI 9	NODI 9
09/30/2001	7	124	12	219	71.9	100

Parameter & Limit / DMR Date	TSS				IC_{25} Chronic Chrceriodaphnia WET	IC_{25} Chronic Chrpimephales WET
	30-Day Av		Daily Max		Minimum	Minimum
	N/A, mg/L	1,100 lb/d	N/A, mg/L	2,200 lb/d	Varies, %	Varies, %
10/31/2001	9	168	14	299	NODI 9	NODI 9
11/30/2001	7.7	133	14	286		
12/31/2001	5.7	94	11	224	82	100
01/31/2002	17.9	292	40	668		
02/28/2002	11.4	188	19	318		
03/31/2002	6.4	116	13	244	74	100
04/30/2002	2.7	51	8	145		
05/31/2002	4.1	75	7.2	131	NODI 9	NODI 9
06/30/2002	5	89	9.2	179	69	100
07/31/2002	4.8	81	17	222		
08/31/2002	8.4	156	16	330	NODI 9	NODI 9
09/30/2002	12.8	205	24	443	73	100
10/31/2002	6.4	114	8.4	153	NODI 9	NODI 9
11/30/2002	8.1	144	14	276		
12/31/2002	6.4	105	10	196	74	100
01/31/2003	9	168	12	250		
02/28/2003	14.9	273	22	444		
03/31/2003	17.8	331	42	797	71	100
04/30/2003	6.6	123	11	207		
05/31/2003	5.3	101	9.2	187	NODI 9	NODI 9
06/30/2003	3.6	71	5.6	112	NODI 9	NODI 9
07/31/2003	3.4	65	5.6	121		
08/31/2003	3.6	67.3	22	427.3	88.2	100
09/30/2003	5.6	104	12	229	NODI 9	NODI 9
10/31/2003	3.8	75	7.2	161	NODI 9	NODI 9
11/30/2003	7.9	145	20	301		
12/31/2003	11.1	205	27	568	NODI 9	NODI 9
01/31/2004	18.6	317	52	726		
02/29/2004	7.6	142	16	305		
03/31/2004	10.8	202	16	344	NODI 9	NODI 9
04/30/2004	6	112	12	216		
05/31/2004	5.3	91	14	177	71.2	100
06/30/2004	10.5	194	27	499	NODI 9	NODI 9
07/31/2004	4.2	83	11	250		
08/31/2004	9	171	21	462	NODI 9	NODI 9
09/30/2004	11.8	230	32	617	NODI 9	NODI 9
10/31/2004	10.3	210	16	339	NODI 9	NODI 9
11/30/2004	7	141	21	420	70.4	100
12/31/2004	11.5	232	35	740	70.4	100
01/31/2005	31.1	549	54	1,074	NODI 9	NODI 9

Parameter & Limit / DMR Date	TSS				IC_{25} Chronic Chrceriodaphnia WET	IC_{25} Chronic Chrpimephales WET
	30-Day Av		Daily Max		Minimum	Minimum
	N/A, mg/L	1,100 lb/d	N/A, mg/L	2,200 lb/d	Varies, %	Varies, %
02/28/2005	4.8	137	17	359	70.4	100
03/31/2005	11.3	217	26	490	NODI 9	NODI 9
04/30/2005	11.8	225	28	506	NODI 9	NODI 9
05/31/2005	7.8	136	17	244	NODI 9	NODI 9
06/30/2005	6.8	127	12	236	NODI 9	NODI 9
07/31/2005	4.6	85	7.9	163	NODI 9	NODI 9
08/31/2005	6	113	13	253	89.2	100
09/30/2005	4.4	87	8.8	192	NODI 9	NODI 9
10/31/2005	3	58	5.6	109	NODI C	NODI C
11/30/2005	4.4	86	7.2	142	NODI 9	NODI 9
12/31/2005	5.5	98	8.4	169	NODI 9	NODI 9
01/31/2006	12.3	210	44	804	NODI 9	NODI 9
02/28/2006	10.9	204	29	567	NODI 9	NODI 9
03/31/2006	5.4	102	16	352	NODI 9	NODI 9
04/30/2006	3.4	65	6	125	NODI 9	NODI 9
05/31/2006	3.9	72	10	189	95.7	NODI 9
06/30/2006	5.3	103	10	203	NODI 9	NODI 9
07/31/2006	3.3	58	6.4	143	NODI 9	NODI 9
08/31/2006	3.7	74	7.6	158	NODI 9	NODI 9
09/30/2006	5	88	28	414	NODI 9	NODI 9
10/31/2006	5.8	109	12	249	NODI 9	NODI 9
11/30/2006	9.3	176	19	357	69.4	NODI 9
12/31/2006	11.1	194	33	672	NODI 9	NODI 9
01/31/2007	19.3	362	36	707	NODI 9	NODI 9
02/28/2007	15	264	22	450	73.7	NODI 9
03/31/2007	14	243	22	374	NODI 9	NODI 9
04/30/2007	25.1	437	36	669	NODI 9	NODI 9
05/31/2007	14.2	256	22	432	NODI 9	NODI 9
06/30/2007	11.3	227	15	321	NODI 9	NODI 9
07/31/2007	10.3	185	25	497	NODI 9	NODI 9
08/31/2007	23.2	410	40	737	67.4	100
09/30/2007	7.3	135	12	233	NODI 9	NODI 9
10/31/2007	13	248	19	390	NODI 9	NODI 9
11/30/2007	6.4	84	18	239	NODI 9	NODI 9
12/31/2007	5.8	80	10	139	NODI 9	NODI 9
01/31/2008	12.5	249	21	444	NODI 9	NODI 9
02/29/2008	15.9	275	34	437	NODI 9	NODI 9
03/31/2008	20.6	331	53	940	NODI 9	NODI 9
04/30/2008	13.9	247	27	532	NODI 9	NODI 9
05/31/2008	12.2	222	26	434	100	100

Parameter & Limit / DMR Date	TSS				IC_{25} Chronic Chrceriodaphnia WET	IC_{25} Chronic Chrpimephales WET
	30-Day Av		Daily Max		Minimum	Minimum
	N/A, mg/L	1,100 lb/d	N/A, mg/L	2,200 lb/d	Varies, %	Varies, %
06/30/2008	10.5	215	18	392	NODI 9	NODI 9
07/31/2008	13.1	278	21	501	NODI 9	NODI 9
08/31/2008	11.5	230	16	338	NODI 9	NODI 9
09/30/2008	12.4	237	23	453	NODI 9	NODI 9
10/31/2008	17.2	361	32	720	NODI 9	NODI 9
11/30/2008	14.4	278.2	20	453.4	78.3	100
12/31/2008	25	459	25	705	NODI 9	NODI 9
01/31/2009	22.9	491.6	33	758	NODI 9	NODI 9
02/28/2009	34.1	767	48	1,023	NODI 9	NODI 9
03/31/2009	24.6	490.2	42	895	NODI 9	NODI 9
04/30/2009	23.4	355	130	1,775.90	NODI 9	NODI 9
05/31/2009	21	402.3	56	1,225.50	NODI 9	NODI 9
06/30/2009	12.8	261.9	18	412.4	100	100
07/31/2009	11.2	226.7	21	499.1	NODI 9	NODI 9
08/31/2009	16	308.7	30	551.5	NODI 9	NODI 9
09/30/2009	12.3	232.9	23	373.1	NODI 9	NODI 9
10/31/2009	8.9	171.4	15	296.1	NODI 9	NODI 9
11/30/2009	6.8	122.9	15	184.3	100	100
12/31/2009	37.9	733.3	110	**2,453.10**	NODI 9	NODI 9
01/31/2010	30.8	544.5	73	1,414.90	NODI 9	NODI 9
02/28/2010	37.9	484.3	260	1,591.60	NODI 9	NODI 9
03/31/2010	39.3	670.8	80	1,345.70	NODI 9	NODI 9
04/30/2010	14.3	296	22	499	100	100
05/31/2010	30	601	48	1,233	NODI 9	NODI 9
06/30/2010	26	606	42	1,008	NODI 9	NODI 9
07/31/2010	13.42	503	48	1,018	NODI 9	NODI 9
08/31/2010	22	938	166	**3,215**	NODI 9	NODI 9
09/30/2010	74.7	**1,297**	196	**4,296**	NODI 9	NODI 9
10/31/2010	46	835	160	**2,710**	NODI 9	NODI 9
11/30/2010	30	602	48	1,057	100	95
12/31/2010	37	622	120	1,673	NODI 9	NODI 9
01/31/2011	48.5	859	81	1,359	NODI 9	NODI 9
02/28/2011	34	611	65	1,199	NODI 9	NODI 9
03/31/2011	37	696	75	1,503	NODI 9	NODI 9
04/30/2011	34	648	56	1,184	77.5	90
05/31/2011	20	400	28	662	NODI 9	NODI 9
06/30/2011	21	466	38	1,051	NODI 9	NODI 9
07/31/2011	25	552	40	1,074	NODI 9	NODI 9
08/31/2011	41.1	896.9	88	1,999.10	NODI 9	NODI 9
09/30/2011	37.8	800.4	62	1,327.10	88	100

Parameter & Limit / DMR Date	TSS				IC_{25} Chronic Chrceriodaphnia WET	IC_{25} Chronic Chrpimephales WET
	30-Day Av		Daily Max		Minimum	Minimum
	N/A, mg/L	1,100 lb/d	N/A, mg/L	2,200 lb/d	Varies, %	Varies, %
10/31/2011	24	521	48	876	NODI 9	NODI 9
11/30/2011	39	629	68	1,562	NODI 9	NODI 9
12/31/2011	62	1,041	130	**2,943**	NODI 9	NODI 9
01/31/2012	24	425	34	703	NODI 9	NODI 9
02/29/2012	26	449	56	721	NODI 9	NODI 9
03/31/2012	24	445	36	789	NODI 9	NODI 9
04/30/2012	21	423	48	1,151	79.6	100
05/31/2012	14	287	27	650	NODI 9	NODI 9
06/30/2012	9	166	25	491	NODI 9	NODI 9
07/31/2012	21	388	60	1,216	NODI 9	NODI 9
08/31/2012	12	162	20	384	NODI 9	NODI 9
09/30/2012	35	706	71	1,472	NODI 9	NODI 9
10/31/2012	49	719	80	1,690	NODI 9	NODI 9
11/30/2012	40	687	70	1,220	100	100
12/31/2012	35	629	84	1,895	NODI 9	NODI 9
01/31/2013	51	942	100	1,922	NODI 9	NODI 9
02/28/2013	37	673	72	1,370	NODI 9	NODI 9
03/31/2013	24	441	51	1,058	NODI 9	NODI 9
04/30/2013	28	434	72	1,333	NODI 9	NODI 9
05/31/2013	27	496	58	1,099	42.4	100
06/30/2013	33	586	91	1,541	NODI 9	NODI 9
07/31/2013	18	334	29	534	NODI 9	NODI 9
08/31/2013	19	361	50	604	NODI 9	NODI 9
09/30/2013	27	543	81	1,904	NODI 9	NODI 9
10/31/2013	40	696	88	1,391	62.6	100
11/30/2013	32	572	59	1,180	NODI 9	NODI 9
12/31/2013	51.5	847	89	1,570	NODI 9	NODI 9
01/31/2014	31	523	42	746	NODI 9	NODI 9
02/28/2014	61	971	130	2,065	NODI 9	NODI 9
03/31/2014	35	591	98	1,703	NODI 9	NODI 9
04/30/2014	31	502	52	799	100	100
05/31/2014	17	284	30	460	NODI 9	NODI 9
06/30/2014	18	335	24	525	NODI 9	NODI 9
07/31/2014	18	301	25	433	NODI 9	NODI 9
08/31/2014	22	400	49	894	NODI 9	NODI 9
09/30/2014	21	391	54	983	NODI 9	NODI 9
10/31/2014	24	453	46	1,039	100	100
11/30/2014	35	635	51	979	NODI 9	NODI 9
12/31/2014	47	808	70	1,146	NODI 9	NODI 9
01/31/2015	28	506	49	854	NODI 9	NODI 9

Parameter & Limit / DMR Date	TSS				IC_{25} Chronic Chrceriodaphnia WET	IC_{25} Chronic Chrpimephales WET
	30-Day Av		Daily Max		Minimum	Minimum
	N/A, mg/L	1,100 lb/d	N/A, mg/L	2,200 lb/d	Varies, %	Varies, %
02/28/2015	29	495	48	862	NODI 9	NODI 9
03/31/2015	31	585	60	1,264	NODI 9	NODI 9
04/30/2015	37	732	64	1,479	100	100
05/31/2015	22	423	36	784	NODI 9	NODI 9
06/30/2015	22	438	38	744	NODI 9	NODI 9
07/31/2015	32	649	84	1,704	NODI 9	NODI 9
08/31/2015	23	513	41	1,144	NODI 9	NODI 9
09/30/2015	24	513	50	1,245	NODI 9	NODI 9
10/31/2015	32	655	56	1,036	73.4	NODI Q
11/30/2015	23	478	34	814	NODI 9	NODI 9
12/31/2015	26	488	39	804	NODI 9	NODI 9
01/31/2016	35	681	74	1,495	NODI 9	NODI 9
02/29/2016	25	473	43	871	NODI 9	NODI 9
03/31/2016	18	334	39	819	NODI 9	NODI 9
04/30/2016	18	334	31	676	100	100
05/31/2016	16	292	32	650	NODI 9	NODI 9
06/30/2016	18	345	32	621	NODI 9	NODI 9
07/31/2016	24	493	41	845	NODI 9	NODI 9
08/31/2016	39	813	68	1,480	NODI 9	NODI 9
09/30/2016	35	766	54	1,500	NODI 9	NODI 9
10/31/2016	23	492	48	1,129	100	100
11/30/2016	40	870	76	1,790	NODI 9	NODI 9
12/31/2016	41	770	80	1,553	NODI 9	NODI 9
01/31/2017	41	814	79	1,615	NODI 9	NODI 9
02/28/2017	33	666	48	1,013	NODI 9	NODI 9
03/31/2017	25	527	37	839	NODI 9	NODI 9
04/30/2017	24	481	46	1,012	100	100
05/31/2017	32	678	50	1,229	NODI 9	NODI 9
06/30/2017	19	427	33	796	NODI 9	NODI 9
07/31/2017	22	459	34	831	NODI 9	NODI 9
08/31/2017	27	600	39	1,022	NODI 9	NODI 9
09/30/2017	24	543	34	779	NODI 9	NODI 9
10/31/2017	35	817	66	1,727	92.6	NODI Q
11/30/2017	27	584	39	931	NODI 9	NODI 9
12/31/2017	34	744	55	1,288	NODI 9	NODI 9
01/31/2018	27	601	40	1,017	NODI 9	NODI 9
02/28/2018	34	712	52	1,146	NODI 9	NODI 9
03/31/2018	28	577	45	990	NODI 9	NODI 9
04/30/2018	32	691	51	1,272	100	100
05/31/2018	30	624	49	1,180	NODI 9	NODI 9

Parameter & Limit / DMR Date	TSS				IC_{25} Chronic Chrceriodaphnia WET	IC_{25} Chronic Chrpimephales WET
	30-Day Av		Daily Max		Minimum	Minimum
	N/A, mg/L	1,100 lb/d	N/A, mg/L	2,200 lb/d	Varies, %	Varies, %
06/30/2018	37	811	60	1,566	NODI 9	NODI 9
07/31/2018	36	731	80	1,440	NODI 9	NODI 9
08/31/2018	36.1	741	120	**2,494**	NODI 9	NODI 9
09/30/2018	19	430	35	795	NODI 9	NODI 9
10/31/2018	14	313	54	1,239	100	100
11/30/2018	12	258	21	446	NODI 9	NODI 9
12/31/2018	13	276	28	549	NODI 9	NODI 9
01/31/2019	33	697	52	1,024	NODI 9	NODI 9
02/28/2019	52	**1,153**	310	**7,102**	NODI 9	NODI 9
03/31/2019	37	961	220	**6,038**	NODI 9	NODI 9
04/30/2019	23	464	38	700	**<36**	100
05/31/2019	27	598	73	1,951	>36	>36
06/30/2019	9	200	26	591	>36	NODI 9

ATTACHMENT 4

Reasonable Potential Analysis

4.1: Reasonable Potential Analysis Methods

The following reasonable potential analyses were completed to determine if parameters found in Smithfield Wastewater Treatment Plant's (WWTP's) effluent have reasonable potential to violate the South Dakota Surface Water Quality Standards (SDSWQS). SDDENR's reasonable potential analysis methodology is documented in *Reasonable Potential Implementation Procedure for SWD Permits* (2013).

As explained in SDDENR'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. For parameters that are allowed mixing, Smithfield WWTP's average design flow of 3.5 MGD (5.42 cfs) was used for the critical effluent flow (Q_e). The critical receiving stream flow (Q_u) of 5.49 cfs was estimated from 10% of the October 7Q5 flow at USGS gage 06482000, located approximately 7.9 miles upstream of Outfall 001 on the Big Sioux River (Attachment 5). As available, the upstream concentrations of the various parameters are the 80th percentiles of data from water quality monitoring site WQM 64, located approximately 0.7 miles upstream of Outfall 001 on the Big Sioux River (Attachment 7).

Critical Flows for Mixing	
Q_u, Big Sioux River (cfs)	5.49
Q_e, Smithfield WWTP Effluent (cfs)	5.42

For the conventional pollutants, reasonable potential values were calculated from the DMR data during the current permit cycle (Attachment 3) for each parameter with a South Dakota Surface Water Quality Standard (SDSWQS). Fecal coliform reasonable potential was not calculated, as the fecal coliform standards have been replaced with *Escherichia coli (E. coli)* standards; both *E. coli* and fecal coliform limits are included in the draft permit, as there is a fecal coliform technology-based effluent limit applicable to Smithfield WWTP.

The reasonable potential analyses are presented in the sections and tables below.

4.2: Conventional Pollutants Reasonable Potential Analysis

Table 1: Chronic Standards Reasonable Potential Analysis, Smithfield WWTP

Statistics	TSS	Ammonia	Nitrate
	mg/L	mg/L	mg/L
Number of Samples (n)	231	231	231
Mean	19.90	1.08	84.00
Variance	178.07	24.22	1137.64
Standard Deviation	13.34	4.92	33.73
Minimum	2.40	0.05	2.00
Maximum	74.70	72.00	160.00
Coefficient of Variation[1]	0.67	4.56	0.40
Multiplying factor [2]	0.70	0.36	0.80
Reasonable Potential Analysis			
80th Percentile Upstream Concentration [3]	96.40	0.12	1.80
Is Mixing Granted for Parameter? [3, 4]	Yes	Yes	No
Maximum Instream Concentration if mixing [4]	85.62	35.83	N/A
Highest RP Concentration [4]	59.95	12.84	127.62
SDSWQ Standard [5]	90.00	0.70	50.00
Is there RP to violate SDSWQ? [6]	No	**Yes**	**Yes**
Is the Highest RP > 50% of SDSWQS?	**Yes**	**Yes**	**Yes**
Current Chronic Limit	TBEL, lbs/d	TBEL, lbs/d	Monitor
Proposed Chronic Limit	TBEL, lbs/d	TBEL, lbs/d	50 mg/L
Current Monitoring Frequency	5 / week	3 / week	Monthly
Proposed Monitoring Frequency	5 / week	3 / week	**Weekly**

Critical Flows for Mixing [3]	
Q_u, Big Sioux River (cfs)	5.49
Q_e, Smithfield WWTP Effluent (cfs)	5.42

[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] Mixing zones are granted on a case-by-case and parameter-by-parameter basis for chronic limits. Mixing will not be allowed for nitrate. Mixing will be allowed for TSS and ammonia, taking into account the following: 10% of the Big Sioux River's October 7Q5 flow at USGS gage 06482000; the 80th percentile of data collected at the WQM Site 64; and the facility's average design flow for effluent.

[4] 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.

[5] The ammonia standard is based on the lowest 30-day average standard calculated (Attachment 5), 0.70 mg/L for the months of June and September.

[6] Pollutants measured at non-detect levels were assumed to be present at the level of detection.

Table 2: Acute Standards Reasonable Potential Analysis, Smithfield WWTP

Statistics	TSS	Ammonia	Nitrate	O&G	Temperature	TRC	DO	Min pH	Max pH
	mg/L	mg/L	mg/L	mg/L	°C	mg/L	mg/L	su	su
Number of Samples (n)	231	231	231	207	231	121	231	231	231
Mean	42.53	3.31	84.07	1.81	31.74	0.01	6.60	6.88	7.58
Variance	1594.61	122.47	1126.21	3.59	10.56	0.01	0.47	0.11	0.09
Standard Deviation	39.93	11.07	33.56	1.89	3.25	0.07	0.69	0.34	0.30
Minimum	5.60	0.09	6.00	0.00	24.00	0.00	5.10	4.56	7.00
Maximum	310.00	109.00	160.00	17.00	38.00	0.73	8.28	7.64	8.40
Coefficient of Variation [1]	0.94	3.34	0.40	1.05	0.10	5.99	0.10	0.05	0.04
Multiplying factor [2]	0.63	0.40	0.80	0.63	0.94	0.54	0.94	0.97	0.98
Reasonable Potential									
Highest RP Concentration [3, 4]	194.73	43.25	127.78	10.66	35.80	0.39	5.42	4.69	8.21
SDSWQ Standard [5]	158.00	2.80	88.00	10.00	32.20	0.019	5.00	6.50	9.00
Is there RP to violate SDSWQS? [6]	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	No	**Yes**	No
Is the Highest [4] RP > 50% of SDSWQS?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	N/A	N/A
Current Acute Limit	TBEL, lb/d	TBEL, lb/d	Monitor	10.00	Monitor	0.019	5.00	6.50	9.00
Proposed Acute Limit	TBEL, lb/d	TBEL, lb/d	88.00	10.00	Monitor	0.019	5.00	6.50	9.00
Current Monitoring Frequency	5 / week	3 / week	Monthly	Weekly	5 / week	Daily	5 / week	Daily	Daily
Proposed Monitoring Frequency	5 / week	3 / week	**Weekly**	Weekly	**Daily**	Daily	5 / week	Daily	Daily

[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 pH and 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 pH and DO are the lowest RP. For DO, is the SDSWQ > 50% of Lowest RP?

[5] The ammonia standard is based on the lowest daily maximum standard calculated (Attachment 5), 2.80 mg/L for the month of November.

[6] Pollutants measured at non-detect levels were assumed to be present at the level of detection, except for Total Recoverable Chlorine (TRC), for which zero was assumed.

4.3: Reasonable Potential Analysis Conclusions

For conventional pollutants in Smithfield WWTP's effluent, there is reasonable potential to violate the SDSWQS for 30-day average and daily maximum ammonia, 30-day average and daily maximum nitrate, daily maximum oil and grease, daily maximum temperature, daily maximum total recoverable chlorine (TRC), and daily minimum pH. Also, the highest reasonable potential concentrations are within 50% of the SDSWQS for daily minimum dissolved oxygen (DO), and 30-day average TSS. The current permit's limits and monitoring frequencies for TRC, DO, pH, and oil and grease are protective of the SDSWQS, and are recommended for the draft permit. The updated permit limits and monitoring frequencies developed for the draft permit for ammonia, nitrate, and TSS are protective of the SDSWQS.

For daily maximum temperature, daily monitoring without a limit is recommended based on the lack of a significant observable temperature change in the Big Sioux River downstream of Outfall 001, as shown in the instream monitoring data statistics from WQM 64 above Smithfield WWTP, and WQM BS29 below Smithfield WWTP (Attachment 7). The 80th percentile temperature change from WQM 64 to WQM BS29 ranges from a 1.87 °F decrease in April, to a 2.68 °F increase in January. This range is below the SDSWQS of +/-5 °F for temperature change in warmwater semipermanent fish life propagation waters (SDSWQS 74:51:01:31). The effluent likely cools between the facility's on-site sampling location and Outfall 001, and mixes instantaneously with the receiving waters below Outfall 001. A daily maximum temperature limit is not recommended; however increasing monitoring frequency from 5 days per week to daily is recommended and proposed in the draft permit.

Table 3: Instream Temperature Monitoring, Big Sioux River

	WQM 64 Temperature, 80th Percentile		WQM BS29 Temperature, 80th Percentile		Change in Temperature, WQM BS29 – WQM 64	
Month	**(°C)**	**(°F)**	**(°C)**	**(°F)**	**(°C)**	**(°F)**
January	1.33	34.40	2.82	37.08	1.49	2.68
February	1.75	35.15	3.11	37.60	1.36	2.45
March	7.24	45.03	7.61	45.70	0.37	0.67
April	16.40	61.52	15.36	59.65	-1.04	-1.87
May	19.00	66.20	19.82	67.68	0.82	1.48
June	25.00	77.00	25.76	78.37	0.76	1.37
July	28.82	83.88	29.65	85.37	0.83	1.49
August	27.20	80.96	27.87	82.16	0.67	1.20
September	22.00	71.60	23.00	73.40	1.00	1.80
October	14.00	57.20	14.60	58.28	0.60	1.08
November	7.92	46.26	8.00	46.40	0.08	0.14
December	2.80	37.04	3.00	37.40	0.20	0.36
Annual	22.78	73.00	23.00	73.40	0.22	0.40

ATTACHMENT 5

Ammonia Limits Development
for the Smithfield Wastewater Treatment Plant
and Sioux Falls Water Reclamation Facility

in the Big Sioux River
near
Sioux Falls, South Dakota

Prepared by

South Dakota Department of Environment and Natural Resources

2019

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 Environment 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 Environment 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 Smithfield Wastewater Treatment Plant (WWTP) and the city of Sioux Falls Water Reclamation Facility (WRF) together, due to the proximity of the facilities' outfalls. These limits will ensure the surface water quality standards for the Big Sioux River near Sioux Falls are maintained and protected.

The city of Brandon's Wastewater Treatment Facility (WWTF), located downstream of Sioux Falls WRF, had been a seasonal discharger to the Big Sioux River prior to regionalization with the city of Sioux Falls. The city of Brandon's WWTF has not discharged since May 2017, and the stabilization pond facility has been decommissioned and converted to a 12-acre equalization basin for emergency storage. Ammonia limits are not needed for the city of Brandon's WWTF.

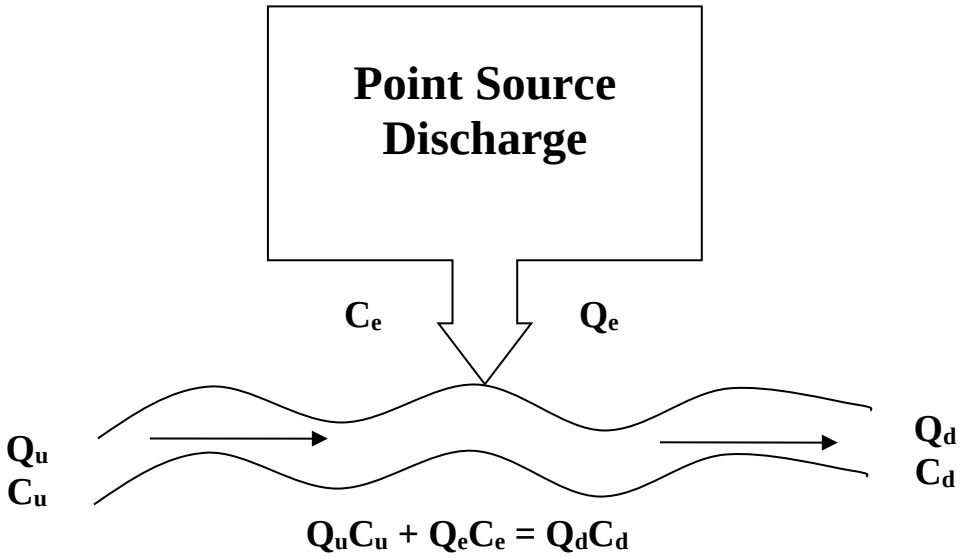
Developing the ammonia limits for Smithfield WWTP and Sioux Falls WRF is a matter of determining the maximum level of ammonia that can be present in the Big Sioux River without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) for ammonia to be exceeded.

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;
- the presence or absence of salmonids; and
- the presence or absence of early life stages of aquatic life.

The following mass balance equation will be used to develop the ammonia limits for Smithfield WWTP and Sioux Falls WRF:

Figure 1



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.

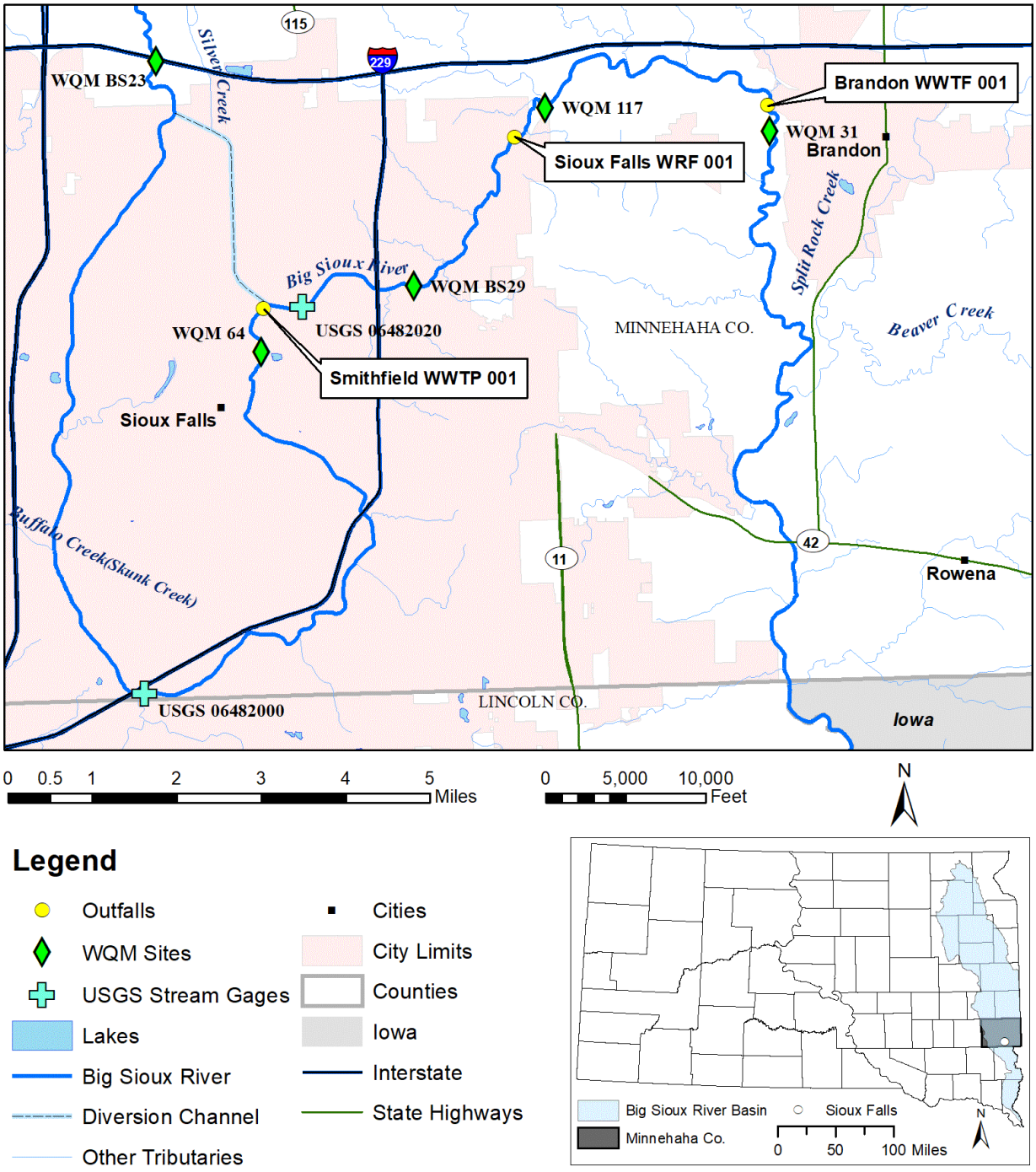
Using the mass balance equation and the following information, the water quality-based effluent limits for ammonia can be developed for Smithfield WWTP's and Sioux Falls WRF's discharge to the Big Sioux River.

In addition to the mass balance equation, water quality modeling using the program QUAL2Kw was conducted to support water-quality based effluent limits development for ammonia, five-day biochemical oxygen demand (BOD_5), and dissolved oxygen (DO). Attachment 6 includes the QUAL2Kw modeling simulations and documentation.

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 Sioux Falls.

Figure 2: The Big Sioux River near Sioux Falls, SD



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 can 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 Smithfield WWTP's and Sioux Falls WRF's discharge to 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 at Smithfield WWTP:

(1) Domestic water supply waters;
(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.

Approximately 150 yards downstream below Smithfield WWTP's discharge outfall, and at Sioux Falls WRF, 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.

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.

The presence or absence of early life stages (ELS) can be assumed based on the beneficial uses assigned to the receiving stream. Early life stages are expected to be present from March 1 to October 31 based on the SDSWQS (ARSD Section 74:51:01:48).

Allowable Instream Ammonia Levels

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):

Equation 1: Daily Maximum (Salmonids present)

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

Equation 2: Daily Maximum (Salmonids NOT present)

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

Equation 3: 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: 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 Smithfield WWTP and Sioux Falls WRF, equations 2, 3, and 4 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 current permits contain seasonal limits; for the draft permits, monthly limits will be developed.

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 determine the effectiveness of controls on point and nonpoint sources of pollution; and to evaluate the appropriateness of current beneficial use designations.

Water quality samples are collected at WQM stations on the Big Sioux River near Smithfield WWTP and Sioux Falls WRF. Descriptions of the stations are listed below. Figure 2 denotes the locations of the WQM stations.

WQM 64 Big Sioux River at East Falls Park Drive and North Weber Avenue, located 0.7 miles (3,478 feet) above Smithfield WWTP (Latitude 43.559361°, Longitude -96.721111°).

WQM BS23 Big Sioux River at I-90 and North Ditch Road, located above the split between the historic and diversion channels, representing diversion channel

water quality as it re-enters the Big Sioux River at 28 feet below Smithfield WWTP (Latitude 43.609722°, Longitude -96.744166°).

WQM BS29 Big Sioux River at North Bahnson Avenue, located 2.1 miles (10,942 feet) below Smithfield WWTP and 2.6 miles (13,574 feet) above Sioux Falls WRF (Latitude 43.569934°, Longitude -96.684715°).

WQM 117 Big Sioux River at North Timberline Road, located 0.6 miles (3,268 feet) below Sioux Falls WRF (Latitude 43.599880°, Longitude -96.652501°).

WQM 31 Big Sioux River near Brandon at West Holly Boulevard, located 4.7 miles below Sioux Falls WRF (Latitude 43.594722°, Longitude -96.599722°).

Ambient water temperature, pH, and ammonia data from these WQM sites were obtained to represent instream conditions. Data from WQM 64 represent headwater conditions above Smithfield WWTP. Data from WQM BS29 represent headwater conditions above Sioux Falls WRF and mixing zone conditions below Smithfield WWTP. Data from WQM 117 represent mixing zone conditions below Sioux Falls WRF. Data from WQM 31 represent water quality far below Sioux Falls WRF at Brandon, South Dakota. Data from WQM BS23 represent the Big Sioux River diversion channel water quality, which re-enters the historic channel downstream of Smithfield WWTP.

Attachment 7 includes the water quality statistics from data obtained from these sites. Data from WQM sites 64 and BS29 were used to develop the surface water quality standards for the ammonia water quality based effluent limits. Data from all five sites were used in water quality modeling and water-quality based effluent limits development with QUAL2Kw, as documented in Attachment 6.

Calculation of Allowable Instream Ammonia Concentration (C_d)

The SDSWQS specify the total ammonia concentration that is allowed at a given pH and temperature (see ammonia criteria Equations 1-4 above, or ARSD Chapter 74:51:01 Appendix A). The monthly 80th percentiles of the pH and temperature data from WQM 64, WQM BS29, and WQM 31 were calculated to ensure that ammonia standards are maintained during critical conditions. These values were used to calculate the allowable instream ammonia concentrations for each month at each location. The tables below summarize the monthly allowable instream ammonia concentrations (C_d) for the Big Sioux River at Smithfield WWTP (Table 1, WQM 64) and Sioux Falls WRF (Table 2, WQM BS29). The C_d values below Sioux Falls WRF at North Timberline Road (Table 3, WQM 117) and Brandon (Table 4, WQM 31) are included here for the QUAL2Kw modeling presented in Attachment 6.

Table 1: Allowable Instream Total Ammonia Concentrations (C_d) for the Big Sioux River at WQM 64 above Smithfield WWTP

WQM 64				
Season	**Temperature (°C)**	**pH (su)**	**C_d, Allowable Total Ammonia (mg/L)**	
			30-Day Average	**Daily Maximum**
January 1 – 31	1.33	8.30	2.47	4.71
February 1 – 29	1.75	8.25	2.70	5.24

WQM 64				
Season	Temperature (°C)	pH (su)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
March 1 – 31 (ELS)	7.24	8.42	1.25	3.74
April 1 – 30 (ELS)	16.40	8.50	0.96	3.20
May 1 – 31 (ELS)	19.00	8.40	0.97	3.88
June 1 – 30 (ELS)	25.00	8.36	0.70	4.16
July 1 – 31 (ELS)	28.82	8.50	0.43	3.18
August 1 – 31 (ELS)	27.20	8.52	0.47	3.11
September 1 – 30 (ELS)	22.00	8.48	0.70	3.35
October 1 – 31 (ELS)	14.00	8.57	0.97	2.80
November 1 – 30	7.92	8.33	2.22	4.45
December 1 – 31	2.80	8.30	2.47	4.71

Table 2: Allowable Instream Total Ammonia Concentrations (C_d) for the Big Sioux River at WQM BS29 above Sioux Falls WRF

WQM BS29				
Season	Temperature (°C)	pH (su)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January 1 – 31	2.82	8.30	2.47	4.71
February 1 – 29	3.11	8.21	2.86	5.60
March 1 – 31 (ELS)	7.61	8.40	1.29	3.88
April 1 – 30 (ELS)	15.36	8.45	1.13	3.55
May 1 – 31 (ELS)	19.82	8.50	0.78	3.22
June 1 – 30 (ELS)	25.76	8.31	0.72	4.61
July 1 – 31 (ELS)	29.65	8.50	0.41	3.20
August 1 – 31 (ELS)	27.87	8.56	0.42	2.86
September 1 – 30 (ELS)	23.00	8.60	0.53	2.65
October 1 – 31 (ELS)	14.60	8.60	0.91	2.65
November 1 – 30	8.00	8.48	1.72	3.34
December 1 – 31	3.00	8.30	2.47	4.71

Table 3: Allowable Instream Total Ammonia Concentrations (C_d) for the Big Sioux River at WQM 117 below Sioux Falls WRF at North Timberline Road

WQM 117				
Season	Temperature (°C)	pH (su)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January 1 – 31	3.72	8.10	3.41	6.95
February 1 – 29	3.00	8.10	3.41	6.95
March 1 – 31 (ELS)	7.44	8.40	1.29	3.88
April 1 – 30 (ELS)	15.91	8.50	1.00	3.20
May 1 – 31 (ELS)	19.00	8.46	0.87	3.46

WQM 117				
Season	Temperature (°C)	pH (su)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
June 1 – 30 (ELS)	25.54	8.42	0.61	3.71
July 1 – 31 (ELS)	29.00	8.50	0.43	3.20
August 1 – 31 (ELS)	27.13	8.57	0.43	2.82
September 1 – 30 (ELS)	23.00	8.60	0.53	2.65
October 1 – 31 (ELS)	15.36	8.53	0.99	3.05
November 1 – 30	9.90	8.50	1.47	3.20
December 1 – 31	3.73	8.30	2.47	4.71

Table 4: Allowable Instream Total Ammonia Concentrations (C_d) for the Big Sioux River at WQM 31 below Sioux Falls WRF at Brandon, SD

WQM 31				
Season	Temperature (°C)	pH (su)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January 1 – 31	3.00	8.20	2.93	5.77
February 1 – 29	2.56	8.22	2.80	5.47
March 1 – 31 (ELS)	6.92	8.39	1.31	3.94
April 1 – 30 (ELS)	15.52	8.48	1.06	3.33
May 1 – 31 (ELS)	18.00	8.40	1.03	3.88
June 1 – 30 (ELS)	25.76	8.45	0.58	3.54
July 1 – 31 (ELS)	29.00	8.66	0.32	2.35
August 1 – 31 (ELS)	28.00	8.80	0.28	1.84
September 1 – 30 (ELS)	24.00	8.65	0.46	2.43
October 1 – 31 (ELS)	16.00	8.59	0.85	2.69
November 1 – 30	8.88	8.60	1.32	2.65
December 1 – 31	3.00	8.30	2.47	4.71

AMBIENT AMMONIA CONCENTRATION (C_u)

The ammonia data from WQM 64 and BS29 were reviewed to determine the ambient water quality in the Big Sioux River near Smithfield WWTP and Sioux Falls WRF. The monthly 80th percentiles of the ammonia data were calculated to ensure the ammonia standards are maintained during critical conditions. The tables below summarize the 80th percentiles of ambient ammonia data for each month, representing the ambient ammonia concentration (C_u) for the Big Sioux River at Smithfield WWTP (Table 5, WQM 64) and Sioux Falls WRF (Table 6, WQM BS29).

Table 5: Ambient Ammonia Concentrations (C_u) for the Big Sioux River at WQM 64 above Smithfield WWTP

WQM 64	
Season	**C_u, Instream Ammonia (mg/L)**
January 1 – 31	0.29
February 1 – 29	0.40
March 1 – 31 (ELS)	0.73
April 1 – 30 (ELS)	0.05
May 1 – 31 (ELS)	0.05
June 1 – 30 (ELS)	0.08
July 1 – 31 (ELS)	0.05
August 1 – 31 (ELS)	0.05
September 1 – 30 (ELS)	0.05
October 1 – 31 (ELS)	0.05
November 1 – 30	0.08
December 1 – 31	0.12

Table 6: Ambient Ammonia Concentrations (C_u) for the Big Sioux River at WQM BS29 above Sioux Falls WRF

WQM BS29	
Season	**C_u, Instream Ammonia (mg/L)**
January 1 – 31	0.25
February 1 – 29	0.55
March 1 – 31 (ELS)	0.54
April 1 – 30 (ELS)	0.08
May 1 – 31 (ELS)	0.05
June 1 – 30 (ELS)	0.08
July 1 – 31 (ELS)	0.05
August 1 – 31 (ELS)	0.05
September 1 – 30 (ELS)	0.05
October 1 – 31 (ELS)	0.05
November 1 – 30	0.05
December 1 – 31	0.05

EFFLUENT DISCHARGE FLOW RATE (Q_e)

The effluent discharge flow rate (Q_e) can be determined in several different ways. If effluent data are available for the discharger, the 50^{th} or 80^{th} 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.

Smithfield WWTP and Sioux Falls WRF are continuous dischargers with effluent flow rates that vary throughout the year. To represent the current hydraulic treatment capacity of each facility, average design flow was used to develop the monthly ammonia limits. The average design flow for Smithfield WWTP is 3.5 MGD (5.42 cfs), and for Sioux Falls WRF is 21.0 MGD (32.49 cfs). This method will ensure that the in-stream ammonia standards (C_d) are maintained during critical conditions at the end of the mixing zones at each discharge location.

The tables below summarize the effluent flow rates used in these ammonia limits calculations for Smithfield WWTP (Table 7) and Sioux Falls WRF (Table 8).

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,* SDDENR 1998.

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 monthly 7Q5 flows were calculated using data retrieved from the USGS gaging stations 06482000 and 06482020, and a Log Pearson type III statistical analysis. The Log Pearson type III statistical analyses for each gaging station were conducted using USGS SWToolbox, a stream flow analysis tool. Gaging station data were downloaded through SWToolbox. Statistical and analytical methods are documented in the program's user's manual, *SWToolbox: A Surface-Water Toolbox for Statistical Analysis of Streamflow Time Series* (USGS, 2018). Descriptions of the stream gaging stations are listed below, and Figure 2 denotes their locations.

06482000 Big Sioux River at Sioux Falls, SD near West 57th Street and South Old Yankton Road, located 7.9 miles (41,724 feet) above Smithfield WWTP (Latitude 43.501111°, Longitude -96.748056°).

06482020 Big Sioux River at North Cliff Avenue at Sioux Falls, SD, located 0.5 miles (2,569 feet) below Smithfield WWTP and 4.2 miles (22,098 feet) above Sioux Falls WRF (Latitude 43.567028°, Longitude -96.771000°).

South Dakota's water quality standards allow a zone of mixing for discharges. The regulatory mixing zone is 2,500 feet. In accordance with the SDSWQS and the *South Dakota Mixing Zone and Dilution Implementation Procedures*, both the chronic and acute water quality criteria for ammonia 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, including 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 values are adjusted to account for the allowable ratio of flow available in the receiving stream. For stream segments where the effluent and stream flow are not fully mixed by the end of the regulatory mixing zone of 2,500 feet, partial mixing is allowed as follows:

- 10% of 7Q5 flow for a Q_e:7Q5 ratio less than 0.10;
- 25% of 7Q5 for a Q_e:7Q5 ratio of 0.10 to up to less than 0.25;
- 50% for a Q_e:7Q5 ratio of 0.25 to up to less than 0.50; and
- 100% for a Q_e:7Q5 ratio of 0.50 and greater (complete mixing).

These adjusted flows represent the allowable critical receiving stream low flow rates (Q_u) above the discharge locations. The tables below summarize the stream flows and effluent flows used in these ammonia limits calculations for Smithfield WWTP (Table 7) and Sioux Falls WRF (Table 8). The USGS SWToolbox analyses for both stream gaging stations are included in Attachment 8.

Table 7: Critical Low Flow Values (Q_u) for the Big Sioux River at USGS 06482000 above Smithfield WWTP

USGS 06482000 and Smithfield WWTP					
Season	**7Q5 Low Flow (cfs)**	**Q_e, Critical Effluent Flow (cfs)**	**Ratio of Q_e to 7Q5**	**Allowable Ratio of 7Q5 for Mixing**	**Q_u, Critical Low Flow (cfs)**
January 1 – 31	13.81	5.42	0.39	0.50	6.90
February 1 – 29	12.40	5.42	0.44	0.50	6.20
March 1 – 31 (ELS)	18.68	5.42	0.29	0.50	9.34
April 1 – 30 (ELS)	77.70	5.42	0.07	0.10	7.77
May 1 – 31 (ELS)	110.20	5.42	0.05	0.10	11.02
June 1 – 30 (ELS)	134.26	5.42	0.04	0.10	13.43
July 1 – 31 (ELS)	50.87	5.42	0.11	0.25	12.72
August 1 – 31 (ELS)	56.78	5.42	0.10	0.10	5.68
September 1 – 30 (ELS)	39.56	5.42	0.14	0.25	9.89
October 1 – 31 (ELS)	54.91	5.42	0.10	0.10	5.49
November 1 – 30	45.35	5.42	0.12	0.25	11.34
December 1 – 31	23.92	5.42	0.23	0.25	5.98

Table 8: Critical Low Flow Values (Q_u) for the Big Sioux River at USGS 06482020 above Sioux Falls WRF

USGS 06482020 and Sioux Falls WRF					
Season	**7Q5 Low Flow (cfs)**	**Q_e, Critical Effluent Flow (cfs)**	**Ratio of Q_e to 7Q5**	**Allowable Ratio of 7Q5 for Mixing**	**Q_u, Critical Low Flow (cfs)**
January 1 – 31	55.38	32.49	0.59	1.00	55.38
February 1 – 29	48.83	32.49	0.67	1.00	48.83
March 1 – 31 (ELS)	70.72	32.49	0.46	0.50	35.36
April 1 – 30 (ELS)	475.53	32.49	0.07	0.10	47.55
May 1 – 31 (ELS)	479.33	32.49	0.07	0.10	47.93
June 1 – 30 (ELS)	439.71	32.49	0.07	0.10	43.97
July 1 – 31 (ELS)	112.09	32.49	0.29	0.50	56.05
August 1 – 31 (ELS)	101.78	32.49	0.32	0.50	50.89
September 1 – 30 (ELS)	82.47	32.49	0.39	0.50	41.23
October 1 – 31 (ELS)	104.16	32.49	0.31	0.50	52.08
November 1 – 30	132.27	32.49	0.25	0.25	33.07
December 1 – 31	88.49	32.49	0.37	0.50	44.25

DOWNSTREAM FLOW RATE (Q_d)

The downstream flow rate, Q_d, is the sum of the critical upstream low flow rate (Q_u) and the effluent flow rate (Q_e). The tables below summarize the downstream flow rates used for the ammonia limits calculations for Smithfield WWTP's (Table 9) and Sioux Falls WRF's (Table 10) discharges to the Big Sioux River.

CALCULATION OF AMMONIA LIMIT (C_e)

The ammonia limits in the current permits for Smithfield WWTP and Sioux Falls WRF were developed by assigning seasonal wasteload allocations using the methodology in *Total Maximum Daily Load for Ammonia and Dissolved Oxygen in the Big Sioux River near Sioux Falls, South Dakota* (SDDENR 1999). SDDENR currently develops water quality based effluent limits based on the mass balance of the system, taking into account the critical effluent flow, critical receiving stream flow, and the ammonia criteria calculated for the receiving stream's seasonal pH and temperature.

Each of the variables determined above is summarized below for Smithfield WWTP (Table 9) and Sioux Falls WRF (Table 10). Using the mass balance equation, the ammonia limits (C_e) for Smithfield WWTP's and Sioux Falls WRF's discharges to the Big Sioux River can be calculated as follows:

Equation 5: Preliminary Ammonia Limit Calculation (not accounting for nitrification in the mixing zone)

Mass Balance: $$Q_u C_u + Q_e C_e = Q_d C_d$$

Preliminary Effluent Limit: $$C_e = \frac{Q_d C_d - Q_u C_u}{Q_e}$$

The preliminary effluent limits are included below for Smithfield WWTP (Table 9) and Sioux Falls WRF (Table 10). The preliminary limits do not account for instream ammonia reduction due to nitrification as modeled in QUAL2Kw (Attachment 6), technology based effluent limits (TBELs) for Smithfield WWTP (Attachment 10, Smithfield WWTP's Statement of Basis), or more stringent limits in the current permits.

Table 9: Variables for QUAL2Kw Critical Conditions Modeling of Equation 5 for Smithfield WWTP

Smithfield WWTP								
Season	**C_u (mg/L)**	**C_d (mg/L)**		**Preliminary C_e (mg/L)**		**Q_u (cfs)**	**Q_e (cfs)**	**Q_d (cfs)**
		30-day Av.	**Daily Max.**	**30-day Av.**	**Daily Max.**			
January 1 – 31	0.29	2.47	4.71	5.26	10.36	6.90	5.42	12.32
February 1 – 29	0.40	2.70	5.24	5.34	10.77	6.20	5.42	11.61
March 1 – 31 (ELS)	0.73	1.25	3.74	2.14	8.92	9.34	5.42	14.76
April 1 – 30 (ELS)	0.05	0.96	3.20	2.28	7.73	7.77	5.42	13.19
May 1 – 31 (ELS)	0.05	0.97	3.88	2.83	11.68	11.02	5.42	16.44
June 1 – 30 (ELS)	0.08	0.70	4.16	2.22	14.28	13.43	5.42	18.84
July 1 – 31 (ELS)	0.05	0.43	3.18	1.32	10.53	12.72	5.42	18.13
August 1 – 31 (ELS)	0.05	0.47	3.11	0.91	6.31	5.68	5.42	11.09
September 1 – 30 (ELS)	0.05	0.70	3.35	1.89	9.39	9.89	5.42	15.31
October 1 – 31 (ELS)	0.05	0.97	2.80	1.90	5.60	5.49	5.42	10.91
November 1 – 30	0.08	2.22	4.45	6.69	13.59	11.34	5.42	16.75
December 1 – 31	0.12	2.47	4.71	5.07	9.78	5.98	5.42	11.40

Table 10: Variables and Preliminary Effluent Limits for QUAL2Kw Critical Conditions Modeling of Equation 5 for Sioux Falls WRF

Sioux Falls WRF								
Season	**C_u (mg/L)**	**C_d (mg/L)**		**Preliminary C_e (mg/L)**		**Q_u (cfs)**	**Q_e (cfs)**	**Q_d (cfs)**
		30-day Av.	**Daily Max.**	**30-day Av.**	**Daily Max.**			
January 1 – 31	0.25	2.47	4.71	6.27	12.32	55.38	32.49	87.87
February 1 – 29	0.55	2.86	5.60	6.32	13.18	48.83	32.49	81.32
March 1 – 31 (ELS)	0.54	1.29	3.88	2.10	7.52	35.36	32.49	67.85
April 1 – 30 (ELS)	0.08	1.13	3.55	2.67	8.63	47.55	32.49	80.05
May 1 – 31 (ELS)	0.05	0.78	3.22	1.85	7.88	47.93	32.49	80.43
June 1 – 30 (ELS)	0.08	0.72	4.61	1.59	10.73	43.97	32.49	76.47
July 1 – 31 (ELS)	0.05	0.41	3.20	1.03	8.64	56.05	32.49	88.54
August 1 – 31 (ELS)	0.05	0.42	2.86	0.99	7.26	50.89	32.49	83.38
September 1 – 30 (ELS)	0.05	0.53	2.65	1.14	5.95	41.23	32.49	73.73
October 1 – 31 (ELS)	0.05	0.91	2.65	2.30	6.82	52.08	32.49	84.57
November 1 – 30	0.05	1.72	3.34	3.42	6.69	33.07	32.49	65.56
December 1 – 31	0.05	2.47	4.71	5.78	11.07	44.25	32.49	76.74

To account for instream nitrification of ammonia between the discharge location and end of the mixing zone (2,500 feet downstream), instream water quality under critical conditions was modeled using QUAL2Kw, as documented in Attachment 6. Based on these simulations, a QUAL2Kw ammonia value (C_n) of 0.00 to 0.50 mg/L was determined to be added to the mass balance equation to account for the decrease of ammonia due to nitrification in the mixing zone. The QUAL2Kw ammonia values are summarized below for Smithfield WWTP (Table 11) and Sioux Falls WRF (Table 12). For months with more stringent effluent limits due to a TBEL or current permit's water-quality based effluent limit (WQBEL), effluent ammonia concentrations were not eligible for a QUAL2Kw ammonia value as indicated in the tables by "0 (N/A)". Equation 6 will be used to develop the final ammonia limits in the draft permit.

Equation 6: Modeled Ammonia Limit Calculation (accounting for nitrification in the mixing zone)

$$C_e = \frac{Q_d C_d - Q_u C_u}{Q_e} + C_n$$

Table 11: QUAL2Kw Ammonia Values (C_n) for Smithfield WWTP

Smithfield WWTP		
Season	**C_n, QUAL2Kw Ammonia Value (mg/L)**	
	30-Day Average	**Daily Maximum**
January 1 – 31	0 (N/A)	0 (N/A)
February 1 – 29	0 (N/A)	0 (N/A)
March 1 – 31 (ELS)	0.35	0 (N/A)
April 1 – 30 (ELS)	0.50	0 (N/A)
May 1 – 31 (ELS)	0.00	0 (N/A)
June 1 – 30 (ELS)	0.08	0 (N/A)
July 1 – 31 (ELS)	0.50	0 (N/A)
August 1 – 31 (ELS)	0.35	0 (N/A)
September 1 – 30 (ELS)	0.20	0 (N/A)
October 1 – 31 (ELS)	0.20	0 (N/A)
November 1 – 30	0 (N/A)	0 (N/A)
December 1 – 31	0 (N/A)	0 (N/A)

Table 12: QUAL2Kw Ammonia Values (C_n) for Sioux Falls WRF

Sioux Falls WRF		
Season	**C_n, QUAL2Kw Ammonia Value (mg/L)**	
	30-Day Average	**Daily Maximum**
January 1 – 31	0 (N/A)	0 (N/A)
February 1 – 29	0 (N/A)	0 (N/A)
March 1 – 31 (ELS)	0.20	0 (N/A)
April 1 – 30 (ELS)	0 (N/A)	0 (N/A)

Sioux Falls WRF		
Season	C_n, QUAL2Kw Ammonia Value (mg/L)	
	30-Day Average	Daily Maximum
May 1 – 31 (ELS)	0.15	0 (N/A)
June 1 – 30 (ELS)	0.41	0 (N/A)
July 1 – 31 (ELS)	0.30	0 (N/A)
August 1 – 31 (ELS)	0.35	0 (N/A)
September 1 – 30 (ELS)	0.05	0 (N/A)
October 1 – 31 (ELS)	0.10	0 (N/A)
November 1 – 30	0.00	0.00
December 1 – 31	0 (N/A)	0 (N/A)

The tables below compare the current and proposed ammonia effluent limits for Smithfield WWTP (Tables 13-14) and Sioux Falls WRF (Table 15). For Smithfield WWTP, both the mass-based effluent limits and equivalent effluent concentrations are included for comparison to confirm that the WQBELs proposed in this draft permit are at least as stringent as those in the current permit to avoid limit backsliding. See Equations 7 and 8 for the concentration-based and mass-based limits conversions.

Equation 7: Concentration (mg/L) to Mass Loading (lb/d) Limit Conversion

$$\text{Mass Limit (lb/d)} = \text{Concentration Limit (mg/L)} \times \text{Effluent Flow (cfs)} \times 5.3934 \text{ (conversion factor)}$$

Equation 8: Mass Loading (lb/d) to Concentration (mg/L) Limit Conversion

$$\text{Concentration Limit (mg/L)} = \frac{\text{Mass Limit (lb/d)}}{\text{Effluent Flow (cfs)} \times 5.3934 \text{ (conversion factor)}}$$

Table 13: Comparison of Current and Proposed 30-Day Average Ammonia Effluent Limits for Smithfield WWTP

Smithfield WWTP				
Season	30-Day Average			
	Current Permit		Draft Permit	
	Current Limit	Equivalent Conc.	Proposed Limit	C_e, Equivalent Conc.
	lb/d	mg/L [1]	lb/d	mg/L [2]
January 1 – 31	163	6.5	**117**	4.0*
February 1 – 29	163	6.5	**117**	4.0*
March 1 – 31 (ELS)	163	6.5	**73**	2.5
April 1 – 30 (ELS)	70	2.8	**81**	2.8
May 1 – 31 (ELS)	70	2.8	**82**	2.8
June 1 – 30 (ELS)	58	2.3	**67**	2.3
July 1 – 31 (ELS)	58	2.3	**53**	1.8

Smithfield WWTP				
Season	30-Day Average			
	Current Permit		Draft Permit	
	Current Limit	Equivalent Conc.	Proposed Limit	C_e, Equivalent Conc.
	lb/d	mg/L [1]	lb/d	mg/L [2]
August 1 – 31 (ELS)	58	2.3	**37**	1.3
September 1 – 30 (ELS)	75	3.0	**61**	2.1
October 1 – 31 (ELS)	75	3.0	**61**	2.1
November 1 – 30	163	6.5	**117**	4.0*
December 1 – 31	163	6.5	**117**	4.0*

[1] The equivalent concentrations were calculated based on the current permit's design flow of 3.0 MGD (4.64 cfs).

[2] To avoid backsliding, the equivalent concentrations of the proposed mass-based effluent limits must be at least as stringent as the current permit mass-based effluent limits' equivalent concentrations. The equivalent concentrations were calculated based on Smithfield's design flow of 3.5 MGD (5.41 cfs).

* Smithfield WWTP's has an applicable concentration-based TBEL of 4.0 mg/L for 30-day average ammonia. See Attachment 10 of Smithfield's Statement of Basis for TBEL development.

Table 14: Comparison of Current and Proposed Daily Maximum Ammonia Effluent Limits for Smithfield WWTP

Smithfield WWTP				
Season	Daily Maximum			
	Current Permit		Draft Permit	
	Current Limit	Equivalent Conc.	Proposed Limit	C_e, Equivalent Conc.
	lb/d	mg/L [1]	lb/d	mg/L [2]
January 1 – 31	285	11.4	**234**	8.0*
February 1 – 29	285	11.4	**234**	8.0*
March 1 – 31 (ELS)	285	11.4	**234**	8.0*
April 1 – 30 (ELS)	123	4.9	**143**	4.9
May 1 – 31 (ELS)	123	4.9	**143**	4.9
June 1 – 30 (ELS)	101	4.0	**117**	4.0
July 1 – 31 (ELS)	101	4.0	**117**	4.0
August 1 – 31 (ELS)	101	4.0	**117**	4.0
September 1 – 30 (ELS)	131	5.3	**155**	5.3
October 1 – 31 (ELS)	131	5.3	**155**	5.3
November 1 – 30	285	11.4	**234**	8.0*
December 1 – 31	285	11.4	**234**	8.0*

[1] The equivalent concentrations were calculated based on the current permit's design flow of 3.0 MGD (4.64 cfs).

[2] To avoid backsliding, the equivalent concentrations of the proposed mass-based effluent limits must be at least as stringent as the current permit mass-based effluent limits' equivalent concentrations. The equivalent concentrations were calculated based on Smithfield's design flow of 3.5 MGD (5.41 cfs).

[*] Smithfield WWTP's has an applicable concentration-based TBEL of 8.0 mg/L for daily maximum ammonia. See Attachment 10 of Smithfield's Statement of Basis for TBEL development.

Table 15: Comparison of Current and Proposed Ammonia Effluent Limits for Sioux Falls WRF

Sioux Falls WRF				
Season	**30-Day Average**		**Daily Maximum**	
	Current Limit	**C_e, Proposed Limit**	**Current Limit**	**C_e, Proposed Limit**
	mg/L	**mg/L**	**mg/L**	**mg/L**
January 1 – 31	4.3	**4.3**	7.5	**7.5**
February 1 – 29	4.3	**4.3**	7.5	**7.5**
March 1 – 31 (ELS)	4.3	**2.3**	7.5	**7.5**
April 1 – 30 (ELS)	2.0	**2.0**	3.5	**3.5**
May 1 – 31 (ELS)	2.0	**2.0**	3.5	**3.5**
June 1 – 30 (ELS)	2.0	**2.0**	3.5	**3.5**
July 1 – 31 (ELS)	2.0	**1.3**	3.5	**3.5**
August 1 – 31 (ELS)	2.0	**1.3**	3.5	**3.5**
September 1 – 30 (ELS)	2.7	**1.2**	4.7	**4.7**
October 1 – 31 (ELS)	2.7	**2.4**	4.7	**4.7**
November 1 – 30	4.3	**3.4**	7.5	**6.7**
December 1 – 31	4.3	**4.3**	7.5	**7.5**

ATTACHMENT 6

QUAL2Kw Modeling for Ammonia-Nitrogen, Five-Day Biochemical Oxygen Demand (BOD_5), and Dissolved Oxygen (DO) Limits Development for the Smithfield Wastewater Treatment Plant and the Sioux Falls Water Reclamation Facility

6.1 Introduction

QUAL2Kw is a one-dimensional, steady state water quality model that can simulate point and non-point pollutant loadings in streams. The heat budget and water-quality kinetics are calculated on a diel time scale over the modeled stream reaches, so the water quality effects can be modeled as a function of downstream distance and as a function of the time of day at a given distance.

QUAL2Kw is supported by the Washington State Department of Ecology, and is available for download at http://www.ecy.wa.gov/programs/eap/models.html. For more information about using QUAL2Kw, refer to *QUAL2Kw Theory and Documentation (Version 6): A modeling framework for simulating river and stream water quality* (Pelletier and Chapra, Washington State Department of Ecology, DRAFT 2/13/2019) and *QUAL2Kw user manual (version 5.1): A modeling framework for simulating river and stream water quality* (Pelletier and Chapra, Washington State Department of Ecology, July 2008).

The purpose of incorporating QUAL2Kw into this report is to model the water quality interactions between the Big Sioux River and discharging wastewater treatment facilities (Smithfield WWTP and city of Sioux Falls WRF), in order to determine if the receiving stream's water quality standards for Ammonia-Nitrogen and Dissolved Oxygen (DO) will be met under critical streamflow conditions with the proposed effluent limits. The model will be calibrated for low streamflow conditions using the available in-stream water quality data and effluent monitoring data. Using the calibrated models, critical effluent and receiving stream conditions will be simulated.

This modeling study ties together many parts of the draft Statements of Basis for Smithfield WWTP and Sioux Falls WRF. The proposed effluent limits and explanations are listed in the *Effluent Limits* section, and the methodology to develop the ammonia-nitrogen criteria and limits is detailed in Attachment 5. Also see Attachment 5 for a study area map with the receiving stream, outfall, USGS gages, and water quality monitoring site locations. Attachment 7 includes Big Sioux River water quality data statistics from the study area, and Attachment 8 includes the Big Sioux River's monthly 7Q5 low streamflows. Attachment 9 includes monthly effluent monitoring data statistics.

6.2 Data Availability

Effluent Data

The Smithfield WWTP and Sioux Falls WRF provided daily effluent monitoring data for several parameters for use in model calibration, as presented in the tables in this attachment. All monitoring data required by the current permits are reported in monthly DMRs; their statistics (Attachment 9) were used for critical conditions simulations for effluent limits development. The effluent data sets used in this modeling study were narrowed to the current permit's effective date to present: April 1, 2000 to June 31, 2019 for Smithfield WWTP; and July 1, 2000 to June 31, 2019 for Sioux Falls WRF.

Outfall locations and descriptions are listed below for Smithfield WWTP, Sioux Falls WRF, and the city of Brandon's wastewater treatment facility (WWTF). Smithfield WWTP and Sioux Falls WRF discharge continuously to the Big Sioux River. Brandon WWTF had been a seasonal discharger to the Big Sioux River prior to regionalization with the city of Sioux Falls. Brandon WWTF has not discharged since May 2017, and the stabilization pond facility has been decommissioned and converted to a 12-acre equalization basin for emergency storage. Brandon WWTF discharge data were not needed for these modeling simulations.

Smithfield WWTP Outfall 001 – Any discharge from the discharge structure located north of the wastewater treatment plant to the Big Sioux River (Latitude 43.566679°, Longitude -96.720198°).

Sioux Falls WRF Outfall 001 – Any discharge from the discharge structure located east of the water reclamation facility to the Big Sioux River (Latitude 43.595106°, Longitude -96.660041°).

Brandon WRF Outfall 001 – Any discharge from the discharge structure located at the southwest corner of Cell 3 to the Big Sioux River (Latitude 43.595106°, Longitude -96.660041°.) *This wastewater treatment facility has been decommissioned and converted to a one-cell equalization basin. No discharge is permitted from the equalization basin to the Big Sioux River.*

Instream Water Quality Data

Ambient instream water quality in the Big Sioux River near the Smithfield WWTP and Sioux Falls WRF is monitored monthly at WQM 64, WQM BS23, WQM BS29, WQM 117, and WQM 31 (Attachment 7). For this study, the receiving stream's water quality monitoring data were limited from January 1, 1990 to December 31, 2018 to represent recent instream conditions.

Data from WQM 64 represent headwater conditions above Smithfield WWTP. Data from WQM BS29 represent headwater conditions above Sioux Falls WRF and mixing zone conditions below Smithfield WWTP. Data from WQM 117 represent mixing zone conditions below Sioux Falls WRF. Data from WQM 31 represent water quality far below Sioux Falls WRF at Brandon, South Dakota. Data from WQM BS23 represent the Big Sioux River diversion channel water quality, which re-enters the historic channel downstream of Smithfield WWTP.

WQM 64 Big Sioux River at East Falls Park Drive and North Weber Avenue, located 0.7 miles (3,478 feet) above Smithfield WWTP (Latitude 43.559361°, Longitude -96.721111°).

WQM BS23 Big Sioux River at I-90 and North Ditch Road, located above the split between the historic and diversion channels, representing diversion channel water quality as it re-enters the Big Sioux River at 28 feet below Smithfield WWTP (Latitude 43.609722°, Longitude -96.744166°).

WQM BS29 Big Sioux River at North Bahnson Avenue, located 2.1 miles (10,942 feet) below Smithfield WWTP and 2.6 miles (13,574 feet) above Sioux Falls WRF (Latitude 43.569934°, Longitude -96.684715°).

WQM 117 Big Sioux River at North Timberline Road, located 0.6 miles (3,268 feet) below Sioux Falls WRF (Latitude 43.599880°, Longitude -96.652501°).

WQM 31 Big Sioux River near Brandon at West Holly Boulevard, located 4.7 miles below Sioux Falls WRF (Latitude 43.594722°, Longitude -96.599722°).

Streamflow Data

Streamflow in the Big Sioux River is measured daily near the Smithfield WWTP and Sioux Falls WRF at USGS gages 06482000 and 06482020 (Attachment 8). The receiving stream's streamflow monitoring data were limited from January 1, 2005 to December 31, 2018 based on gage data availability and to represent recent instream conditions.

Data from USGS gage 06482000 represent streamflow in the historic channel upstream of Smithfield WWTP. Data from USGS gage 06482020 represent the streamflow upstream of Sioux Falls WRF, which is the combination of historic channel flow, diversion channel flow, and Smithfield WWTP's effluent flow.

06482000 Big Sioux River at Sioux Falls, SD near West 57th Street and South Old Yankton Road, located 7.9 miles (41,724 feet) above Smithfield WWTP (Latitude 43.501111°, Longitude -96.748056°).

06482020 Big Sioux River at North Cliff Avenue at Sioux Falls, SD, located 0.5 miles (2,569 feet) below Smithfield WWTP and 4.2 miles (22,098 feet) above Sioux Falls WRF (Latitude 43.567028°, Longitude -96.771000°).

Streamflow in the diversion channel can be estimated by subtracting Smithfield WWTP's effluent flow and the USGS 06482000 gage's historic channel flow from the USGS 06482020 gage's combined flow. Based on stream characteristics, the diversion channel flow water quality will be mixed in diffusively with the historic channel over a 1 mile distance, from approximately 0.2 miles below the end of Smithfield WWTP's mixing zone to 0.6 miles above WQM BS29.

The Big Sioux River's stream characteristics such as width and slope were estimated from satellite imagery and 5-meter Interferometric Synthetic Aperture Radar Digital Elevation Model (IFSAR DEM). Widths ranged from approximately 82 to 216 feet; widths were reduced to 33 feet to reflect channel and mixing hydraulics from the headwaters to below Smithfield WWTP's mixing zone, and the full stream widths were used elsewhere. Slopes ranged from approximately 3.2×10^{-4} to 6.4×10^{-4}. The Manning Roughness Coefficient was estimated as 0.03 based on the channel characteristics. Shade was estimated as 10% from satellite imagery.

Atmospheric Data

The National Oceanic and Atmospheric Administration (NOAA) has determined monthly climate normals from 1981-2010, available at http://www.ncdc.noaa.gov/cdo-web/datatools/normals; monthly average air temperature values from the Sioux Falls Foss Field monitoring site were used in this study. Monthly average wind speed and cloud cover were obtained from https://weatherspark.com/y/9059/Average-Weather-in-Sioux-Falls-South-Dakota-United-States-

Year-Round from a 1980-2016 dataset. Monthly average dew point temperatures were obtained from CustomWeather via https://www.timeanddate.com/weather/usa/sioux-falls/climate from 1985-2015 weather reports. Daily temperature, dew point, wind speed, and cloud cover values were determined from https://www.wunderground.com/weather/us/sd/sioux-falls/57103 for each seasonal calibration date.

6.3 Model Calibration

The seasonal limits in Smithfield WWTP's and Sioux Falls WRF's current permits are divided into Winter (November 1 – March 31); Spring (April 1 – May 31); Summer (June 1 – August 31); and Fall (September 1 – October 31). A model calibration date for each season was selected based on instream and effluent monitoring data availability. There were no recent dates with all the required in-stream monitoring and point source discharger data available for the entire stream study area, from above Smithfield WWTP to below Sioux Falls WRF. Therefore, the seasonal models were calibrated for the stream reaches where data were available. Model rates and constants were calibrated at Smithfield WWTP for the spring season, and at Sioux Falls WRF for the summer, fall, and winter seasons.

For the spring calibration model at Smithfield WWTP, the headwaters are set at WQM 64, located 0.7 miles above Smithfield WWTP's outfall. The model extends 4 miles downstream to 2.3 miles below the end of Smithfield WWTP's mixing zone.

For the summer, fall, and winter calibration models at Sioux Falls WRF, the headwaters are set at WQM BS29, located 2.1 miles below Smithfield WWTP's outfall and 2.6 miles above Sioux Falls WRF's outfall. The model extends 5.7 miles downstream to 2.6 miles below the end of Sioux Falls WRF's mixing zone.

Calibration Flows

The full USGS gage, diversion channel, and effluent flows for each calibration date (Table 1) and *South Dakota's Mixing Zone and Dilution Implementation Procedures* (SDDENR 1998) were used to calculate the allowable stream flows for mixing in the calibration models (Table 2). The full effluent flows for Smithfield WWTP's Outfall 001 and Sioux Falls WRF's Outfall 001 were used in the calibration simulations.

Table 1: Full Stream, Diversion Channel, and Effluent Flows

Season	Date	Receiving Stream Flow (cfs)		Diversion Channel (DC) Flow (cfs)	Effluent Flow (Q_e) (cfs)	
		USGS 06482000	USGS 06482020		Smithfield Outfall 001	Sioux Falls Outfall 001
Spring	04/16/2015	190		67.30 *	3.70	
Summer	07/18/2017		503			27.22
Fall	10/23/2017		1,260			26.27
Winter	12/12/2017		483			23.24

* Q_{DC} (67.30 cfs) = USGS 06482020 (261 cfs) - USGS 06482000 (190 cfs) - Smithfield 001 (3.70 cfs)

Table 2: Stream and Diversion Channel Flows for Mixing

Season	Date	Ratio of Q_e to USGS or DC Flows		Allowable Ratio of USGS or DC for mixing		Allowable Flows for Mixing, USGS (Q_u) or DC (Q_{DC})	
		Q_e:USGS	Q_e:DC	USGS	DC	Q_u (cfs)	Q_{DC} (cfs)
Spring	04/16/2015	0.02	0.05	0.10	0.10	19.00	6.73
Summer	07/18/2017	0.05		0.10		50.30	
Fall	10/23/2017	0.02		0.10		126.00	
Winter	12/12/2017	0.05		0.10		48.30	

Calibration Water Quality

As available, the water quality data for the in-stream WQM stations and effluent discharge were used for model calibration; exceptions are shaded. For parameters measured as non-detect (ND) or present below quantification level (PBQL), the SD State Health Laboratory's detection limits were used. For parameters that were not measured on the calibration date, the monthly average values were used from the WQM site or DMR. For the summer calibration, the Sioux Falls WRF's effluent fecal coliform was measured as 9 #/100 mL; the translated *E. coli* value of 5.80 #/100 mL was used, as calculated using Equation 1. For total phosphorus, values were used or estimated from the Sioux Falls WRF's 2017 annual pretreatment report; phosphorous monitoring was unavailable for Smithfield WWTP. Where $CBOD_5$ monitoring was unavailable, BOD_5 values were used for Fast $CBOD_5$. Water quality input data for seasonal calibration are listed in Tables 3-6 below.

Equation 1: Fecal Coliform to *E. coli* Translator

$$[E.coli, \#/100\text{mL}] = e^{-0.536 + 1.0436 * \ln[\text{Fecal Coliform},\#/100\text{mL}]}$$

Table 3: Spring Calibration Water Quality (04/16/2015)

Parameter	*Headwater*	*Effluent*	*Diversion Channel*	*Downstream*
	WQM 64	**Smithfield 001**	**WQM BS23**	**WQM BS29**
Temperature, °C	14	31.5	13	15
Conductivity, µmhos/cm	1150.29	--	872.2	963.11
TSS, mg/L	57	30.0	54	71
DO, mg/L	11.9	7.02	9.0	14.9
Fast $CBOD_5$, mg/L	10	19.0	4.83	10
Ammonia, mg/L	0.05	0.80	0.05	0.05
Nitrate, mg/L	0.2	126	0.2	1.9
Total P, mg/L	0.201	--	0.219	0.843
E. coli, #/100 mL	--	--	--	--
Alkalinity, mg/L	200	--	181	194
pH, su	8.4	6.78	8.5	8.4

Table 4: Summer Calibration Water Quality (07/18/2017)

Parameter	*Headwater*	*Effluent*	*Downstream*
	WQM BS29	**Sioux Falls 001**	**WQM 117**
Temperature, °C	28	21.1	27
Conductivity, µmhos/cm	743	--	838
TSS, mg/L	72	1.3	74
DO, mg/L	14.0	9.7	15.7
Fast $CBOD_5$, mg/L	10	1.8	16
Ammonia, mg/L	0.05	0.21	0.05
Nitrate, mg/L	1.2	33.9	2.7
Total P, mg/L	0.664	4.170	0.744
E. coli, #/100 mL	5,170	5.80	5,170
Alkalinity, mg/L	238.50	--	238.78
pH, su	9.0	7.04	8.9

Table 5: Fall Calibration Water Quality (10/23/2017)

Parameter	*Headwater*	*Effluent*	*Downstream*
	WQM BS29	**Sioux Falls 001**	**WQM 117**
Temperature, °C	12	19	12
Conductivity, µmhos/cm	1,110	--	1,111
TSS, mg/L	92	2.5	85
DO, mg/L	10.7	9.21	9.6
Fast $CBOD_5$, mg/L	2	4.8	2
Ammonia, mg/L	0.05	0.12	0.05
Nitrate, mg/L	3.2	35.4	3.9
Total P, mg/L	0.358	4.480	0.433
E. coli, #/100 mL	--	--	--
Alkalinity, mg/L	248.40	--	236.00
pH, su	8.3	7.4	8.3

Table 6: Winter Calibration Water Quality (12/12/2017)

Parameter	*Headwater*	*Effluent*	*Downstream*
	WQM BS29	**Sioux Falls 001**	**WQM 117**
Temperature, °C	1	11	1
Conductivity, µmhos/cm	1,263	--	1,265
TSS, mg/L	8	1.3	9
DO, mg/L	18.0	10.11	16.8
Fast $CBOD_5$, mg/L	2	2.5	2
Ammonia, mg/L	0.05	0.06	0.05
Nitrate, mg/L	5.7	38.0	7.4
Total P, mg/L	0.470	4.480	0.704
E. coli, #/100 mL	--	--	--
Alkalinity, mg/L	324.45	--	311.09
pH, su	8.3	7.3	8.3

Calibration Atmospheric Information

The following atmospheric values were used for model calibration (Table 7).

Table 7: Atmospheric Data

Season	Date	Air Temp. (°C)	Dew Point Temp. (°C)	Wind Speed (m/s)	Cloud Cover (%)
Spring	04/16/2015	15.56	8.33	5.36	60%
Summer	07/18/2017	25.56	20.00	7.15	50%
Fall	10/23/2017	10.56	2.22	16.09	60%
Winter	12/12/2017	-2.78	-6.11	5.81	40%

Calibration Summary

The model variables that affect dissolved oxygen, biochemical oxygen demand, and ammonia were varied to calibrate the modeled water quality to the observed water quality for each of the seasons. Dissolved oxygen was modeled using the Owen-Gibbs method with a temperature correction factor of 1.024. Fast $CBOD_5$ was modeled using hydrolysis rates of 0.05 to 1.75 day^{-1} with a temperature correction factor of 1.02. Ammonia was modeled using nitrification rates of 1.5 to 5 day^{-1} with a temperature correction factor of 1.02. Bottom algae coverage as modeled to affect ammonia nitrification was estimated at 0 to 2% based on these calibration simulations. The model rates and variables developed from these seasonal calibrations will be used in the monthly critical conditions simulations (Table 8).

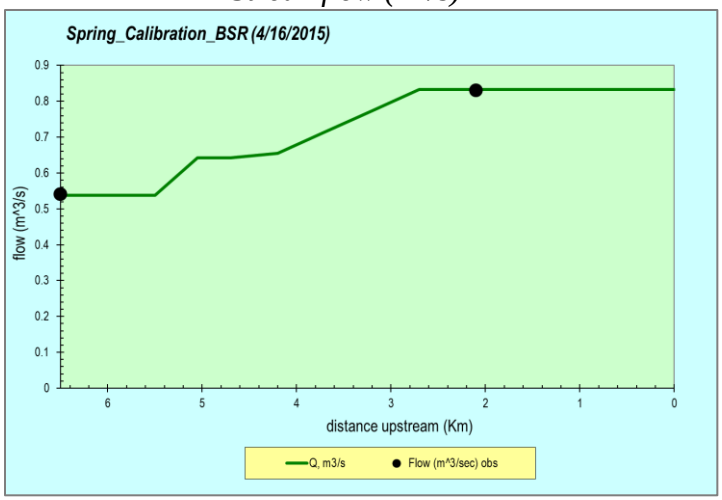
Table 8: Model Rates for Seasonal Calibrations

Season	Dissolved Oxygen		Fast $CBOD_5$		Ammonia		Bottom Algae Coverage (%)
	Method	Temp. Corr. Factor	Hydrol. Rate (day^{-1})	Temp. Corr. Factor	Nitr. Rate (day^{-1})	Temp. Corr. Factor	
Spring	Owens-Gibbs	1.024	0.05	1.02	3.0	1.02	1%
Summer	Owens-Gibbs	1.024	0.10	1.02	5.0	1.02	2%
Fall	Owens-Gibbs	1.024	1.75	1.02	2.0	1.02	0%
Winter	Owens-Gibbs	1.024	0.5	1.02	1.5	1.02	0%

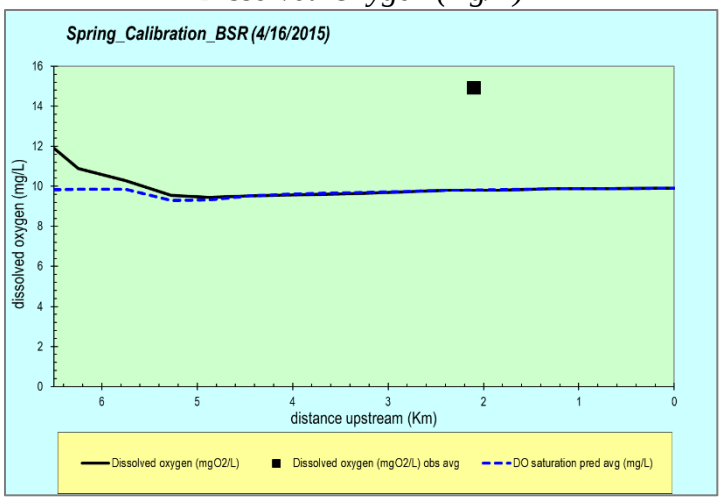
The seasonal calibration results for instream flow, dissolved oxygen, fast $CBOD_5$ ammonia, temperature, and pH are presented below. Downstream water quality observed at WQM BS29 (spring) or WQM 117 (summer, fall, winter) are plotted on the results charts below.

Spring Season Calibration

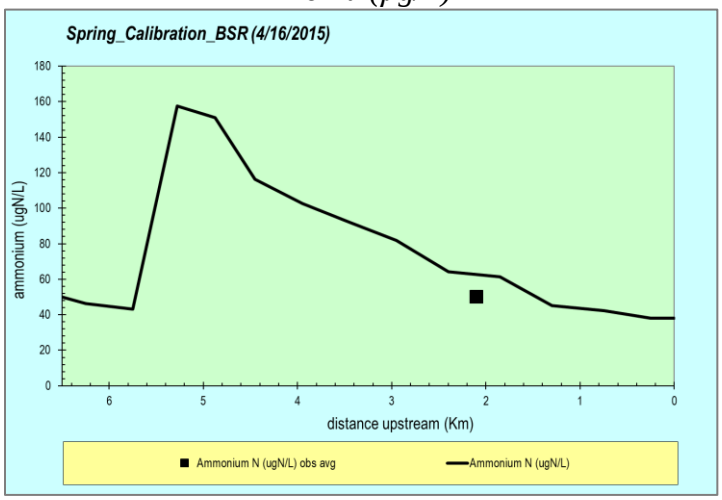
Streamflow (m^3/s)



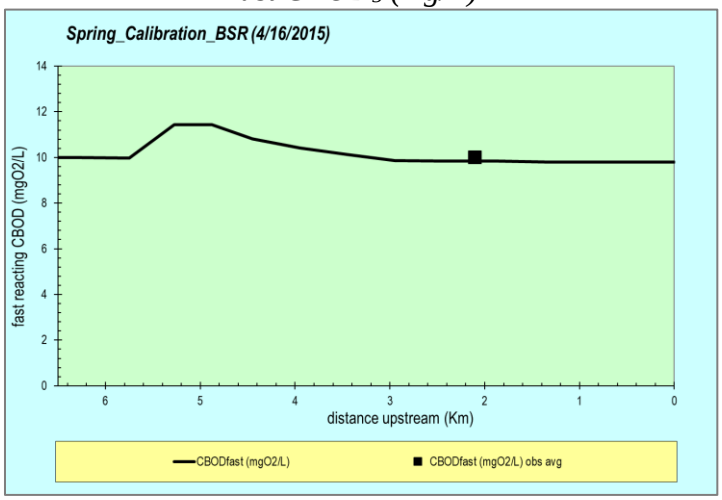
Dissolved Oxygen (mg/L)



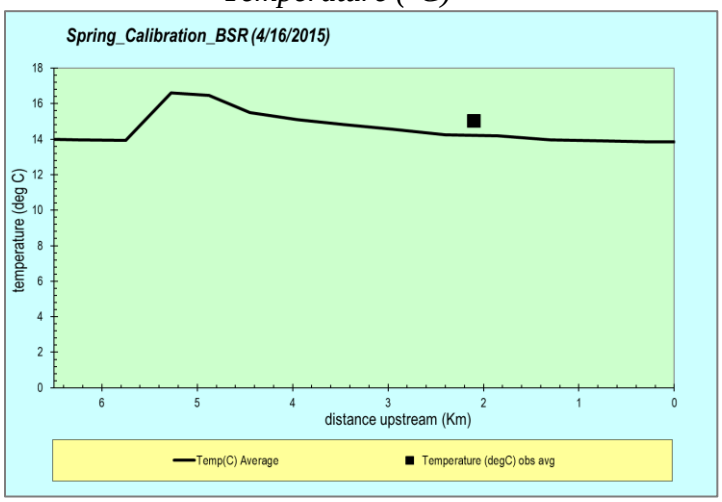
Ammonia (µg/L)



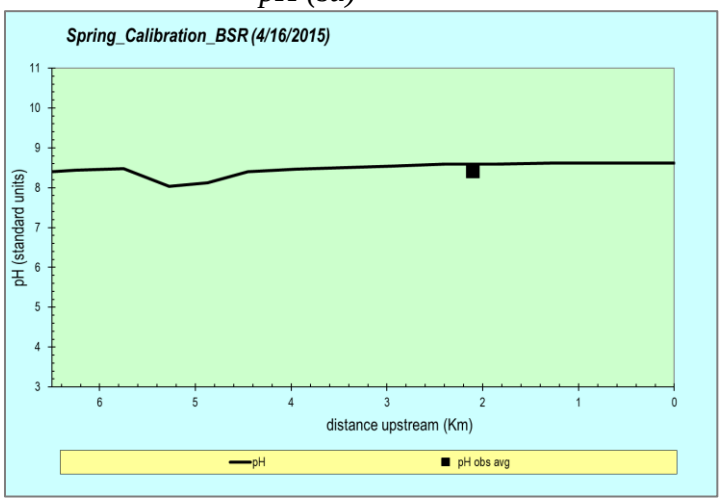
Fast $CBOD_5$ (mg/L)



Temperature (°C)

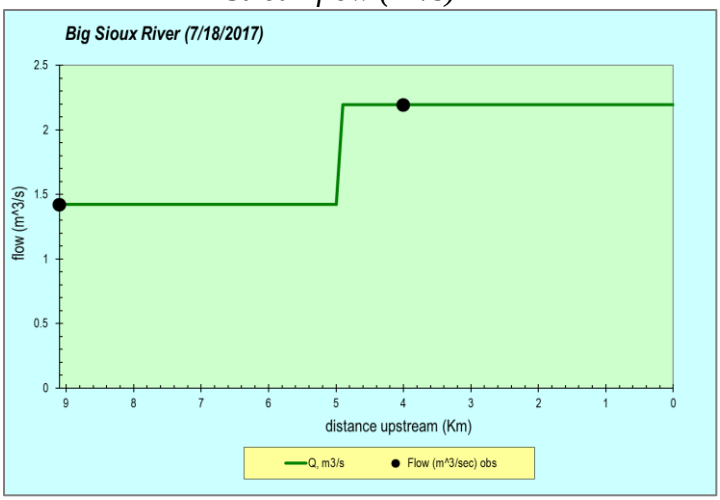


pH (su)

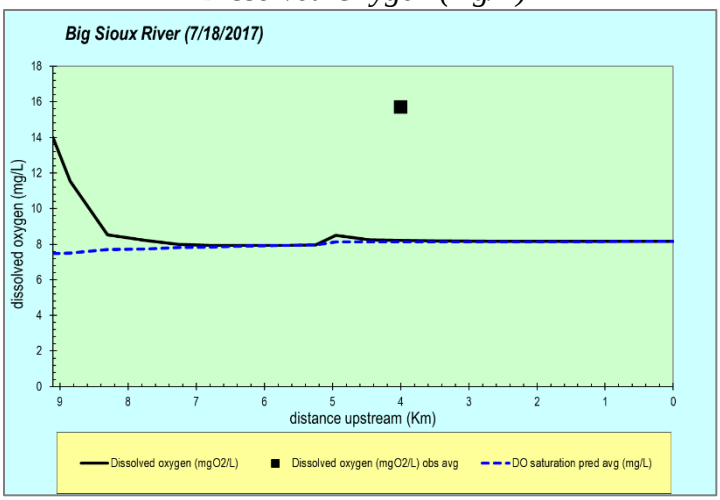


Summer Season Calibration

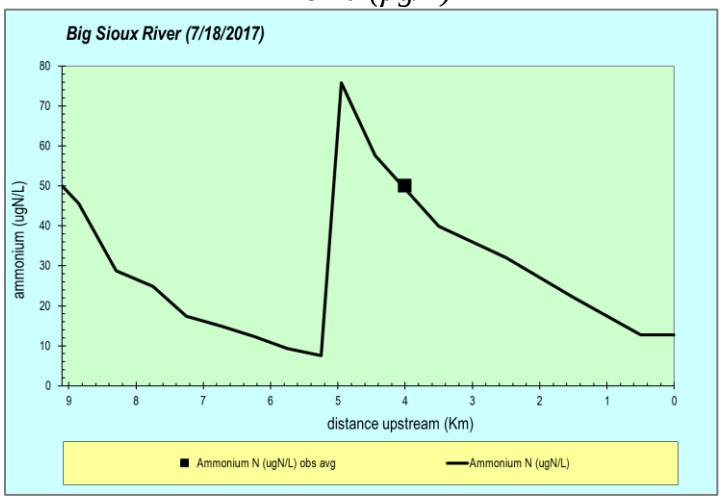
Streamflow (m^3/s)



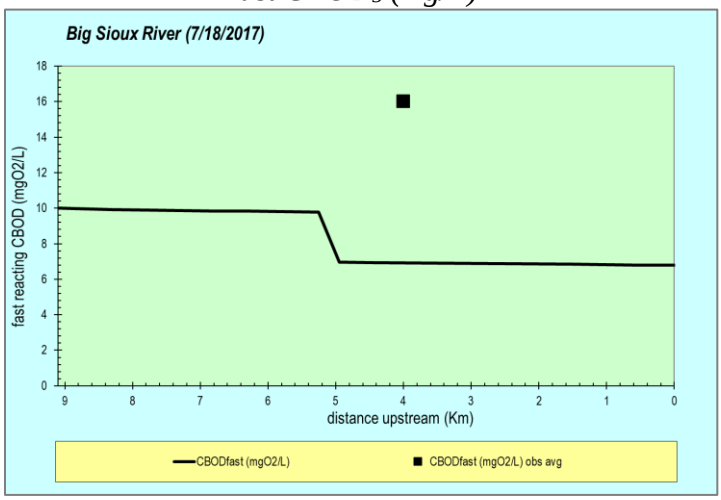
Dissolved Oxygen (mg/L)



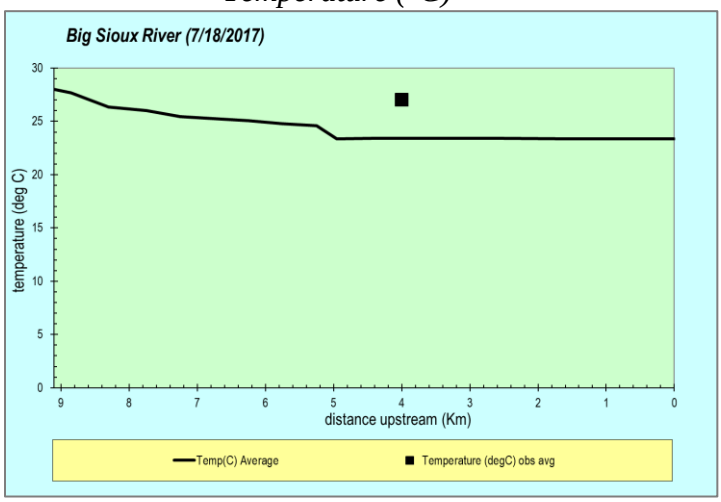
Ammonia (µg/L)



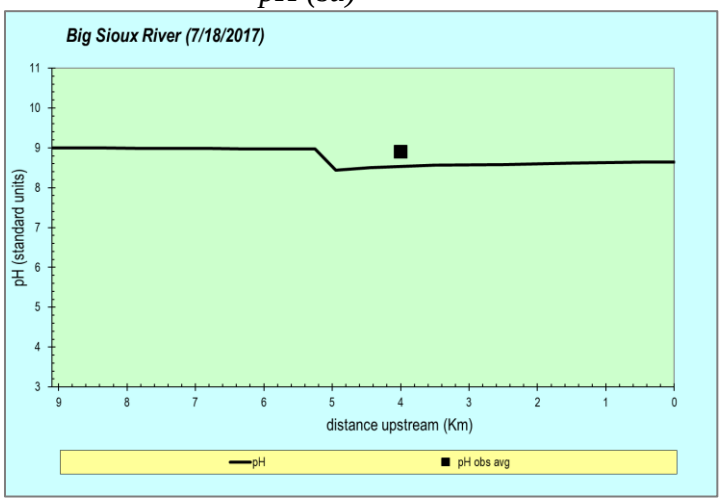
Fast $CBOD_5$ (mg/L)



Temperature (°C)

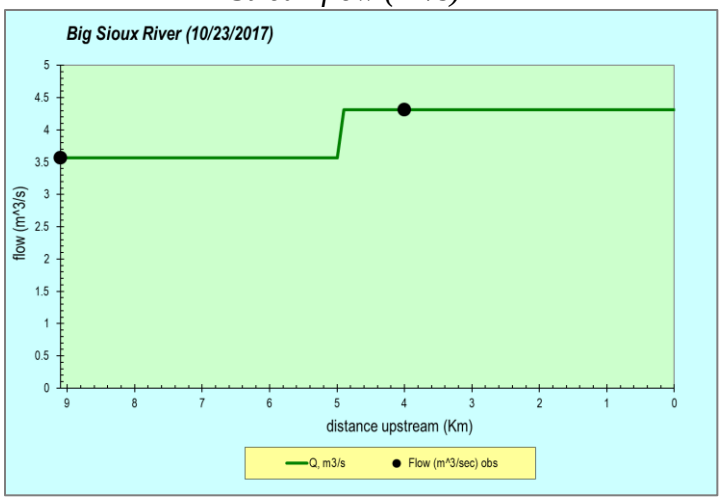


pH (su)

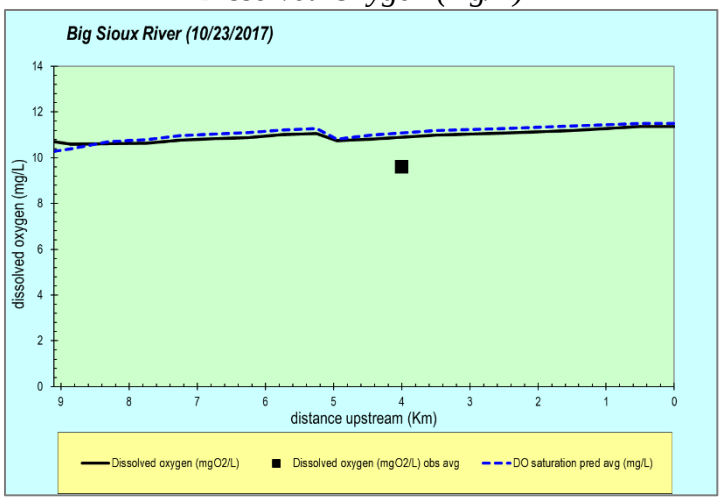


Fall Season Calibration

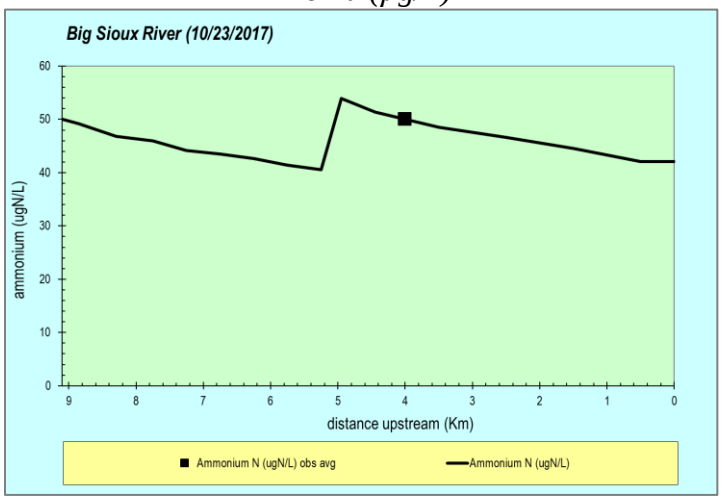
Streamflow (m^3/s)



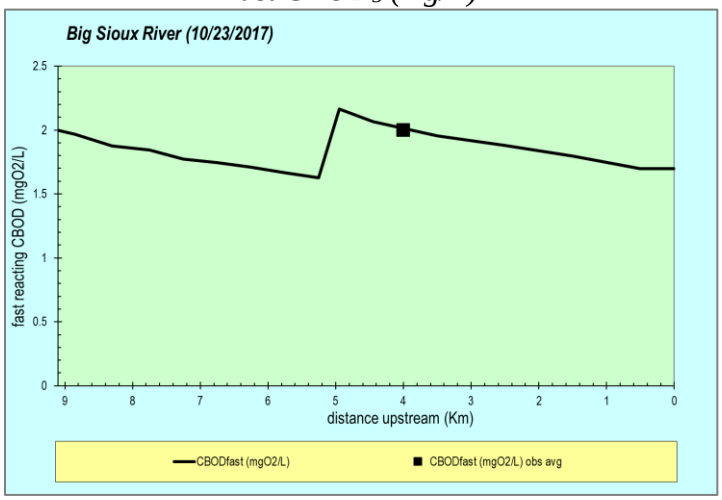
Dissolved Oxygen (mg/L)



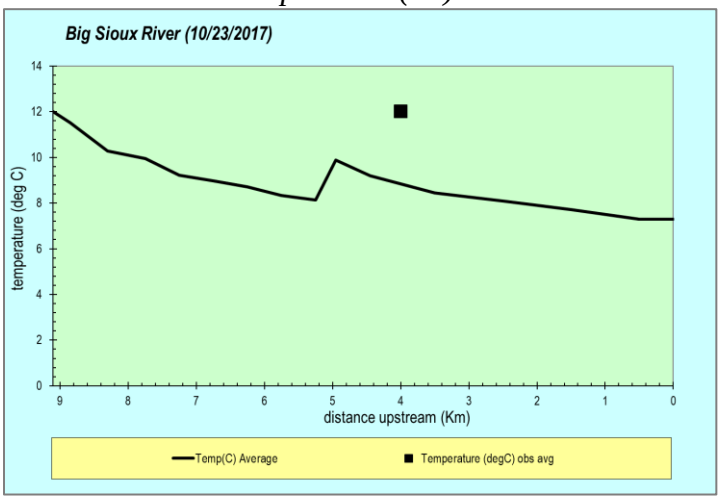
Ammonia (µg/L)



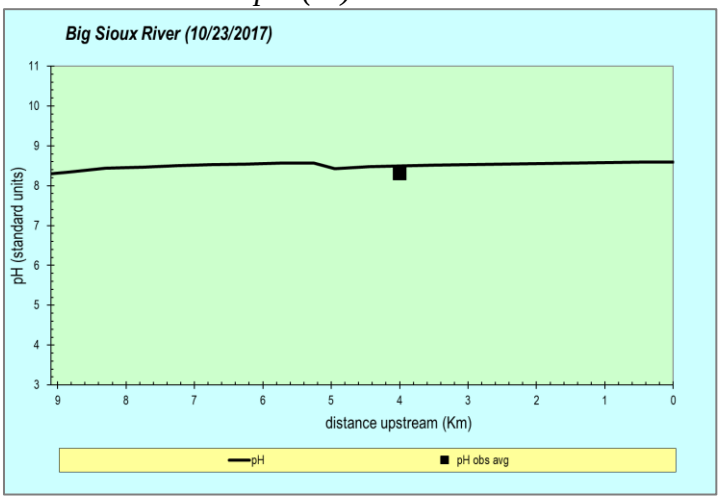
Fast $CBOD_5$ (mg/L)



Temperature (°C)

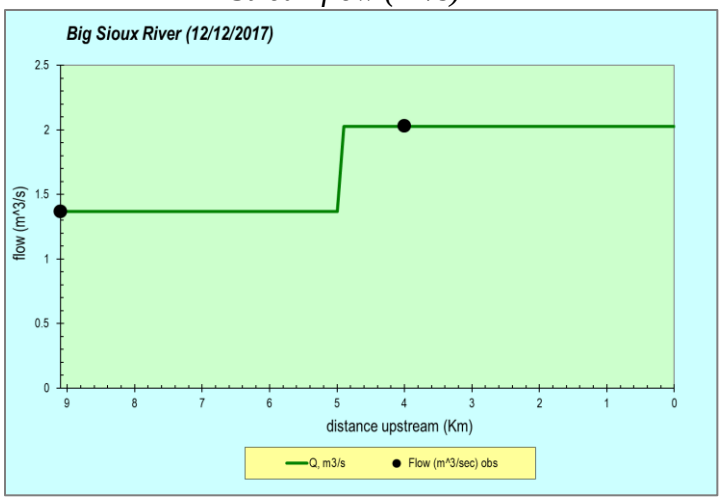


pH (su)

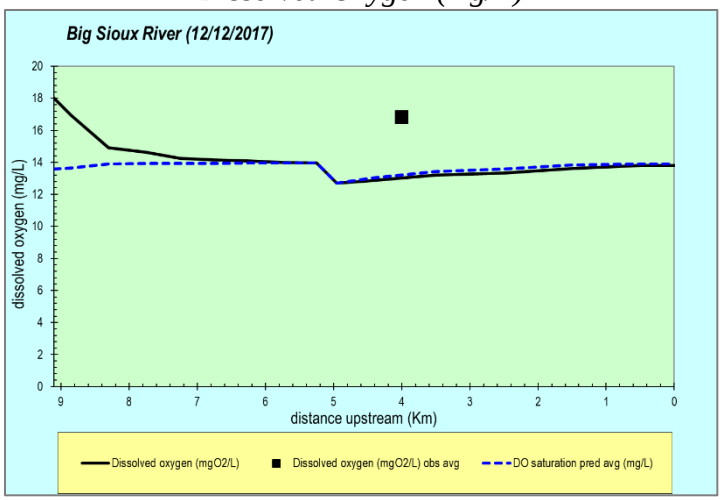


Winter Season Calibration

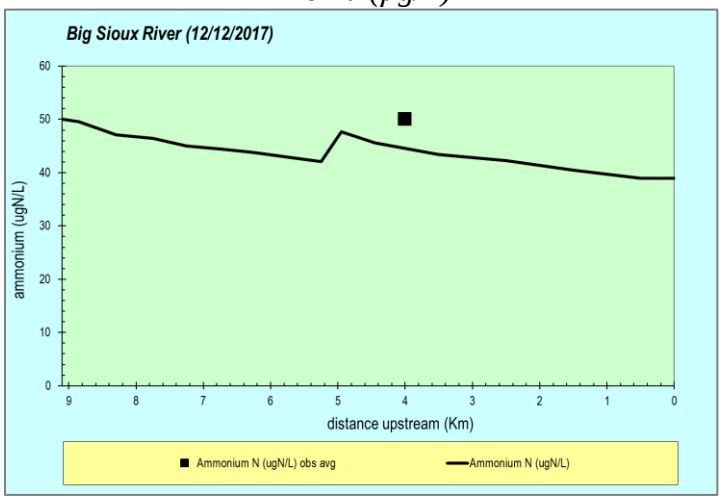
Streamflow (m^3/s)



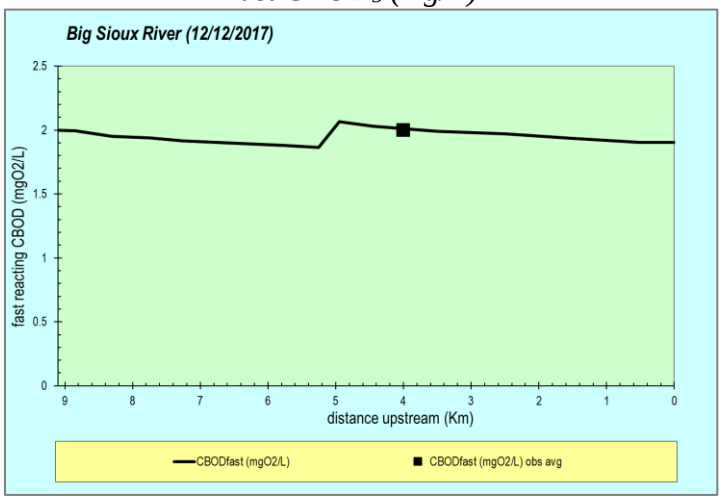
Dissolved Oxygen (mg/L)



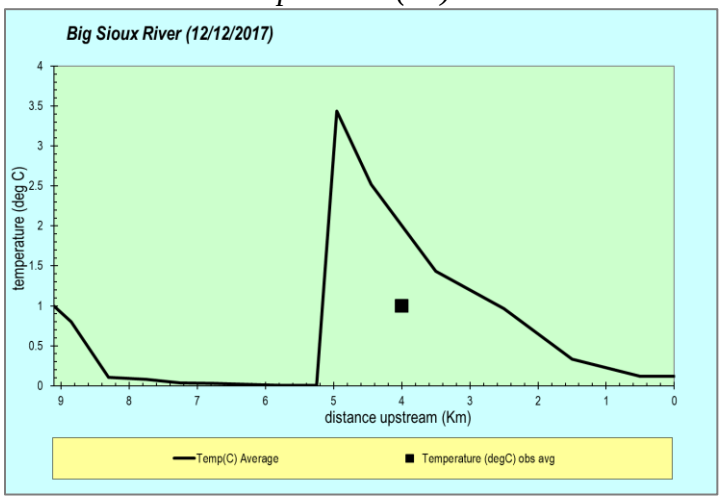
Ammonia (µg/L)



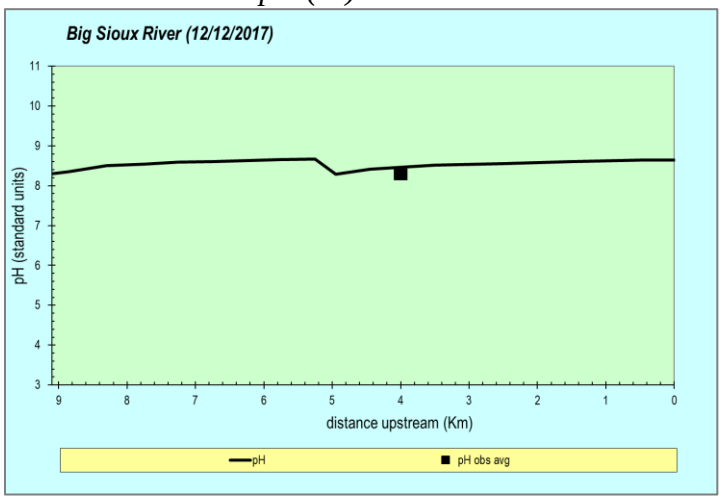
Fast $CBOD_5$ (mg/L)



Temperature (°C)



pH (su)



6.4 Critical Conditions Model

Model rates and variables developed in the seasonal calibration simulations were used for monthly effluent limits development modeling as follows: spring (April 1 to May 31); summer (June 1 to August 31); fall (September 1 to October 31); and winter (November 1 to March 31). The headwaters are set at WQM 64, located 0.7 miles above Smithfield WWTP. The model extends 15 miles downstream to just above the Split Rock Creek confluence south of Brandon, SD.

Critical Conditions Flows

The allowable critical low streamflows at USGS gages 06482000 and 06482020 for the monthly critical conditions model simulations were developed in Attachment 5 using the *South Dakota's Mixing Zone and Dilution Implementation Procedures* (SDDENR 1998). The allowable low streamflows are included in Table 9 below.

Table 9: Allowable Critical Low Streamflows (Q_u) for Mixing

Season	Critical Low Flows (Q_u) (cfs)	
	USGS 06482000 above Smithfield WWTP	**USGS 06482020 above Sioux Falls WRF**
January 1 – 31	6.90	55.38
February 1 – 29	6.20	48.83
March 1 – 31	9.34	35.36
April 1 – 30	7.77	47.55
May 1 – 31	11.02	47.93
June 1 – 30	13.43	43.97
July 1 – 31	12.72	56.05
August 1 – 31	5.68	50.89
September 1 – 30	9.89	41.23
October 1 – 31	5.49	52.08
November 1 – 30	11.34	33.07
December 1 – 31	5.98	44.25

Smithfield WWTP and Sioux Falls WRF are continuous dischargers with effluent flow rates that vary throughout the year. To represent the current hydraulic treatment capacity of each facility, average design flow was used for effluent limits development. The average design flow for Smithfield WWTP is 3.5 MGD (5.42 cfs), and for Sioux Falls WRF is 21.0 MGD (32.49 cfs).

Streamflow in the diversion channel can be estimated by subtracting Smithfield WWTP's effluent flow and the USGS 06482000 gage's historic channel flow from the USGS 06482020 gage's combined flow. Based on stream characteristics, the diversion channel flow water quality will be mixed in diffusively with the historic channel over a 1 mile distance, from approximately 0.2 miles below the end of Smithfield WWTP's mixing zone to 0.6 miles above WQM BS29. Any additional flow from USGS 06482000 allowed for mixing with the Sioux Falls WRF will also be mixed in diffusively over this 1 mile distance. The proportions of historic channel flow and diversion channel flow above Sioux Falls WRF were calculated according to the full 7Q5 flows developed in Attachment 8; see Table 10 below for a summary of these flows.

Table 10: Critical Low Flow (Q_u) Composition above Sioux Falls WRF

Season	USGS 06482020 Critical Low Flow(Q_u) Above Sioux Falls (cfs)	Historic Channel		Diversion Channel		Smithfield Effluent	
		cfs	%	cfs	%	cfs	%
January 1 – 31	55.38	13.81	25%	36.15	65%	5.42	10%
February 1 – 29	48.83	12.40	25%	31.02	64%	5.42	11%
March 1 – 31	35.36	8.57	24%	21.38	60%	5.42	15%
April 1 – 30	47.55	6.96	15%	35.17	74%	5.42	11%
May 1 – 31	47.93	9.89	21%	32.63	68%	5.42	11%
June 1 – 30	43.97	11.92	27%	26.64	61%	5.42	12%
July 1 – 31	56.05	24.14	43%	26.49	47%	5.42	10%
August 1 – 31	50.89	26.80	53%	18.68	37%	5.42	11%
September 1 – 30	41.23	18.39	45%	17.43	42%	5.42	13%
October 1 – 31	52.08	25.95	50%	20.71	40%	5.42	10%
November 1 – 30	33.07	9.88	30%	17.77	54%	5.42	16%
December 1 – 31	44.25	11.18	25%	27.65	62%	5.42	12%

Critical Conditions Water Quality

Water quality calibration inputs for critical conditions water quality modeling are summarized in Tables 11-21 below for temperature, conductivity, TSS, DO, fast $CBOD_5$, ammonia, nitrate, total phosphorus, *E. coli*, alkalinity, and pH. For the historic channel and diversion channel water quality, the 20th or 80th percentile of WQM site data are used as applicable. For effluent water quality, the 20th or 80th percentiles of Discharge Monitoring Report (DMR) effluent monitoring data (Attachment 9) or the proposed effluent limits are used as applicable.

Table 11: Temperature Critical Conditions Inputs

Temperature (°C)						
Season	*Historic Channel*	*Effluent*		*Diversion Channel*	*Effluent*	
	WQM 64	Smithfield 001		WQM BS23	Sioux Falls 001	
		30-Day Av.	Daily Max.		30-Day Av.	Daily Max.
	80th Perc.	*80th Perc.*	*80th Perc.*	*80th Perc.*	*80th Perc.*	*80th Perc.*
January 1– 31	1.33	26.00	29.00	1.50	10.64	15.00
February 1 – 29	1.75	26.08	28.40	1.80	10.42	13.40
March 1 – 31	7.24	28.00	31.00	6.65	12.00	15.00
April 1 – 30	16.40	29.00	31.00	15.44	15.00	18.00
May 1 – 31	19.00	30.10	33.20	19.00	17.40	20.80
June 1 – 30	25.00	33.02	36.00	26.00	20.00	22.00
July 1 – 31	28.82	35.00	37.00	29.54	22.00	24.00
August 1 – 31	27.20	34.60	37.00	27.00	23.00	24.40
September 1 – 30	22.00	33.00	35.00	22.00	21.88	24.00
October 1 – 31	14.00	31.00	33.00	13.18	19.00	22.00
November 1 – 30	7.92	29.40	32.00	5.80	16.00	19.40
December 1 – 31	2.80	27.00	30.00	1.63	12.92	16.00

Table 12: Conductivity Critical Conditions Inputs

Conductivity (µmhos/cm)						
Season	***Historic Channel***	***Effluent***		***Diversion Channel***	***Effluent***	
	WQM 64	**Smithfield 001**		**WQM BS23**	**Sioux Falls 001**	
		30-Day Av.	**Daily Max.**		**30-Day Av.**	**Daily Max.**
	80th Perc.	*N/A*	*N/A*	*80th Perc.*	*N/A*	*N/A*
January 1– 31	1695.80	--	--	1268.00	--	--
February 1 – 29	1900.60	--	--	1254.40	--	--
March 1 – 31	1280.00	--	--	945.40	--	--
April 1 – 30	1337.00	--	--	1010.00	--	--
May 1 – 31	1359.00	--	--	1084.00	--	--
June 1 – 30	1281.20	--	--	1038.80	--	--
July 1 – 31	1204.20	--	--	982.00	--	--
August 1 – 31	1140.80	--	--	1035.80	--	--
September 1 – 30	1148.80	--	--	995.00	--	--
October 1 – 31	1190.40	--	--	1038.00	--	--
November 1 – 30	1378.80	--	--	1090.40	--	--
December 1 – 31	1570.00	--	--	1209.40	--	--

Table 13: TSS Critical Conditions Inputs

TSS (mg/L)						
Season	***Historic Channel***	***Effluent***		***Diversion Channel***	***Effluent***	
	WQM 64	**Smithfield 001[1]**		**WQM BS23**	**Sioux Falls 001**	
		30-Day Av.	**Daily Max.**		**30-Day Av.**	**Daily Max.**
	80th Perc.	*Limit*	*Limit*	*80th Perc.*	*Limit*	*Limit*
January 1– 31	9.40	45.00	91.00	14.80	30.00	45.00
February 1 – 29	29.60	45.00	91.00	36.80	30.00	45.00
March 1 – 31	72.00	45.00	91.00	123.20	30.00	45.00
April 1 – 30	80.00	45.00	91.00	107.20	30.00	45.00
May 1 – 31	98.20	45.00	91.00	132.00	30.00	45.00
June 1 – 30	247.60	45.00	91.00	188.00	30.00	45.00
July 1 – 31	126.40	45.00	91.00	136.00	30.00	45.00
August 1 – 31	133.60	45.00	91.00	134.40	30.00	45.00
September 1 – 30	85.20	45.00	91.00	98.40	30.00	45.00
October 1 – 31	64.00	45.00	91.00	75.20	30.00	45.00
November 1 – 30	42.00	45.00	91.00	46.00	30.00	45.00
December 1 – 31	20.80	45.00	91.00	34.80	30.00	45.00

[1] These are the concentration-based equivalent limits of the proposed mass-based effluent limits for Smithfield WWTP.

Table 14: DO Critical Conditions Inputs

DO (mg/L)				
Season	***Historic Channel***	***Effluent***	***Diversion Channel***	***Effluent***
	WQM 64	**Smithfield 001**	**WQM BS23**	**Sioux Falls 001**
		Daily Min.		**Daily Min.**
	20th Perc.	*Limit*	*20th Perc.*	*Limit*
January 1– 31	13.90	5.00	11.14	5.50
February 1 – 29	13.30	5.00	9.30	5.50
March 1 – 31	12.56	5.00	11.60	5.50
April 1 – 30	10.10	5.00	9.56	5.00
May 1 – 31	9.26	5.00	9.20	5.00
June 1 – 30	7.86	5.00	7.20	5.50
July 1 – 31	7.36	5.00	7.60	5.50
August 1 – 31	7.72	5.00	7.44	5.50
September 1 – 30	8.30	5.00	9.42	5.00
October 1 – 31	10.44	5.00	10.54	5.00
November 1 – 30	12.48	5.00	13.50	5.50
December 1 – 31	13.94	5.00	13.02	5.50

Table 15: Fast $CBOD_5$ Critical Conditions Inputs

Fast CBOD5, mg/L (from BOD_5 data and limits)						
Season	***Historic Channel***	***Effluent***		***Diversion Channel***	***Effluent***	
	WQM 64	**Smithfield 001[1]**		**WQM BS23**	**Sioux Falls 001**	
		30-Day Av.	**Daily Max.**		**30-Day Av.**	**Daily Max.**
	80th Perc.	*Limit*	*Limit*	*80th Perc.*	*Limit*	*Limit*
January 1– 31	2.00	38.00	76.00	4.20	30.00	38.00
February 1 – 29	5.80	38.00	76.00	7.00	30.00	38.00
March 1 – 31	8.00	38.00	76.00	8.00	30.00	38.00
April 1 – 30	6.00	38.00	76.00	6.80	30.00	45.00
May 1 – 31	6.00	38.00	76.00	6.80	30.00	45.00
June 1 – 30	7.00	27.00	76.00	8.40	22.00	22.00
July 1 – 31	9.00	27.00	76.00	8.00	22.00	22.00
August 1 – 31	9.00	27.00	76.00	5.80	22.00	22.00
September 1 – 30	8.00	38.00	76.00	7.60	30.00	45.00
October 1 – 31	8.20	38.00	76.00	10.00	30.00	45.00
November 1 – 30	6.00	38.00	76.00	11.00	30.00	38.00
December 1 – 31	4.00	38.00	76.00	8.20	30.00	38.00

[1] These are the concentration-based equivalent limits of the proposed mass-based effluent limits for Smithfield WWTP.

Table 16: Ammonia Critical Conditions Inputs

Ammonia (mg/L)						
Season	*Historic Channel*	*Effluent*		*Diversion Channel*	*Effluent*	
	WQM 64	Smithfield 001[1]		WQM BS23	Sioux Falls 001	
		30-Day Av.	Daily Max.		30-Day Av.	Daily Max.
	80th Perc.	*Limit*	*Limit*	*80th Perc.*	*Limit*	*Limit*
January 1– 31	0.29	4.0	8.0	0.18	4.3	7.5
February 1 – 29	0.40	4.0	8.0	0.35	4.3	7.5
March 1 – 31	0.73	2.5	8.0	0.63	2.3	7.5
April 1 – 30	0.05	2.8	4.9	0.05	2.0	3.5
May 1 – 31	0.05	2.8	4.9	0.05	2.0	3.5
June 1 – 30	0.08	2.3	4.0	0.05	2.0	3.5
July 1 – 31	0.05	1.8	4.0	0.05	1.3	3.5
August 1 – 31	0.05	1.3	4.0	0.05	1.3	3.5
September 1 – 30	0.05	2.1	5.3	0.05	1.2	4.7
October 1 – 31	0.05	2.1	5.3	0.05	2.4	4.7
November 1 – 30	0.08	4.0	8.0	0.05	3.4	6.7
December 1 – 31	0.12	4.0	8.0	0.05	4.3	7.5

[1] These are the concentration-based equivalent limits of the proposed mass-based effluent limits for Smithfield WWTP.

Table 17: Nitrate Critical Conditions Inputs

Nitrate (mg/L)						
Season	*Historic Channel*	*Effluent*		*Diversion Channel*	*Effluent*	
	WQM 64	Smithfield 001		WQM BS23	Sioux Falls 001	
		30-Day Av.	Daily Max.		30-Day Av.	Daily Max.
	80th Perc.	*Limit*	*Limit*	*80th Perc.*	*80th Perc.*	*80th Perc.*
January 1– 31	2.20	50.00	88.00	3.76	35.64	39.40
February 1 – 29	2.00	50.00	88.00	3.50	35.40	38.80
March 1 – 31	1.80	50.00	88.00	2.40	34.40	39.40
April 1 – 30	0.84	50.00	88.00	1.48	35.84	40.20
May 1 – 31	0.90	50.00	88.00	0.90	30.56	35.40
June 1 – 30	1.92	50.00	88.00	2.14	30.58	33.08
July 1 – 31	0.74	50.00	88.00	0.70	31.32	36.40
August 1 – 31	0.72	50.00	88.00	0.54	32.00	34.00
September 1 – 30	0.50	50.00	88.00	0.66	30.75	32.20
October 1 – 31	0.90	50.00	88.00	1.12	34.26	37.00
November 1 – 30	1.90	50.00	88.00	2.26	35.42	36.40
December 1 – 31	2.20	50.00	88.00	3.54	35.06	37.20

Table 18: Total P Critical Conditions Inputs

Total P (mg/L)						
Season	***Historic Channel***	***Effluent***		***Diversion Channel***	***Effluent***	
	WQM 64	**Smithfield 001**		**WQM BS23**	**Sioux Falls 001**	
		30-Day Av.	**Daily Max.**		**30-Day Av.**	**Daily Max.**
	80th Perc.	*N/A*	*N/A*	*80th Perc.*	*N/A*	*N/A*
January 1– 31	0.11	--	--	0.23	--	--
February 1 – 29	0.36	--	--	0.45	--	--
March 1 – 31	0.52	--	--	0.61	--	--
April 1 – 30	0.25	--	--	0.29	--	--
May 1 – 31	0.27	--	--	0.34	--	--
June 1 – 30	0.56	--	--	0.44	--	--
July 1 – 31	0.42	--	--	0.36	--	--
August 1 – 31	0.41	--	--	0.35	--	--
September 1 – 30	0.27	--	--	0.27	--	--
October 1 – 31	0.22	--	--	0.26	--	--
November 1 – 30	0.16	--	--	0.17	--	--
December 1 – 31	0.11	--	--	0.17	--	--

Table 19: *E. coli* Critical Conditions Inputs

E. coli (#/100 mL)[1]						
Season	***Historic Channel***	***Effluent***		***Diversion Channel***	***Effluent***	
	WQM 64	**Smithfield 001[2]**		**WQM BS23**	**Sioux Falls 001[2]**	
		30-Day Geo. Mean	**Daily Max.**		**30-Day Geo. Mean**	**Daily Max.**
	80th Perc.	*80th Perc.*	*80th Perc*	*80th Perc.*	*80th Perc.*	*80th Perc*
January 1– 31	--	--	--	--	--	--
February 1 – 29	--	--	--	--	--	--
March 1 – 31	--	--	--	--	--	--
April 1 – 30	--	--	--	--	--	--
May 1 – 31	488.40	1.83	65.56	121.00	38.18	114.21
June 1 – 30	4440.00	2.76	218.82	439.00	40.94	321.20
July 1 – 31	181.00	3.59	278.57	144.40	42.84	203.83
August 1 – 31	620.40	4.34	156.36	349.00	30.22	97.97
September 1 – 30	147.00	4.15	193.86	162.60	38.76	122.14
October 1 – 31	--	--	--	--	--	--
November 1 – 30	--	--	--	--	--	--
December 1 – 31	--	--	--	--	--	--

[1] The *E. coli* SDSWQS is applicable during the immersion recreation season of May 1 to September 30.

[2] The 80th percentile Fecal Coliform DMR data were translated to *E. coli* (Equation 1).

Table 20: Alkalinity Critical Conditions Inputs

Alkalinity (mg/L)						
Season	***Historic Channel***	***Effluent***		***Diversion Channel***	***Effluent***	
	WQM 64	**Smithfield 001**		**WQM BS23**	**Sioux Falls 001**	
		30-Day Av.	**Daily Max.**		**30-Day Av.**	**Daily Max.**
	80th Perc.	*N/A*	*N/A*	*80th Perc.*	*N/A*	*N/A*
January 1– 31	329.00	--	--	350.00	--	--
February 1 – 29	336.00	--	--	347.00	--	--
March 1 – 31	251.00	--	--	214.00	--	--
April 1 – 30	261.00	--	--	270.00	--	--
May 1 – 31	284.20	--	--	294.00	--	--
June 1 – 30	284.80	--	--	289.20	--	--
July 1 – 31	262.60	--	--	279.20	--	--
August 1 – 31	256.20	--	--	263.20	--	--
September 1 – 30	261.60	--	--	243.60	--	--
October 1 – 31	260.00	--	--	283.00	--	--
November 1 – 30	318.60	--	--	302.60	--	--
December 1 – 31	372.00	--	--	349.00	--	--

Table 21: pH Critical Conditions Inputs

pH (su)				
Season	***Historic Channel***	***Effluent***	***Diversion Channel***	***Effluent***
	WQM 64	**Smithfield 001**	**WQM BS23**	**Sioux Falls 001**
		Daily Max.		**Daily Max.**
	80th Perc.	*80th Perc.*	*80th Perc.*	*80th Perc.*
January 1– 31	8.30	7.72	8.10	7.70
February 1 – 29	8.25	7.72	8.00	7.60
March 1 – 31	8.42	7.84	8.42	7.60
April 1 – 30	8.50	7.73	8.50	7.80
May 1 – 31	8.40	7.84	8.44	7.84
June 1 – 30	8.36	7.90	8.40	7.94
July 1 – 31	8.50	7.92	8.56	7.90
August 1 – 31	8.52	7.86	8.50	7.90
September 1 – 30	8.48	7.92	8.68	7.80
October 1 – 31	8.57	7.82	8.72	7.74
November 1 – 30	8.33	7.91	8.57	7.70
December 1 – 31	8.30	7.82	8.32	7.70

Critical Conditions Summary

The seasonal critical conditions modeling results for instream flow, dissolved oxygen, fast $CBOD_5$, ammonia, temperature, and pH are presented on the next pages for chronic (30-day average) and acute (daily maximum) conditions. Table 22 below summarizes the water-quality based ammonia standards plotted on the ammonia modeling result graphs plotted from upstream to downstream, as developed in Attachment 5. The surface water quality standards for daily minimum dissolved oxygen (5.0 mg/L), daily maximum temperature (32.2 °C), daily minimum pH (6.5 su), and daily maximum pH (9.0 su) are plotted on the modeling results as applicable at the end of the facilities' mixing zones. There is no BOD_5 or Fast $CBOD_5$ standard to plot from the SDSWQS.

Table 22: Ammonia Standards

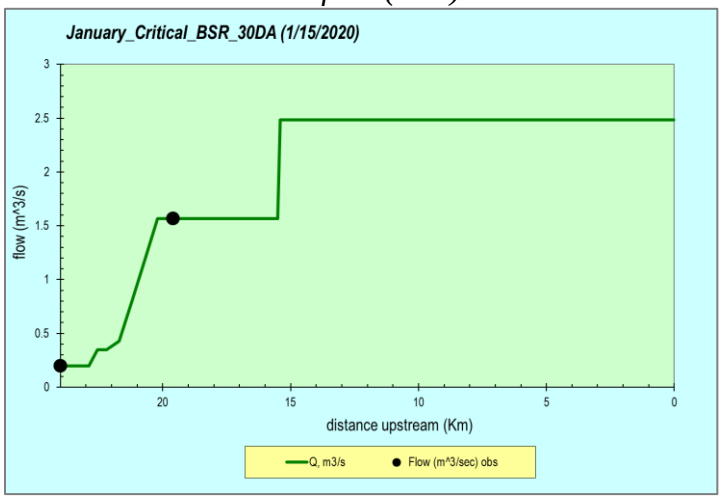
Ammonia Standards (mg/L)								
Season	***WQM 64***		***WQM BS29***		***WQM 117***		***WQM 31***	
	End of Smithfield WWTP's Mixing Zone		**End of Sioux Falls WRF's Mixing Zone**		**Below Sioux Falls WRF at N. Timberline Rd**		**Below Sioux Falls WRF at Brandon, SD**	
	30-Day Av.	**Daily Max**	**30-Day Av.**	**Daily Max**	**30-Day Av.**	**Daily Max**	**30-Day Av.**	**Daily Max**
January 1– 31	2.47	4.71	2.47	4.71	3.41	6.95	2.93	5.77
February 1 – 29	2.70	5.24	2.86	5.60	3.41	6.95	2.80	5.47
March 1 – 31	1.25	3.74	1.29	3.88	1.29	3.88	1.31	3.94
April 1 – 30	0.96	3.20	1.13	3.55	1.00	3.20	1.06	3.33
May 1 – 31	0.97	3.88	0.78	3.22	0.87	3.46	1.03	3.88
June 1 – 30	0.70	4.16	0.72	4.61	0.61	3.71	0.58	3.54
July 1 – 31	0.43	3.18	0.41	3.20	0.43	3.20	0.32	2.35
August 1 – 31	0.47	3.11	0.42	2.86	0.43	2.82	0.28	1.84
September 1 – 30	0.70	3.35	0.53	2.65	0.53	2.65	0.46	2.43
October 1 – 31	0.97	2.80	0.91	2.65	0.99	3.05	0.85	2.69
November 1 – 30	2.22	4.45	1.72	3.34	1.47	3.20	1.32	2.65
December 1 – 31	2.47	4.71	2.47	4.71	2.47	4.71	2.47	4.71

6.5 Conclusions

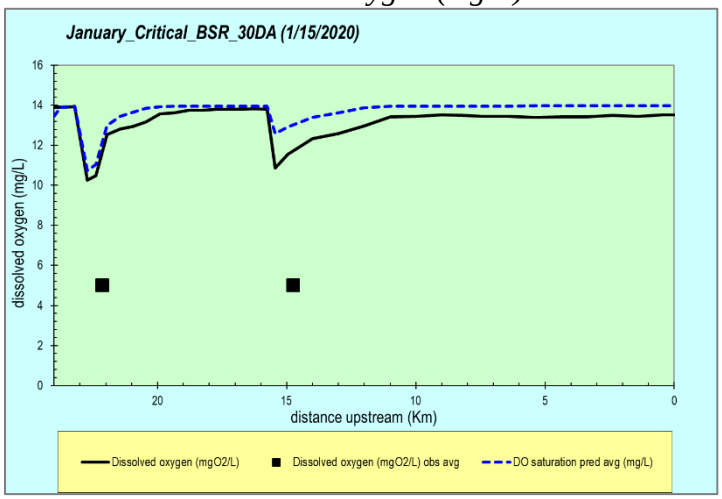
The results of this water quality modeling study were used in effluent limits development for ammonia-nitrogen (as N), dissolved oxygen, and BOD_5. The proposed limits for the draft permits are presented in the draft statements of basis for Smithfield WWTP and Sioux Falls WRF. Additional limits development documentation is included in Attachment 5 for ammonia water-quality based effluent limits (WQBELs) (both Smithfield WWTP and Sioux Falls WRF), and in Attachment 10 for BOD_5 technology based effluent limits (TBELs) (Smitfhield WWTP only).

January Critical Conditions
Chronic (30-Day Average)

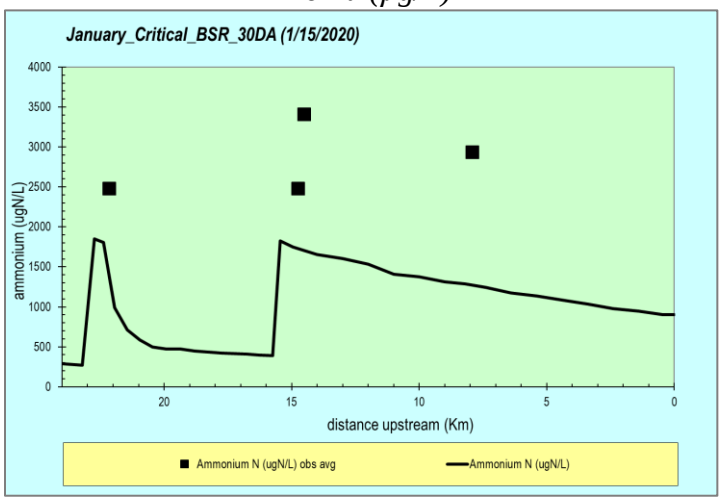
Streamflow (m^3/s)



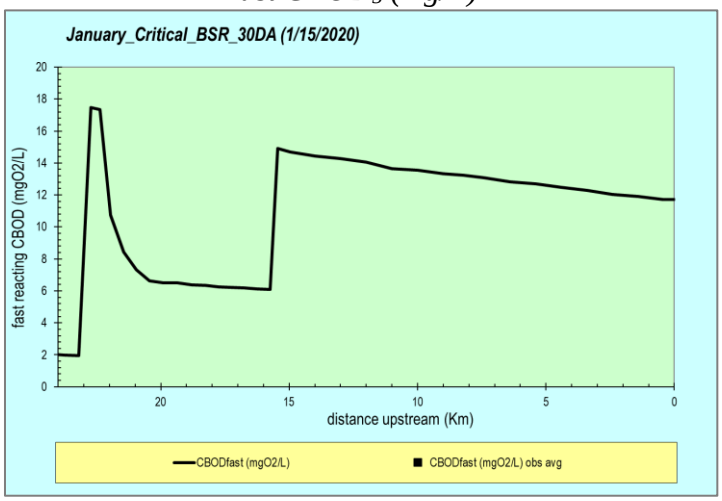
Dissolved Oxygen (mg/L)



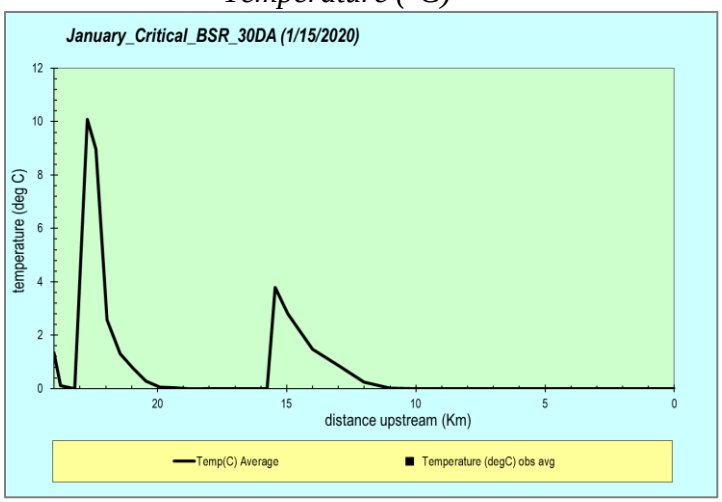
Ammonia (µg/L)



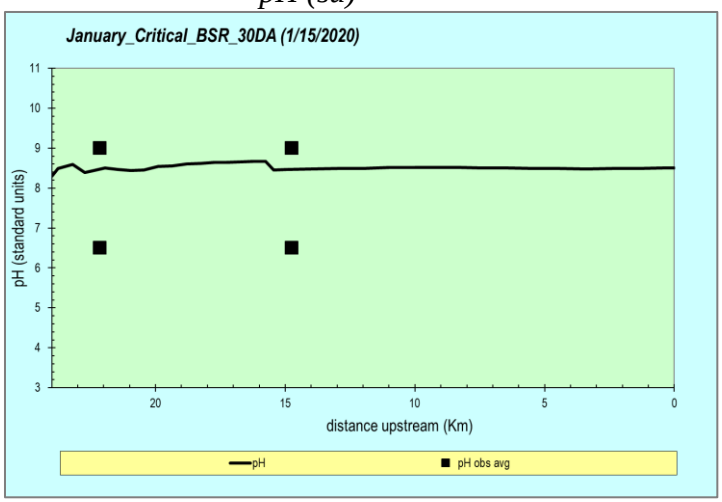
Fast $CBOD_5$ (mg/L)



Temperature (°C)

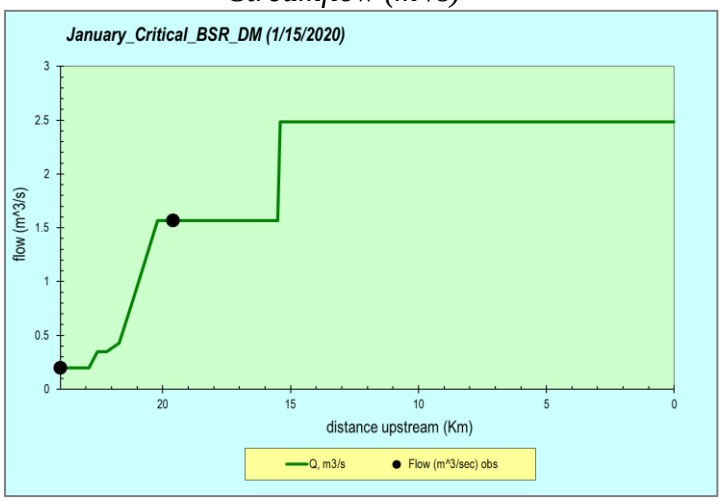


pH (su)

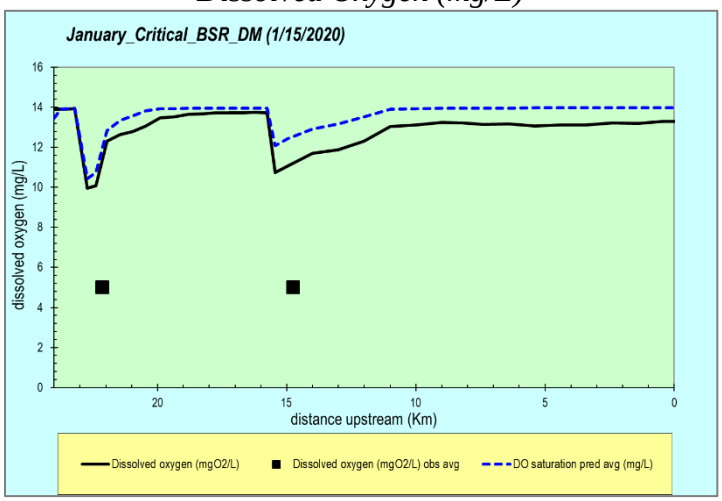


January Critical Conditions
Acute (Daily Maximum)

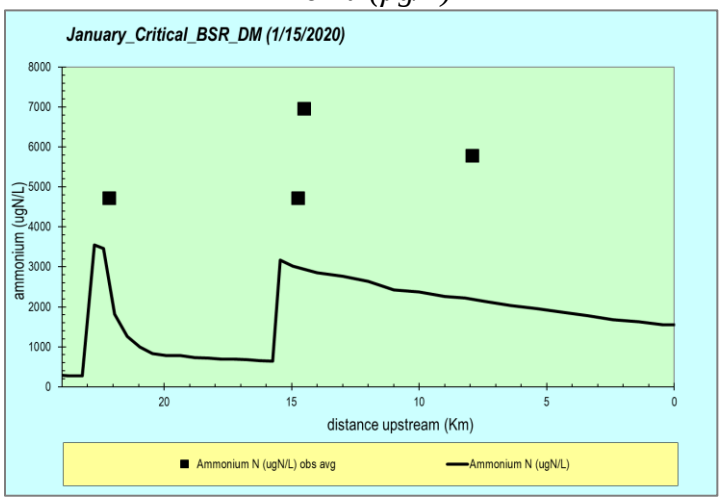
Streamflow (m^3/s)



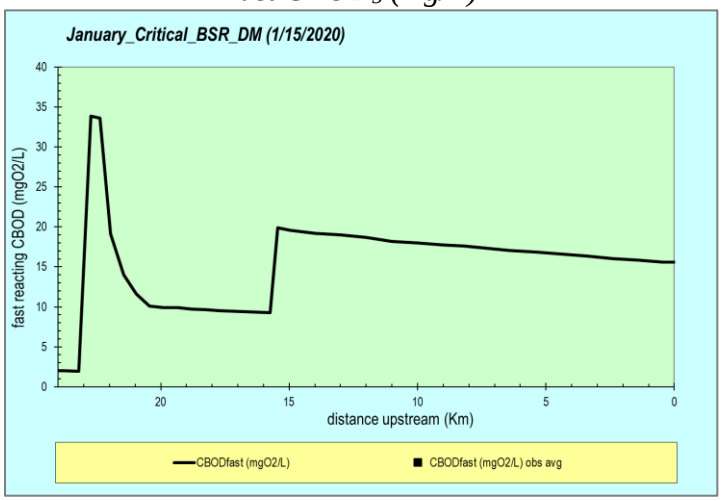
Dissolved Oxygen (mg/L)



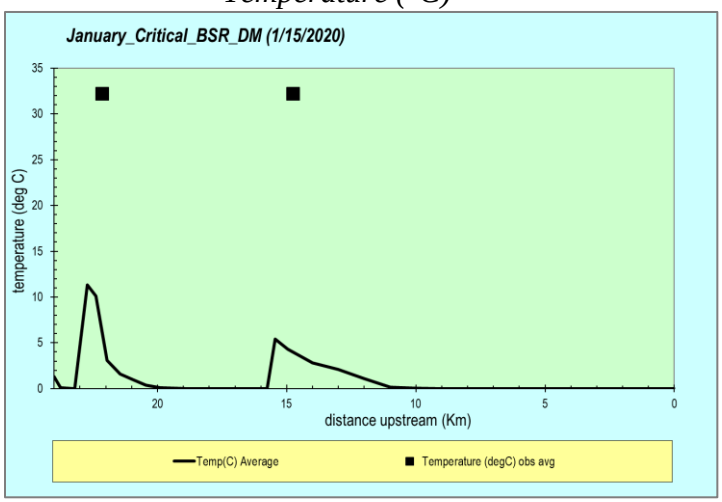
Ammonia (µg/L)



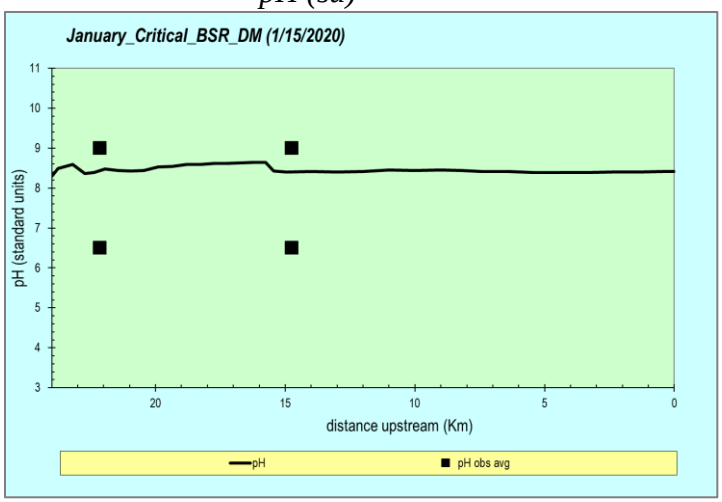
Fast $CBOD_5$ (mg/L)



Temperature (°C)

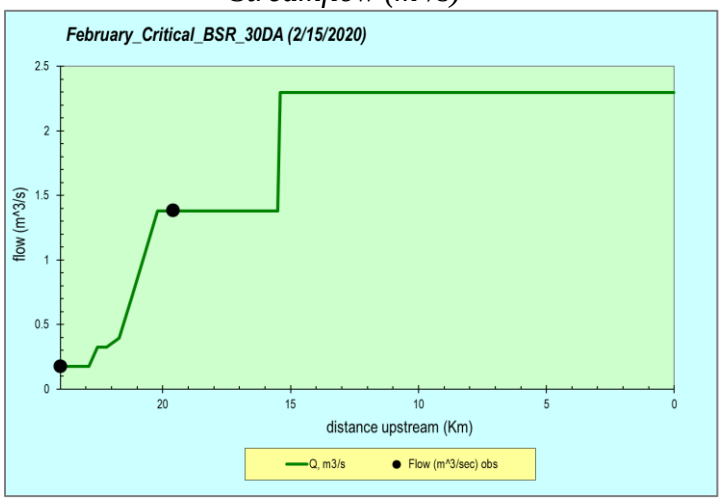


pH (su)

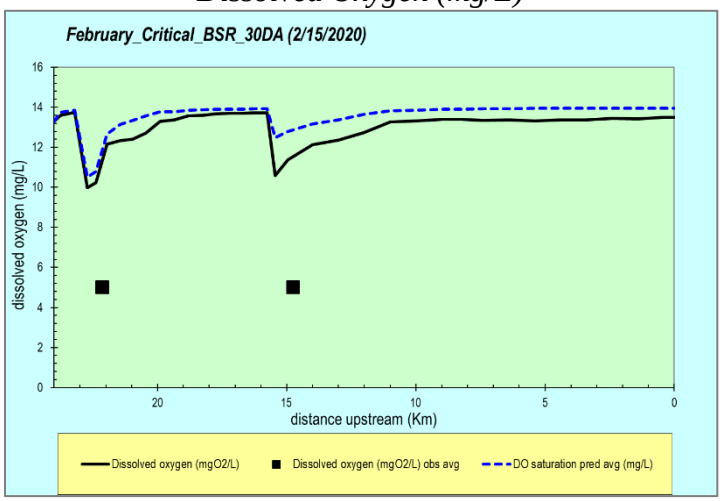


February Critical Conditions
Chronic (30-Day Average)

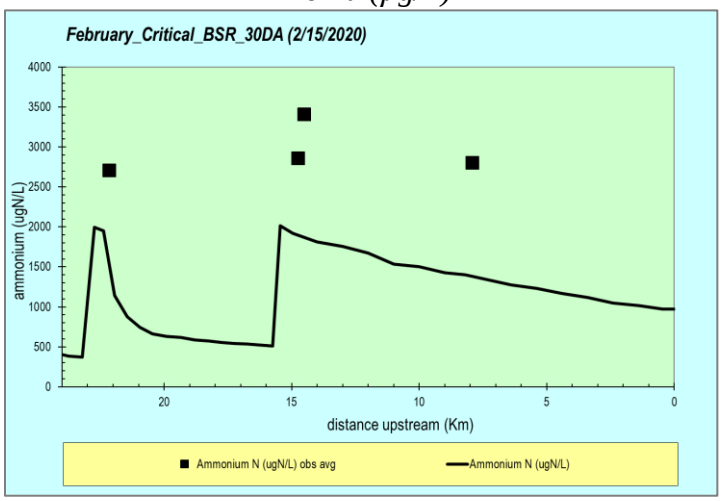
Streamflow (m^3/s)



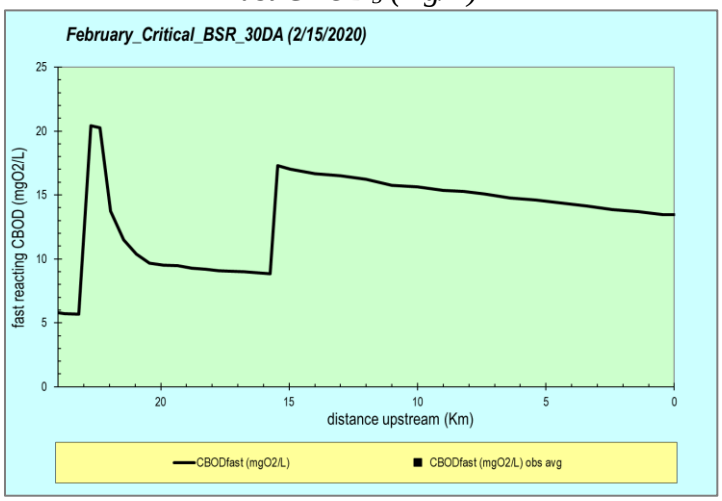
Dissolved Oxygen (mg/L)



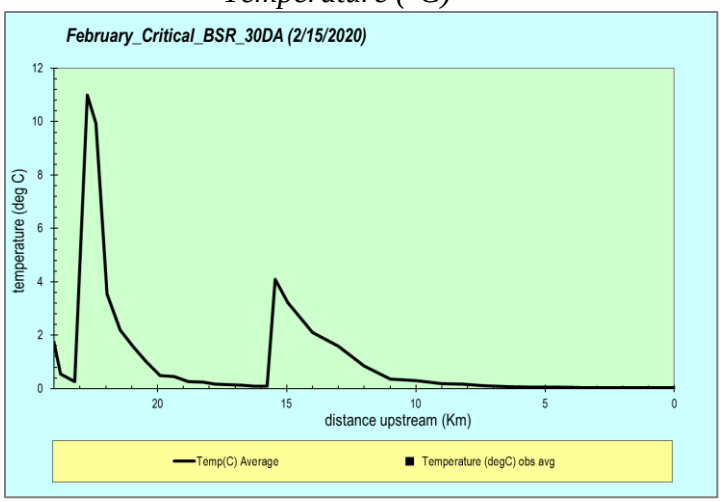
Ammonia (µg/L)



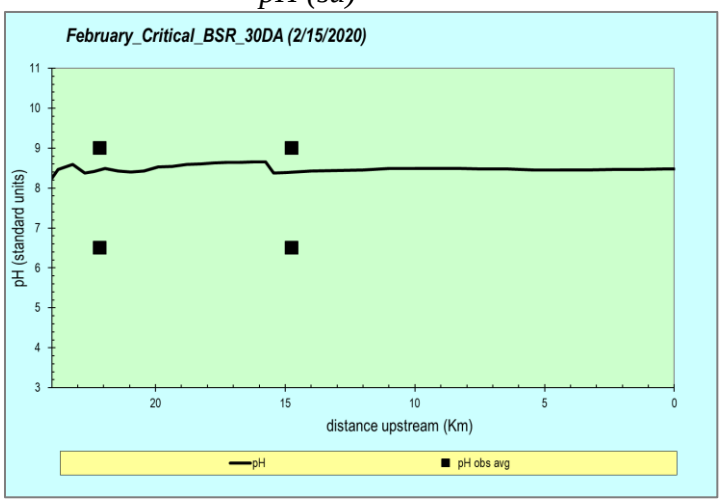
Fast $CBOD_5$ (mg/L)



Temperature (°C)

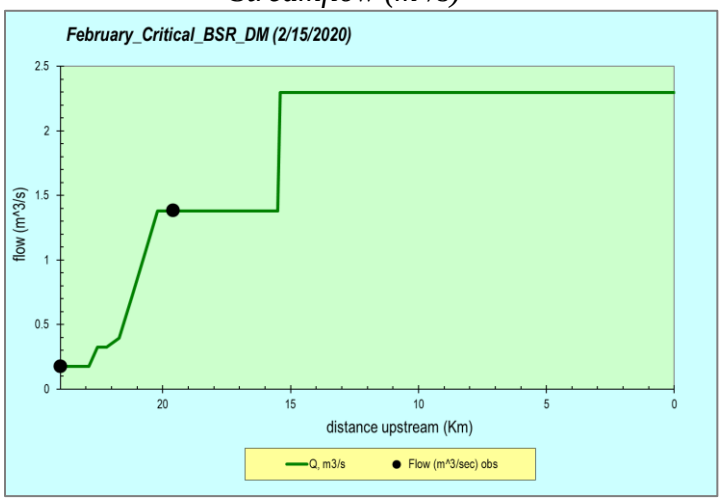


pH (su)

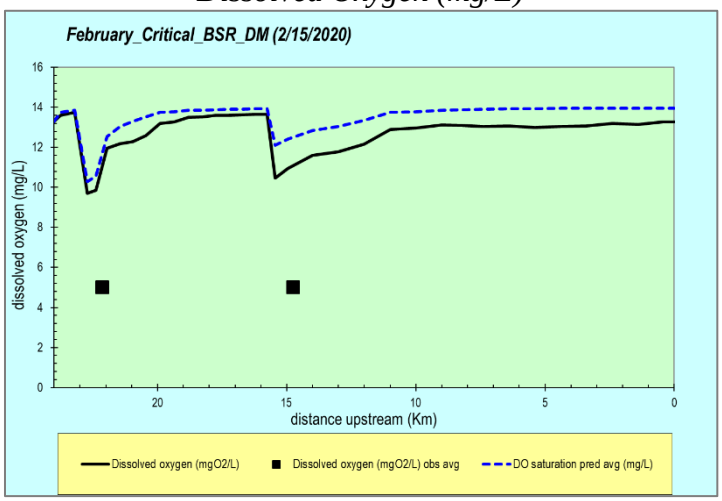


February Critical Conditions
Acute (Daily Maximum)

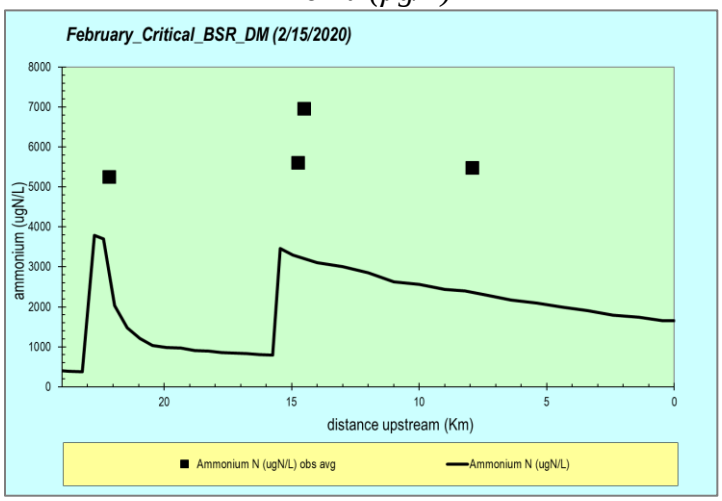
Streamflow (m^3/s)



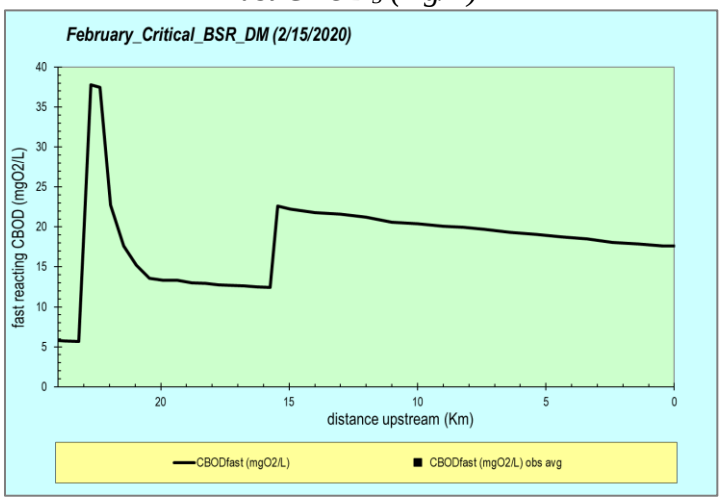
Dissolved Oxygen (mg/L)



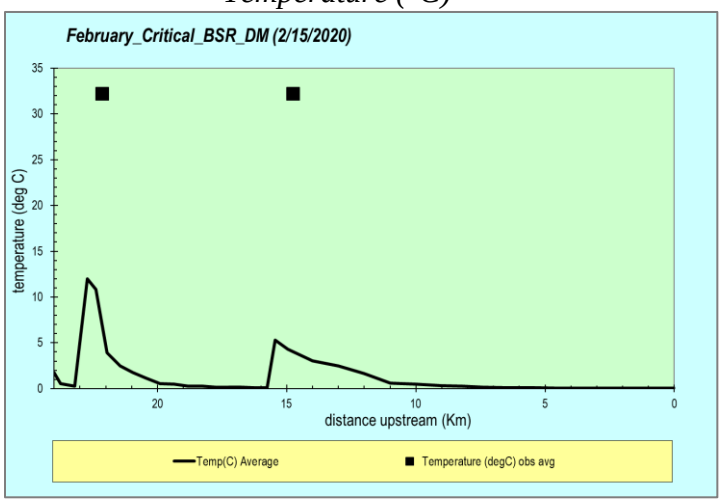
Ammonia (µg/L)



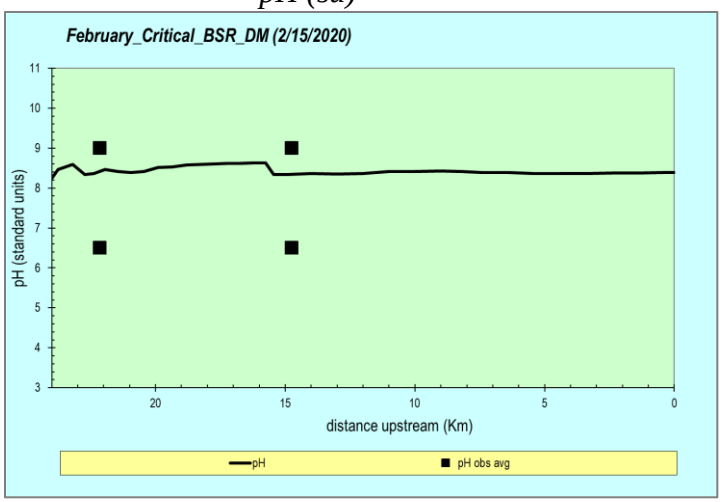
Fast $CBOD_5$ (mg/L)



Temperature (°C)

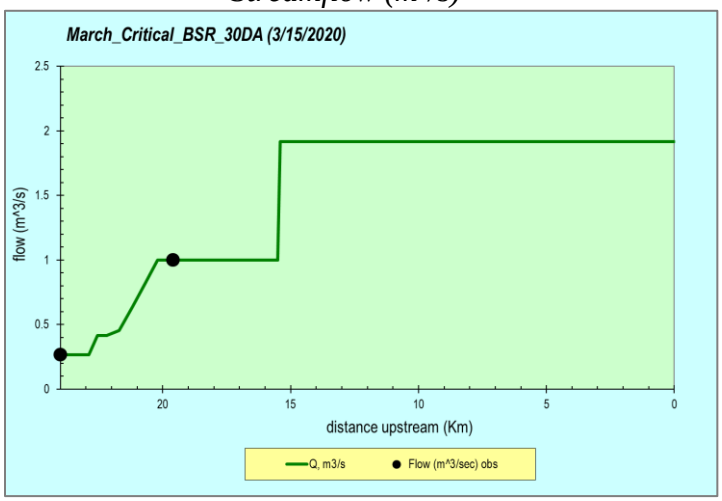


pH (su)

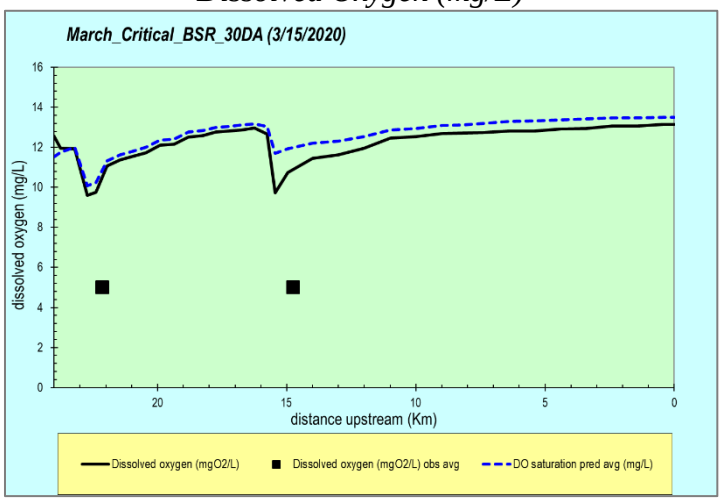


March Critical Conditions
Chronic (30-Day Average)

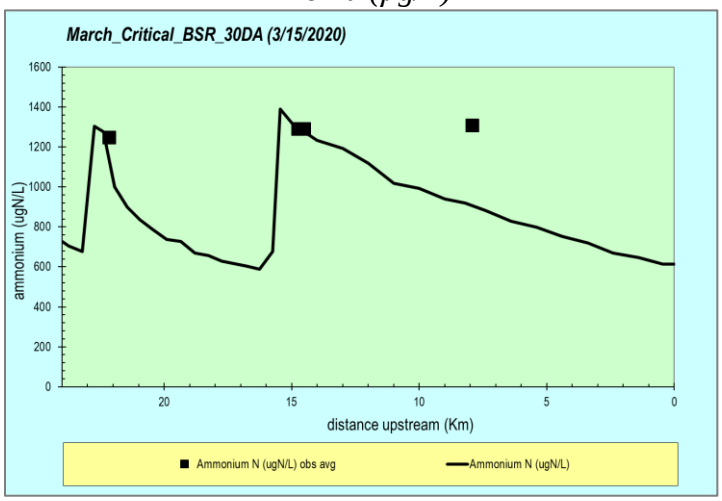
Streamflow (m^3/s)



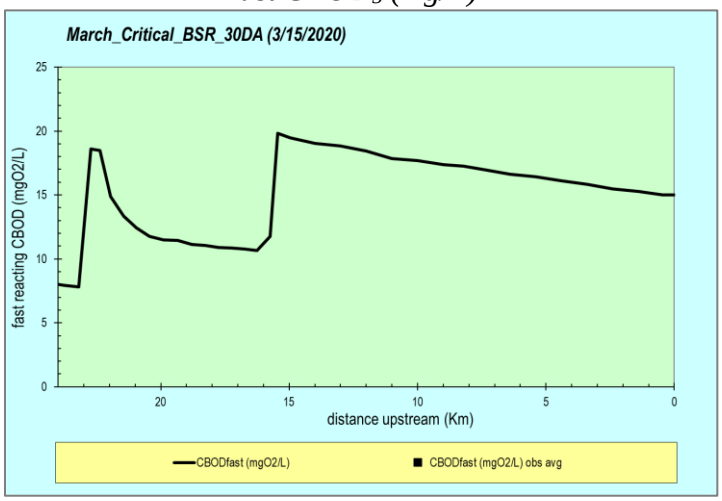
Dissolved Oxygen (mg/L)



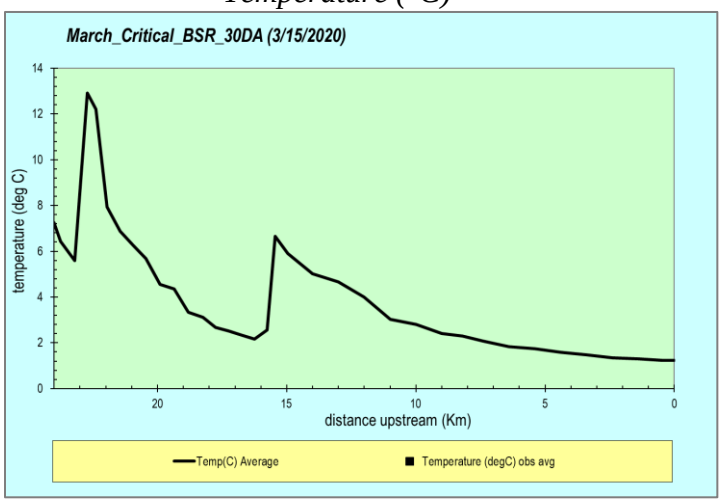
Ammonia (µg/L)



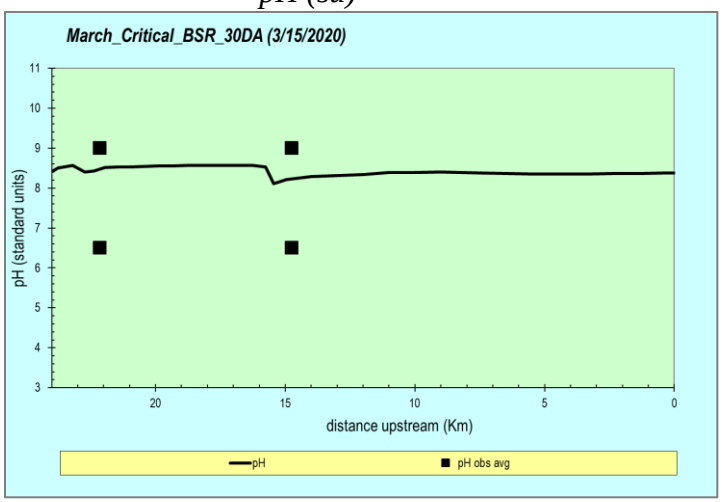
Fast $CBOD_5$ (mg/L)



Temperature (°C)

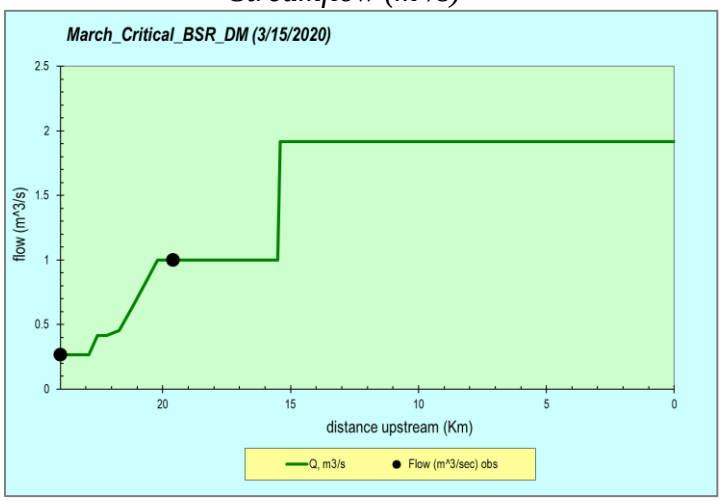


pH (su)

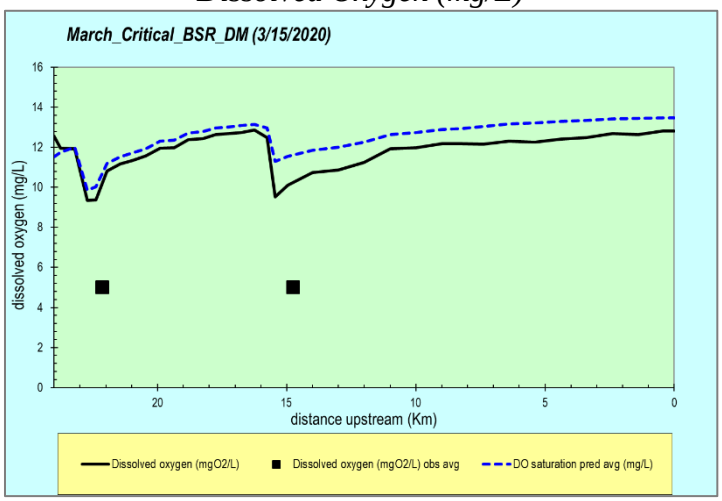


March Critical Conditions
Acute (Daily Maximum)

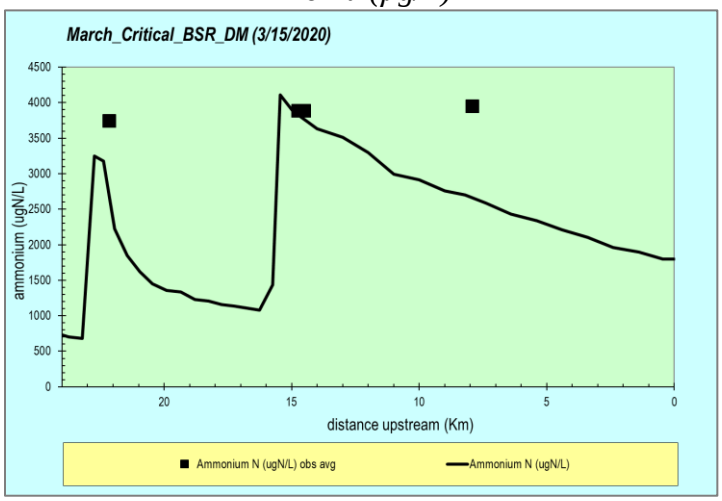
Streamflow (m^3/s)



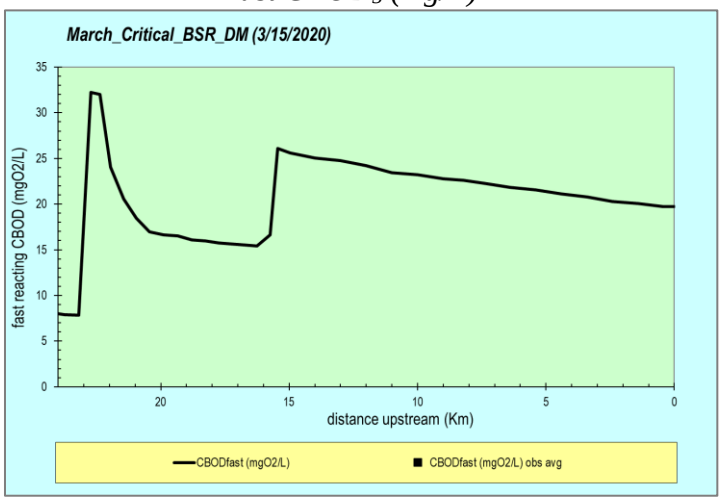
Dissolved Oxygen (mg/L)



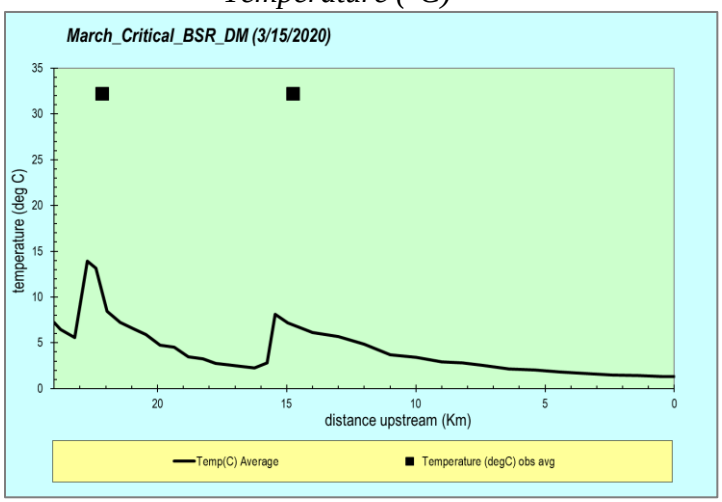
Ammonia (µg/L)



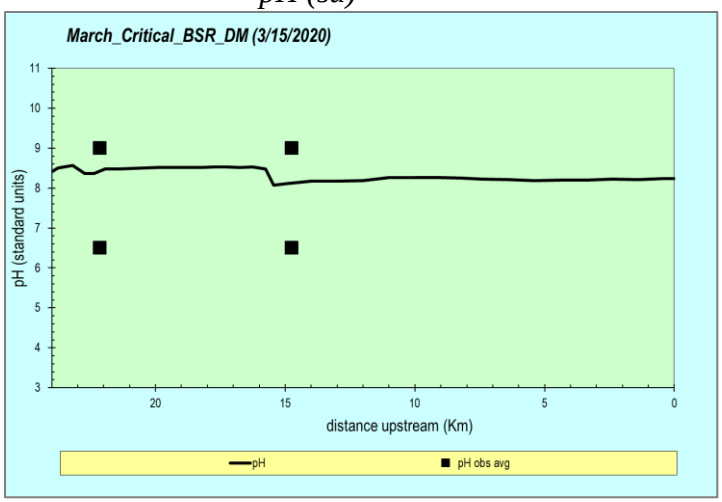
Fast $CBOD_5$ (mg/L)



Temperature (°C)

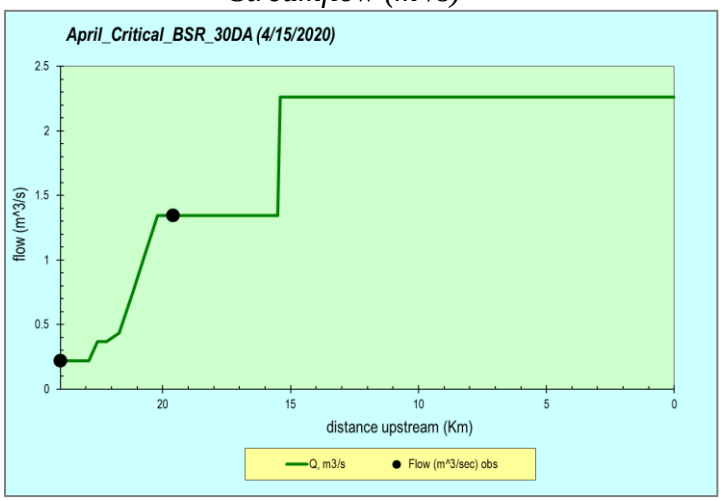


pH (su)

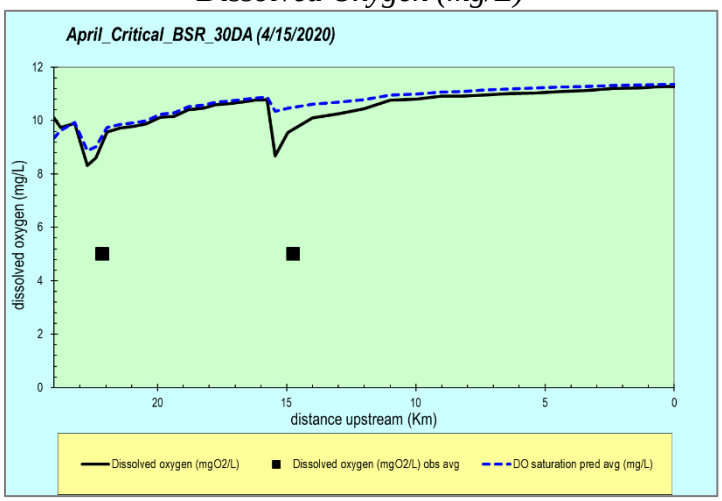


April Critical Conditions
Chronic (30-Day Average)

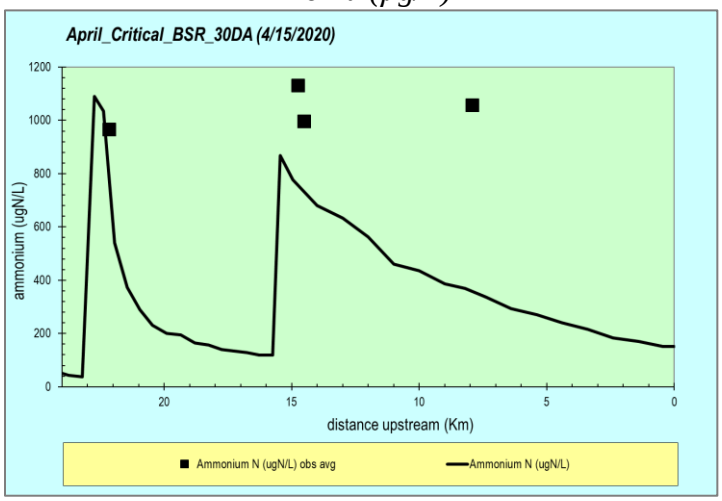
Streamflow (m^3/s)



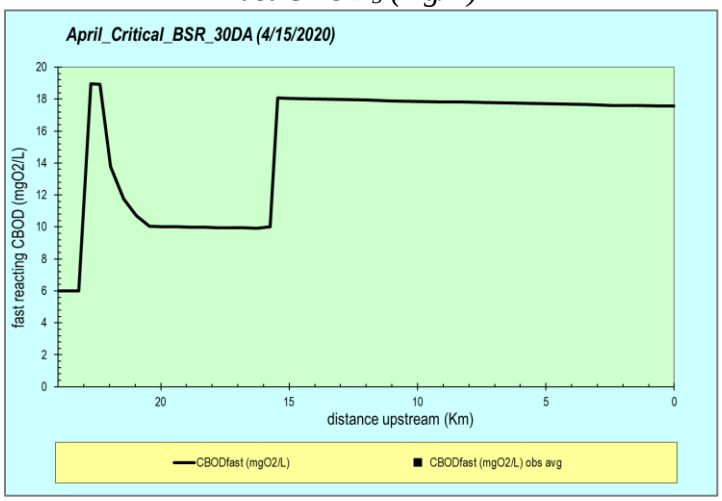
Dissolved Oxygen (mg/L)



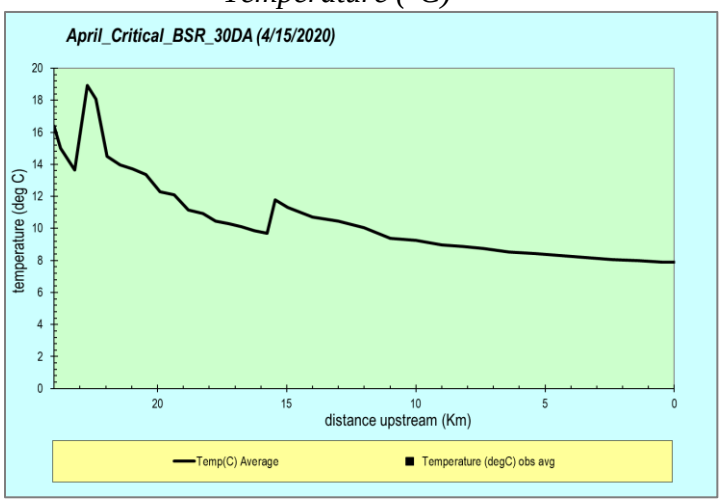
Ammonia (µg/L)



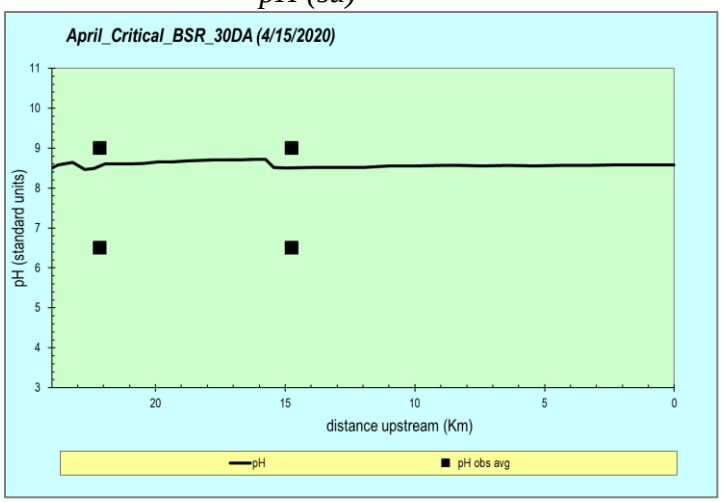
Fast $CBOD_5$ (mg/L)



Temperature (°C)

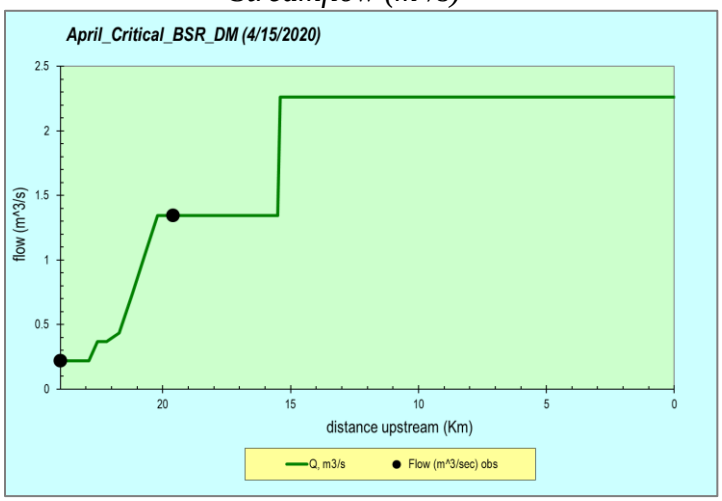


pH (su)

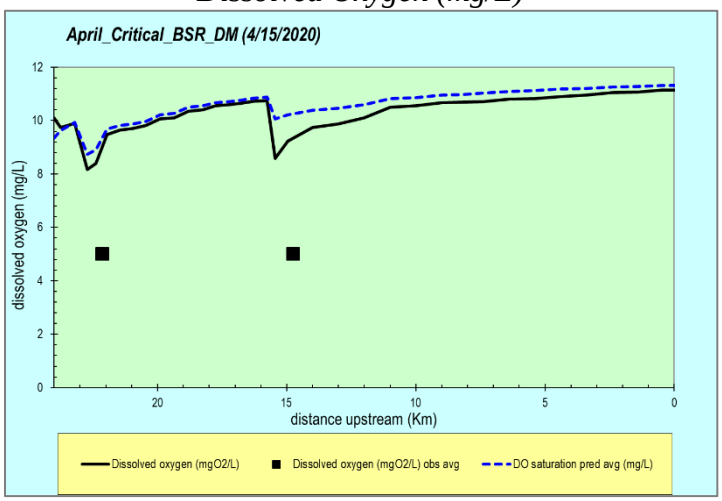


April Critical Conditions
Acute (Daily Maximum)

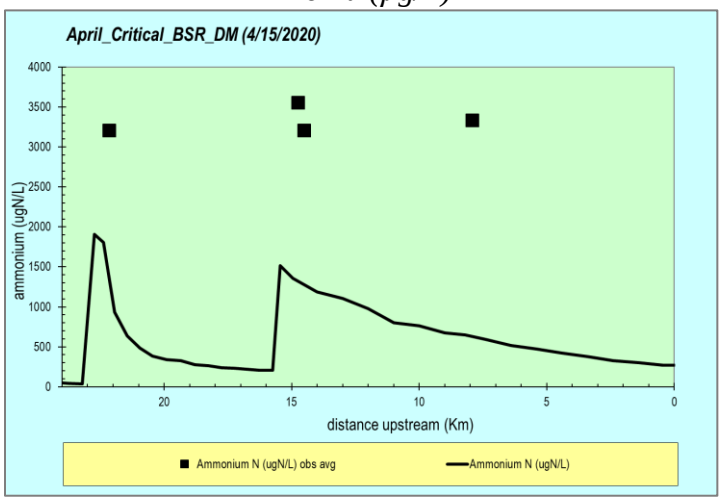
Streamflow (m^3/s)



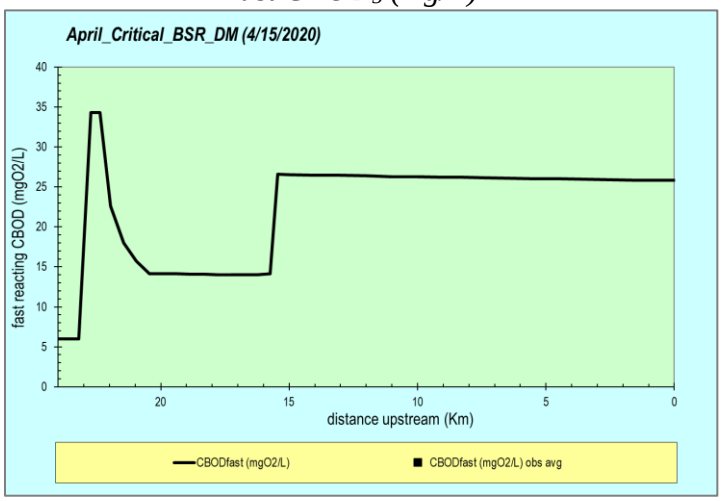
Dissolved Oxygen (mg/L)



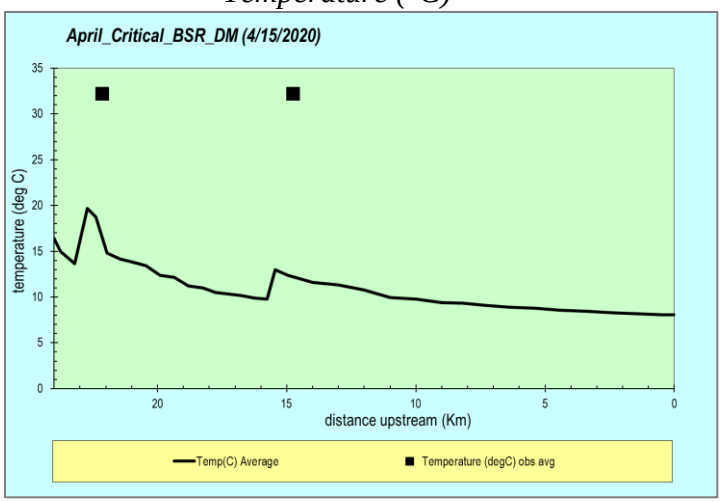
Ammonia (µg/L)



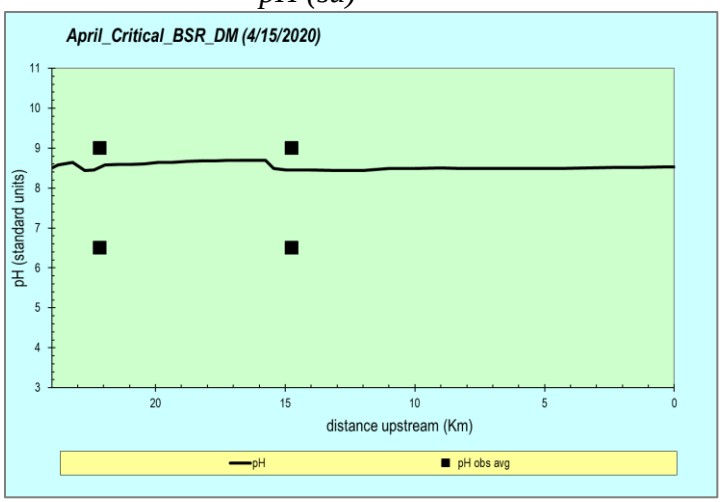
Fast $CBOD_5$ (mg/L)



Temperature (°C)

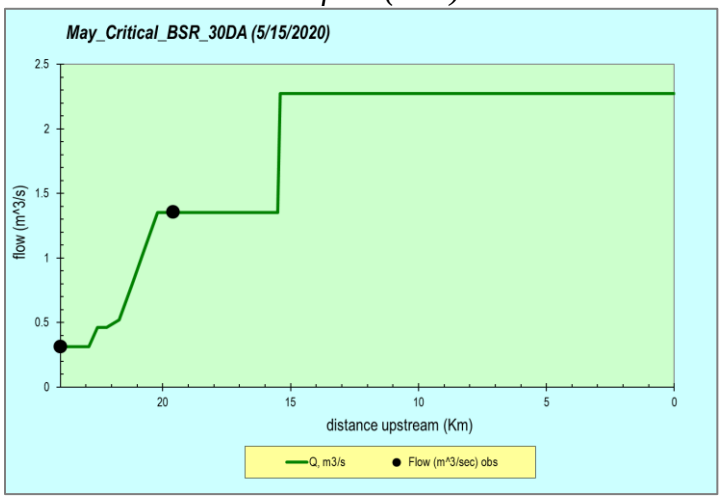


pH (su)

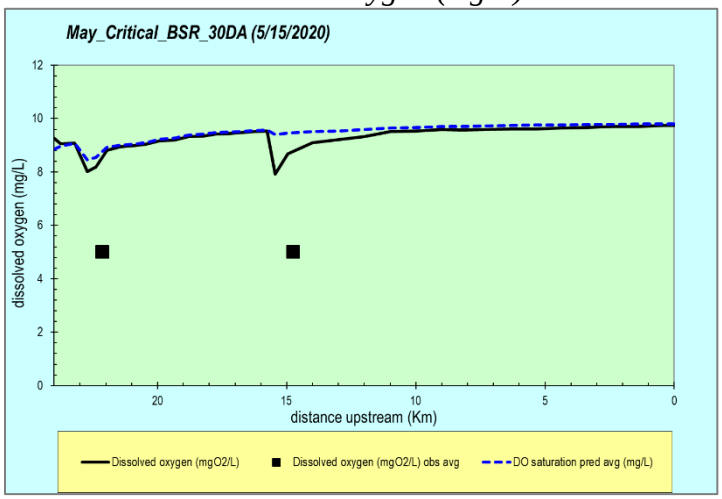


May Critical Conditions
Chronic (30-Day Average)

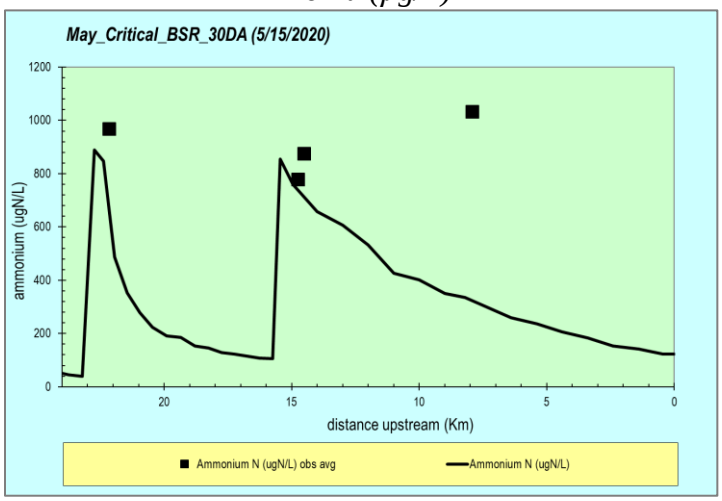
Streamflow (m^3/s)



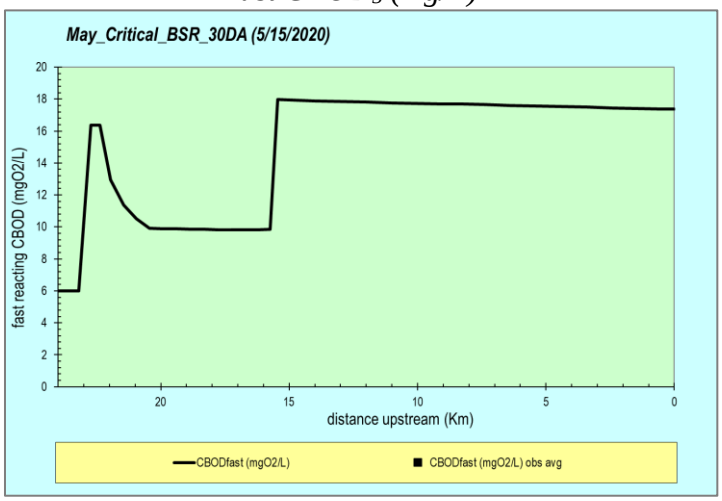
Dissolved Oxygen (mg/L)



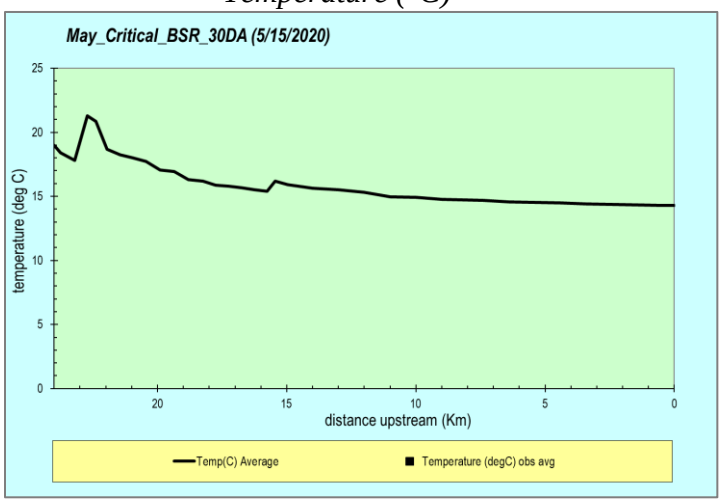
Ammonia (µg/L)



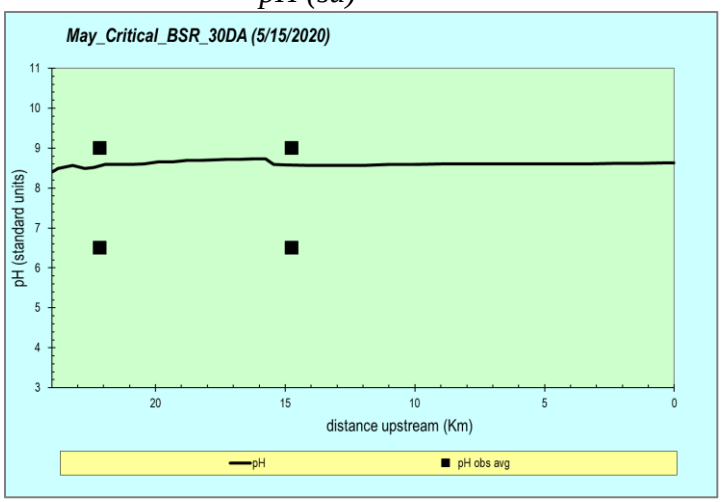
Fast $CBOD_5$ (mg/L)



Temperature (°C)

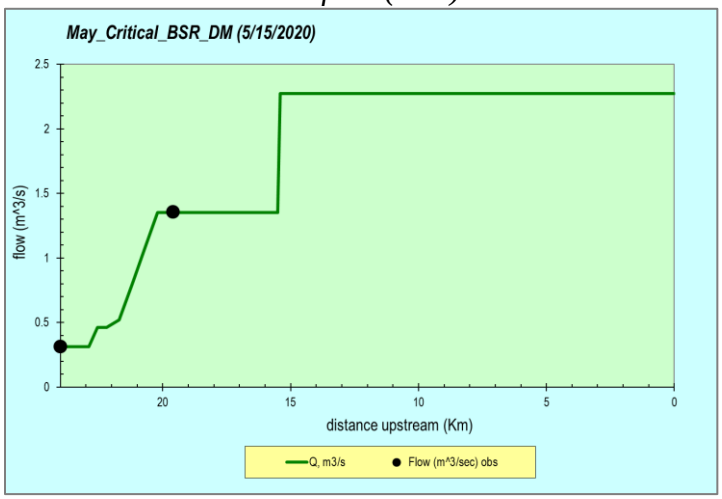


pH (su)

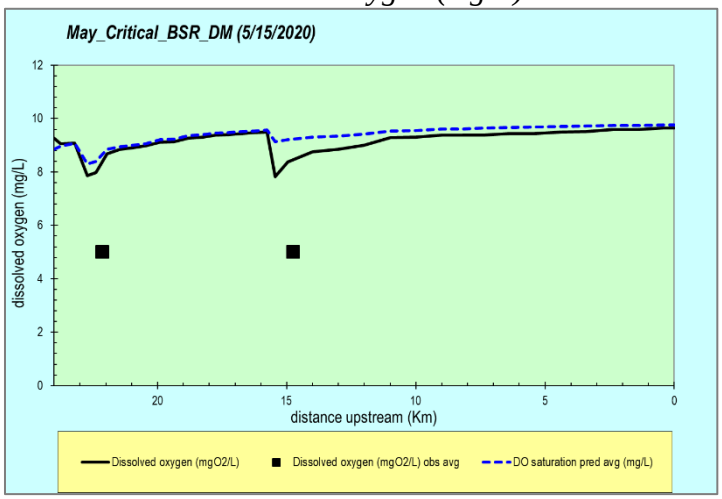


May Critical Conditions
Acute (Daily Maximum)

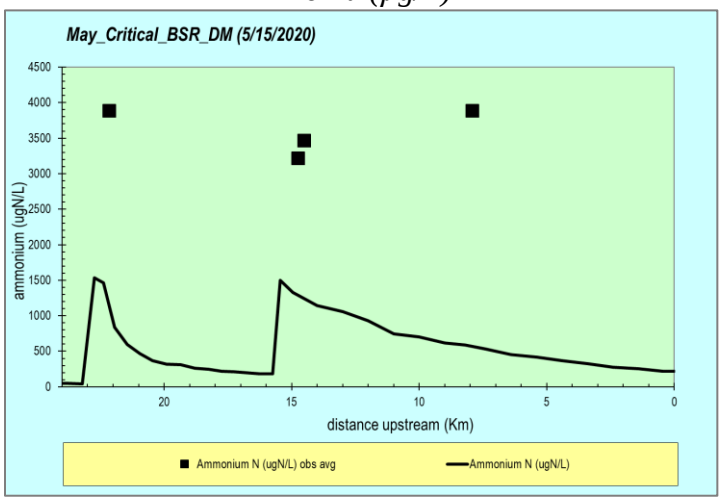
Streamflow (m^3/s)



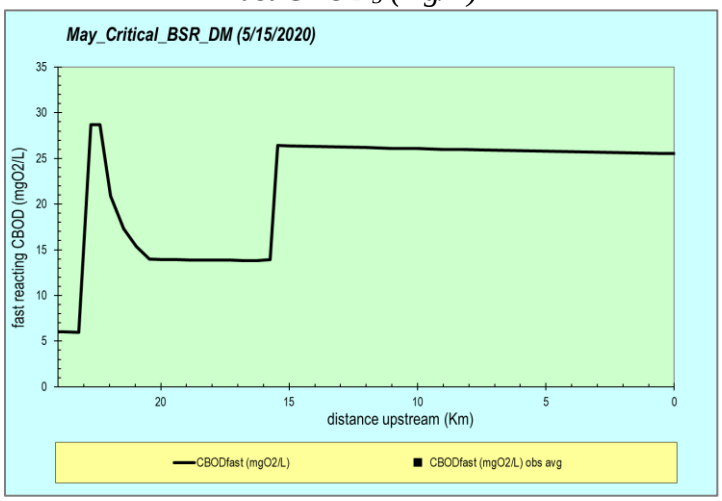
Dissolved Oxygen (mg/L)



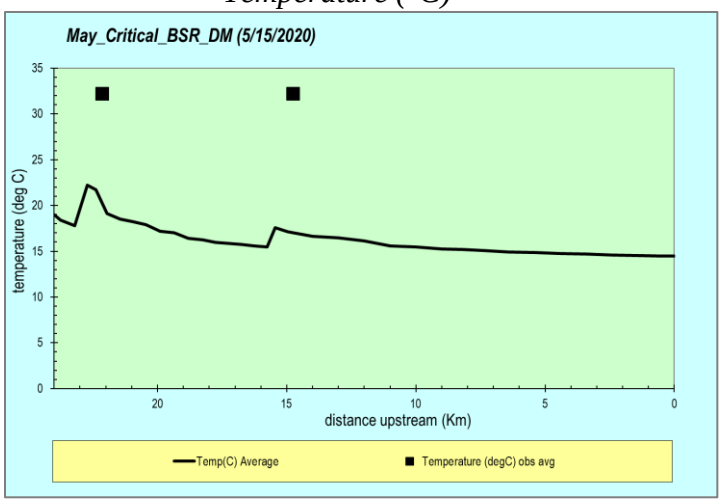
Ammonia (µg/L)



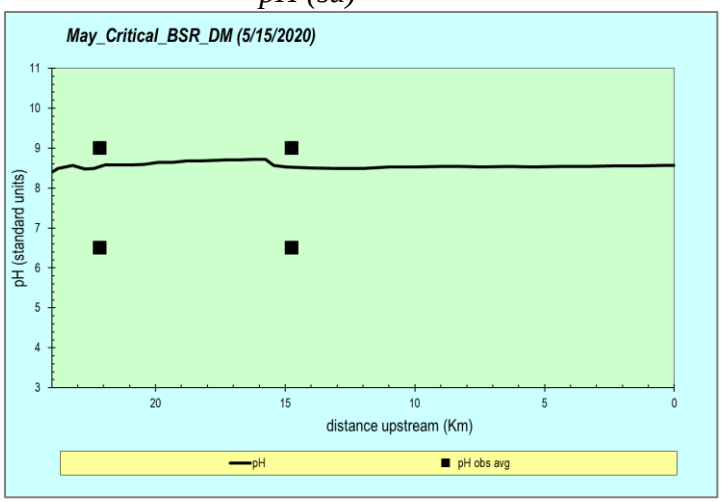
Fast $CBOD_5$ (mg/L)



Temperature (°C)

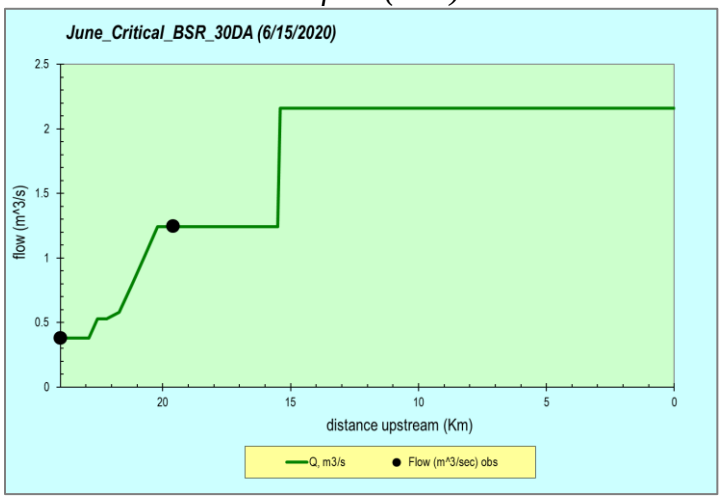


pH (su)

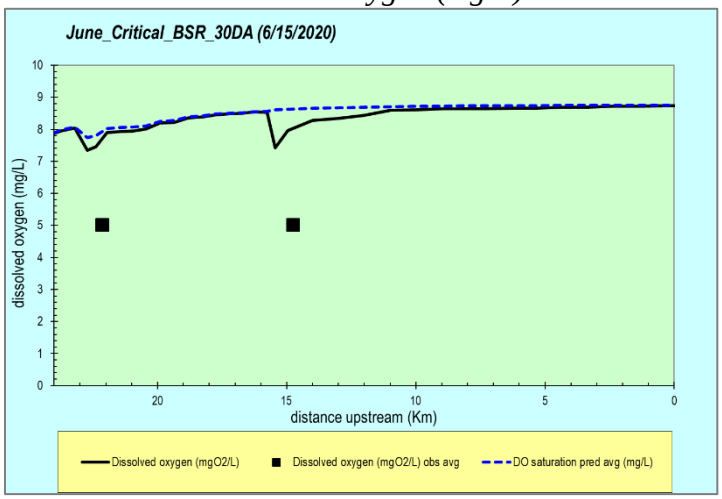


June Critical Conditions
Chronic (30-Day Average)

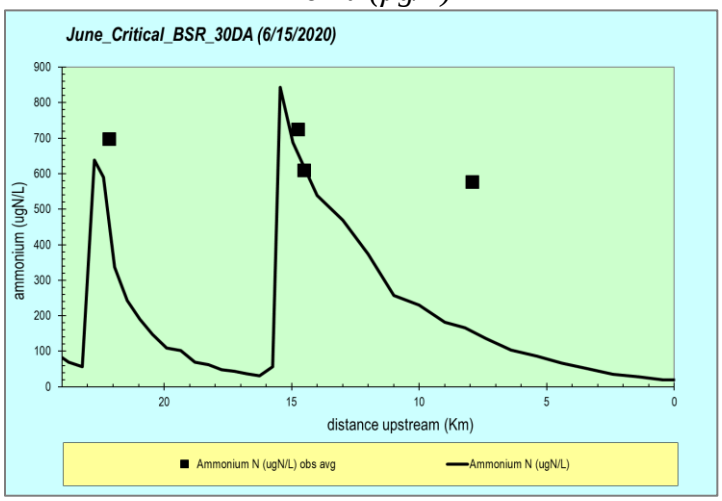
Streamflow (m^3/s)



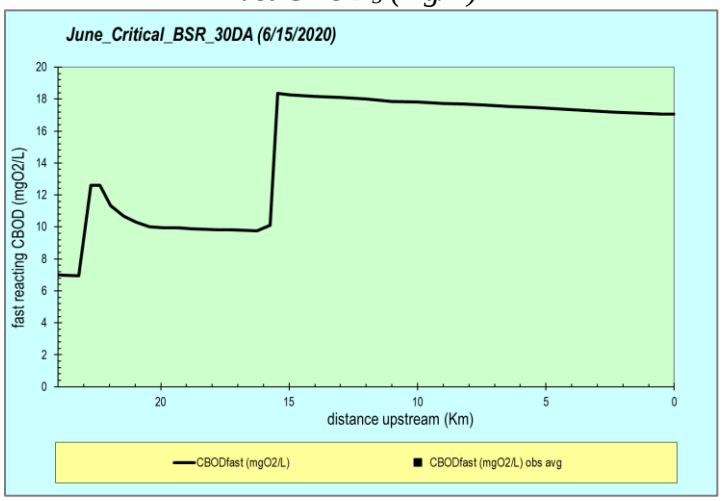
Dissolved Oxygen (mg/L)

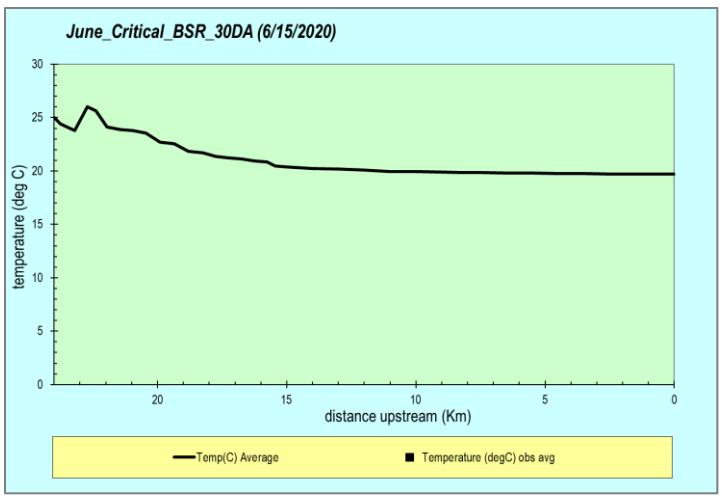


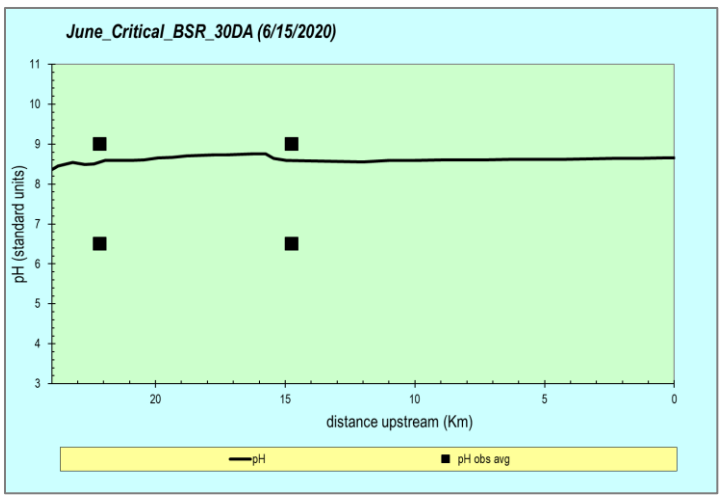
Ammonia (µg/L)



Fast $CBOD_5$ (mg/L)

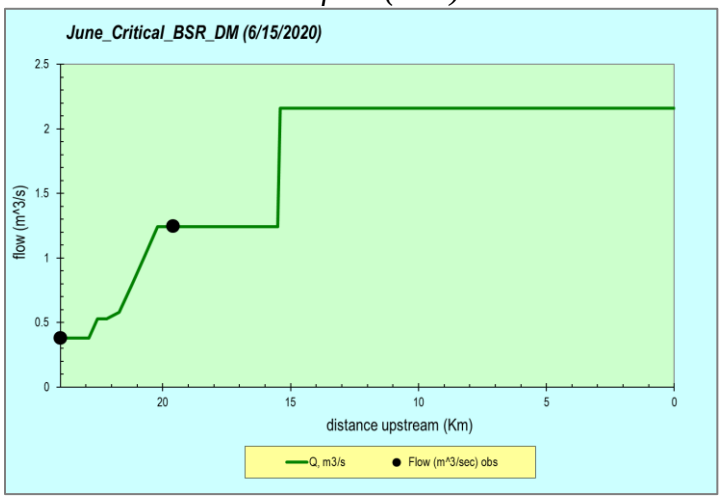




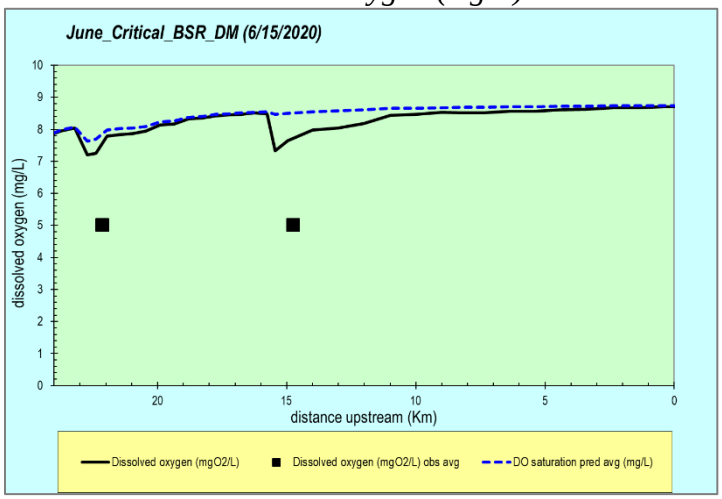


June Critical Conditions
Acute (Daily Maximum)

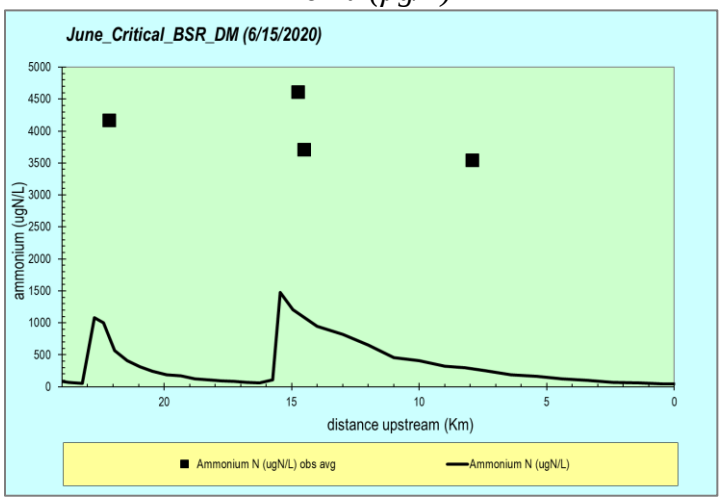
Streamflow (m^3/s)



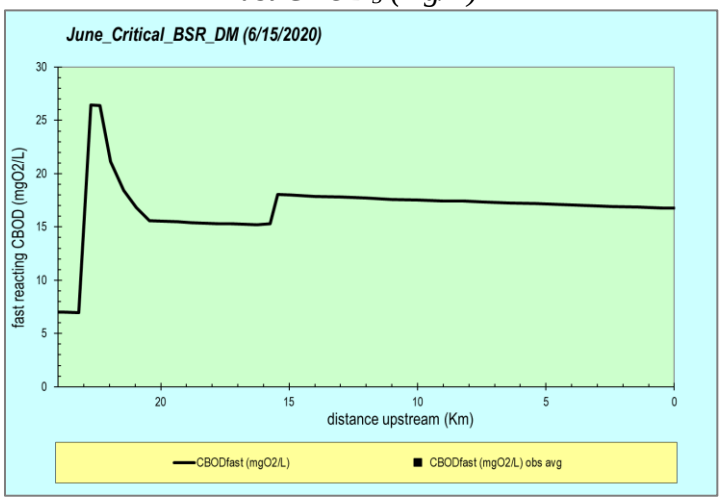
Dissolved Oxygen (mg/L)



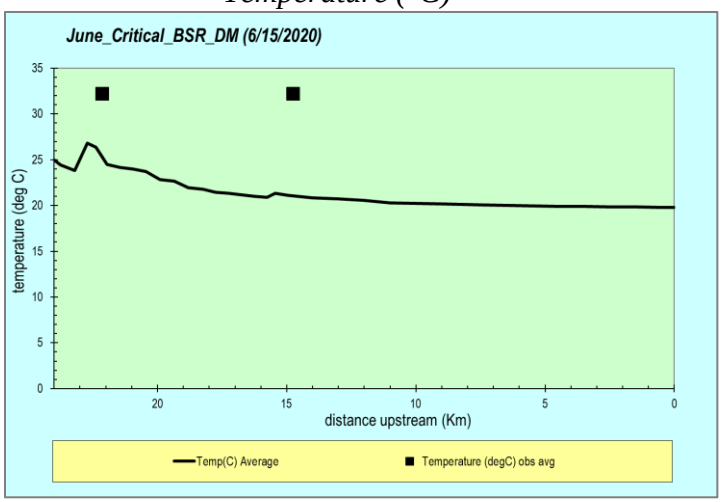
Ammonia (µg/L)



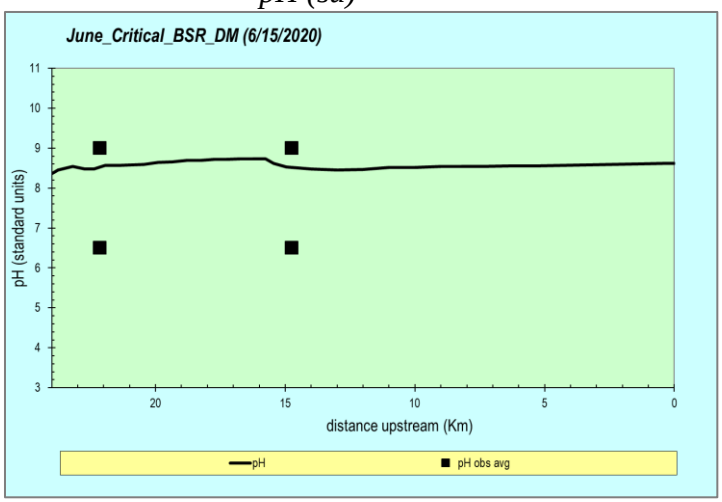
Fast $CBOD_5$ (mg/L)



Temperature (°C)

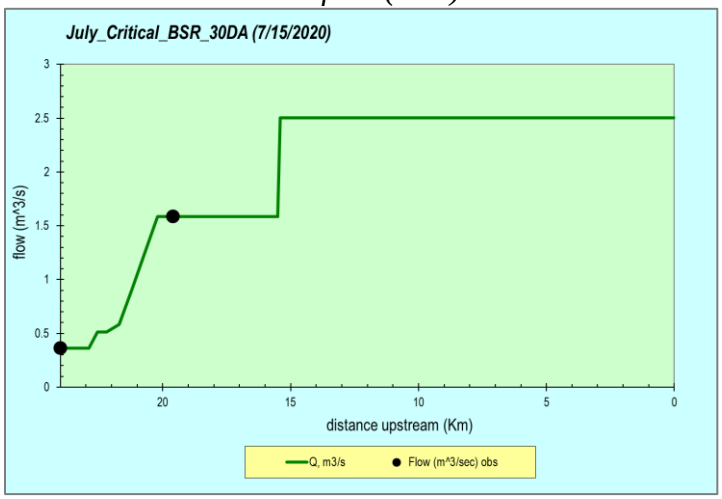


pH (su)

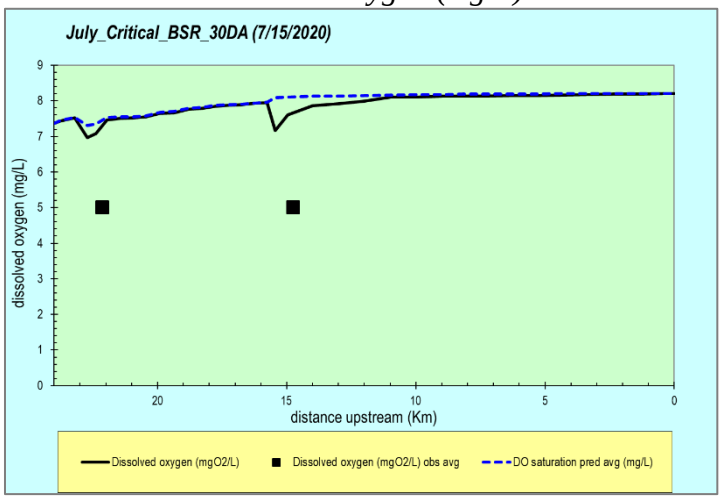


July Critical Conditions
Chronic (30-Day Average)

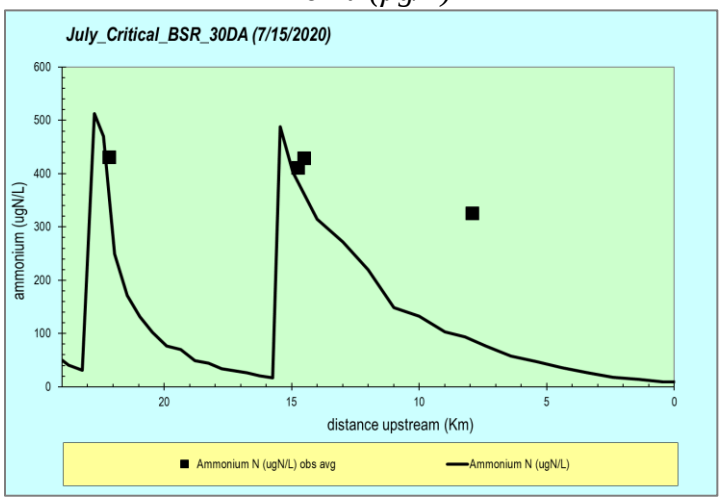
Streamflow (m^3/s)



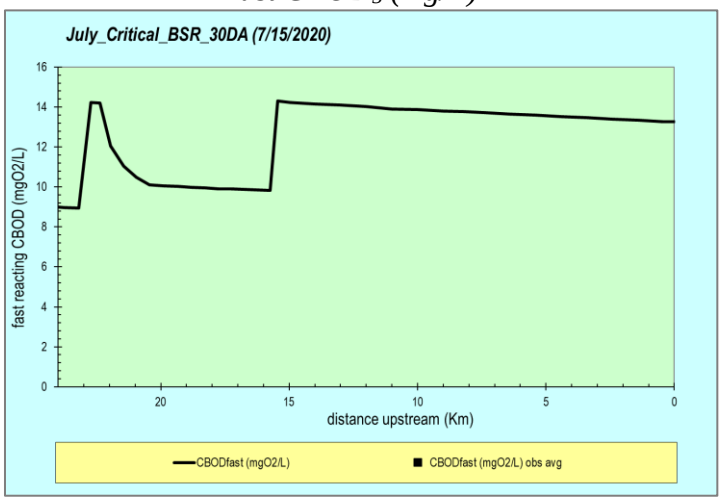
Dissolved Oxygen (mg/L)



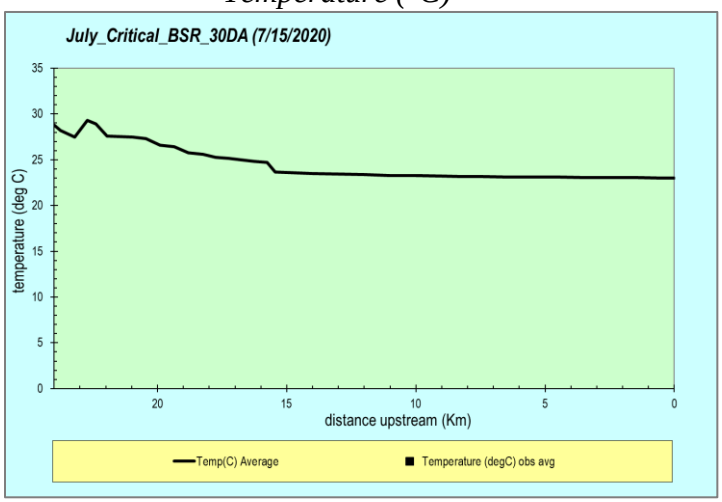
Ammonia (µg/L)



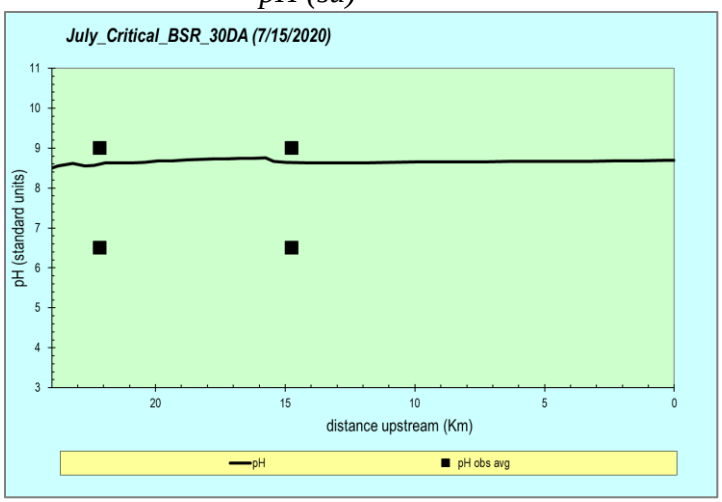
Fast $CBOD_5$ (mg/L)



Temperature (°C)

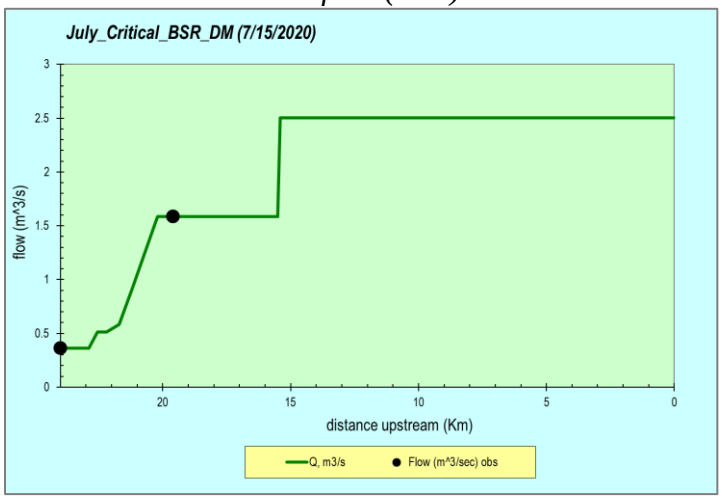


pH (su)

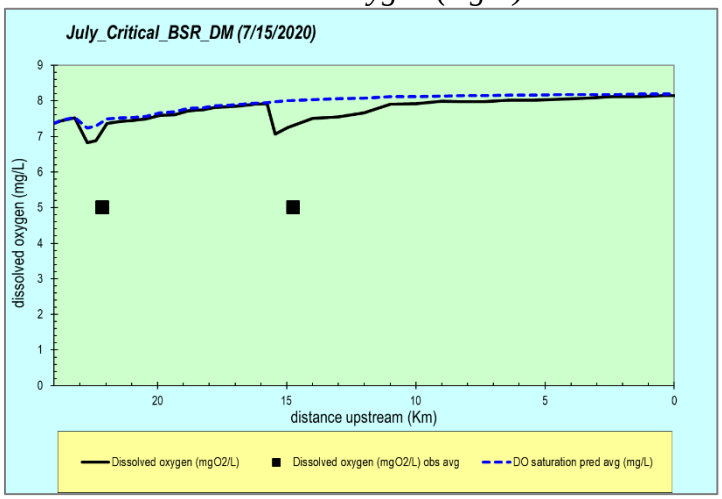


July Critical Conditions
Acute (Daily Maximum)

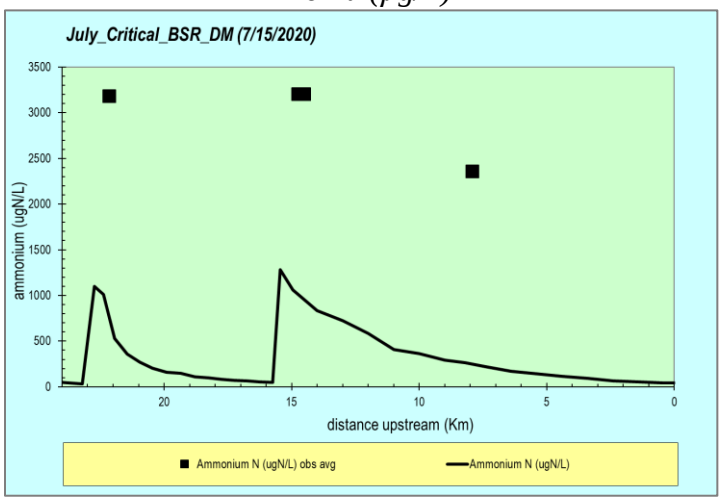
Streamflow (m^3/s)



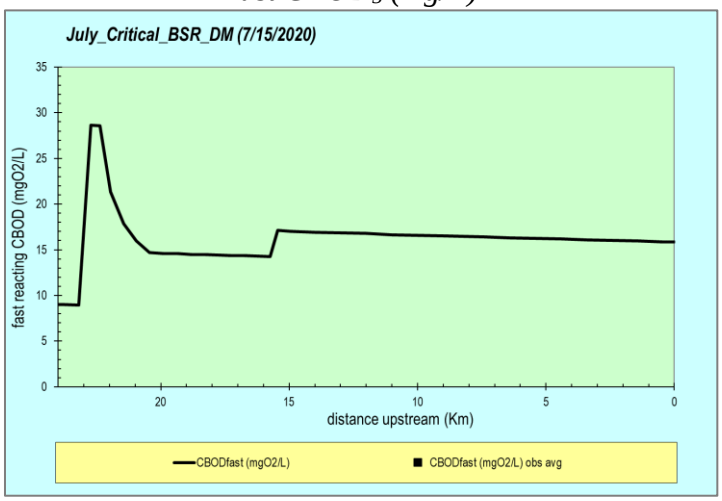
Dissolved Oxygen (mg/L)



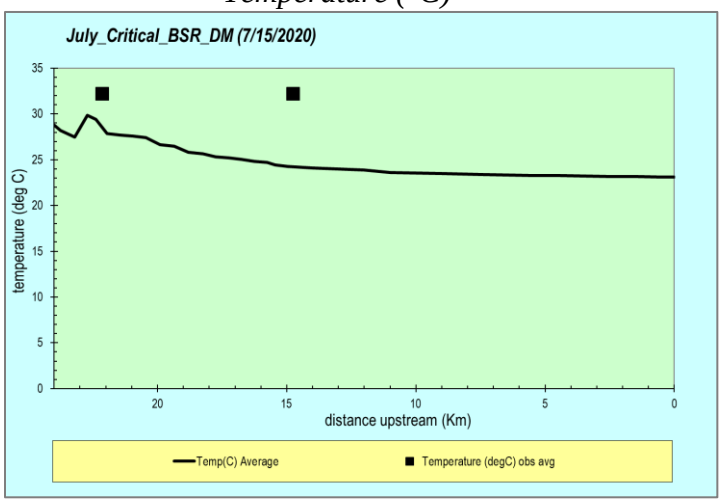
Ammonia (µg/L)



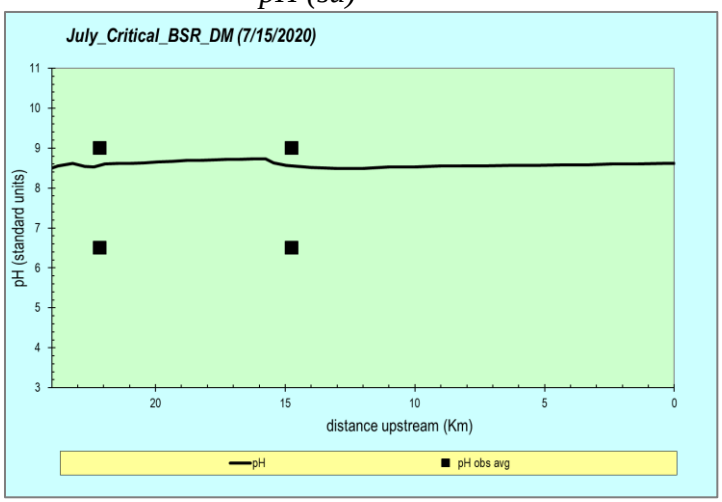
Fast $CBOD_5$ (mg/L)



Temperature (°C)

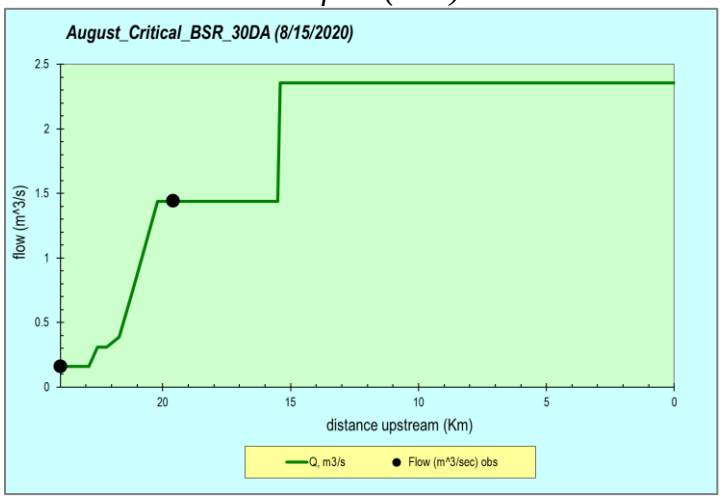


pH (su)

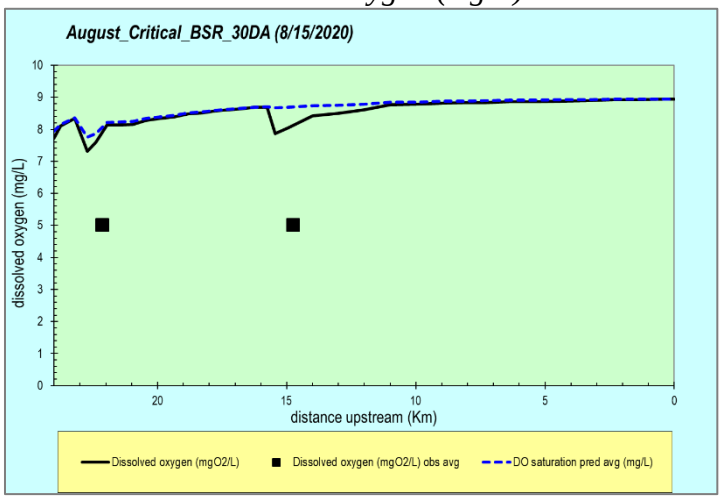


August Critical Conditions
Chronic (30-Day Average)

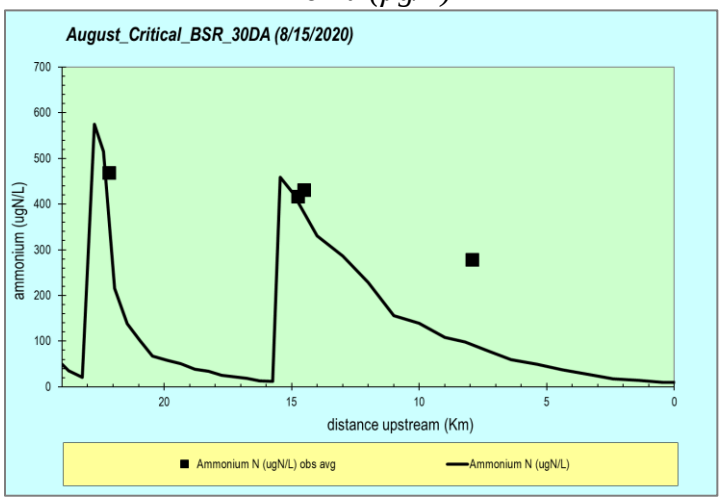
Streamflow (m^3/s)



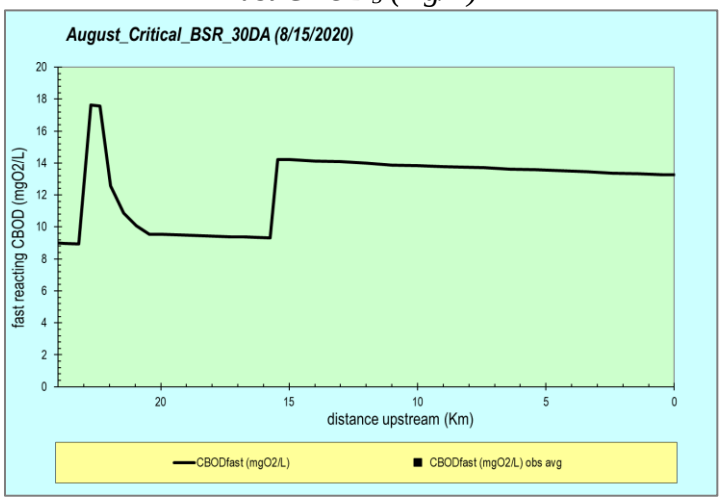
Dissolved Oxygen (mg/L)



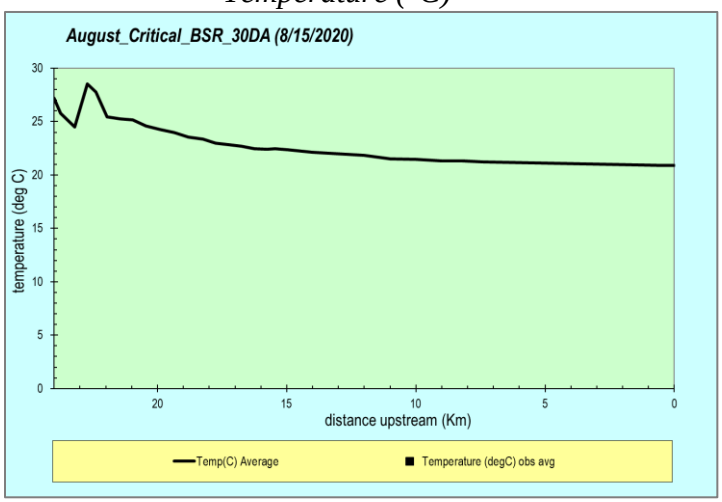
Ammonia (µg/L)



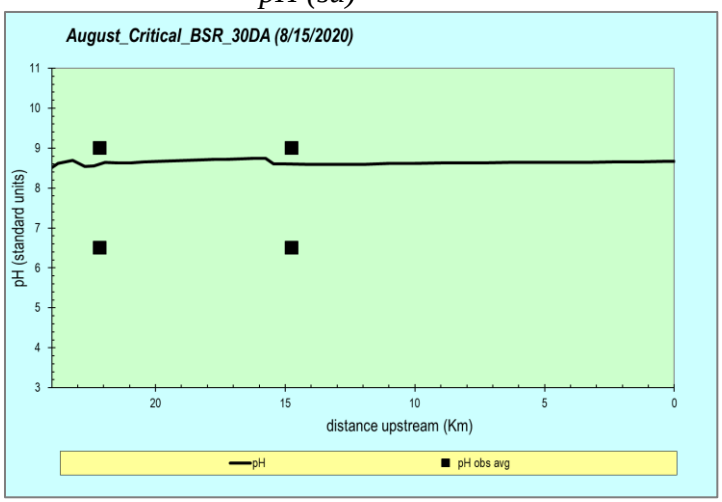
Fast $CBOD_5$ (mg/L)



Temperature (°C)

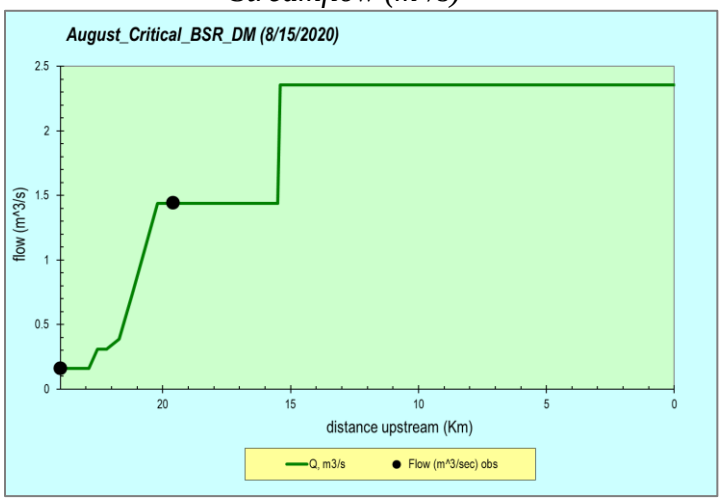


pH (su)

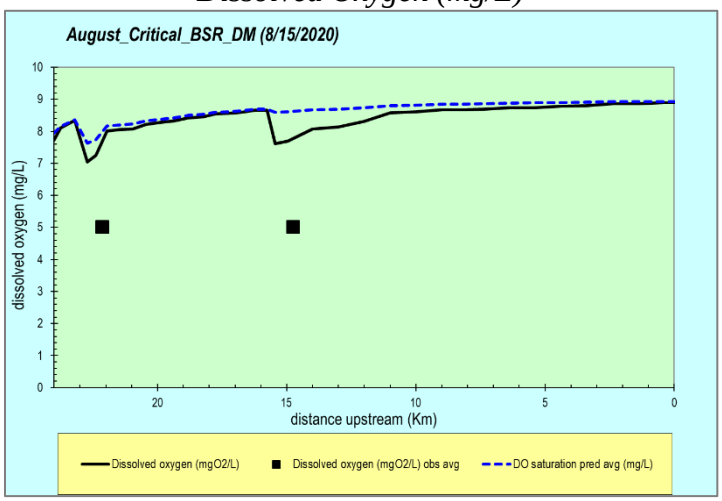


August Critical Conditions
Acute (Daily Maximum)

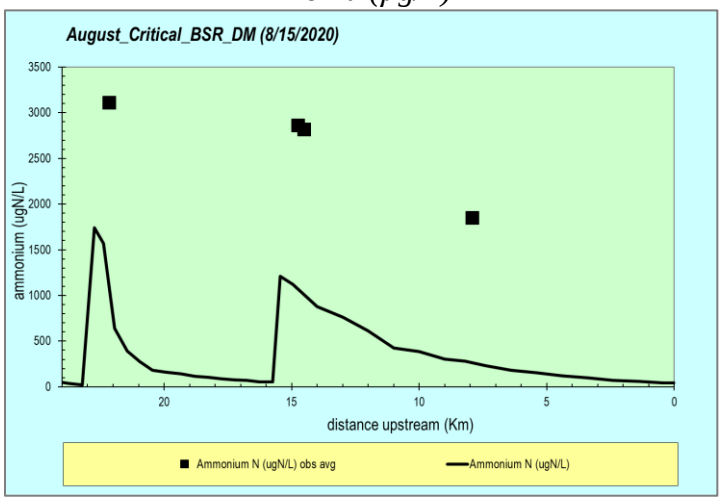
Streamflow (m^3/s)



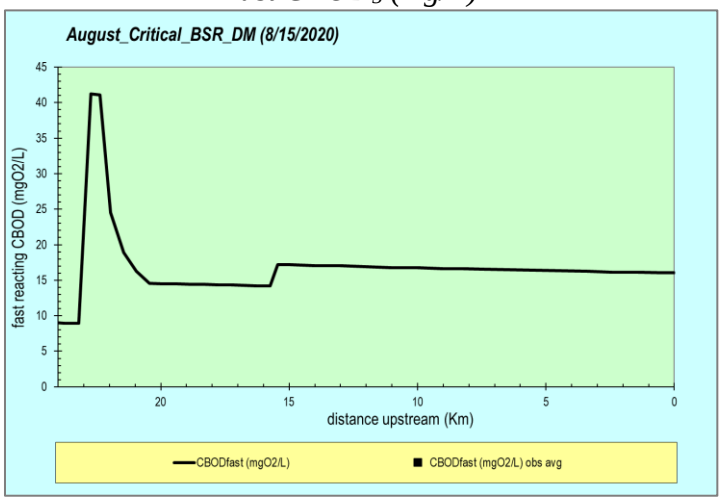
Dissolved Oxygen (mg/L)



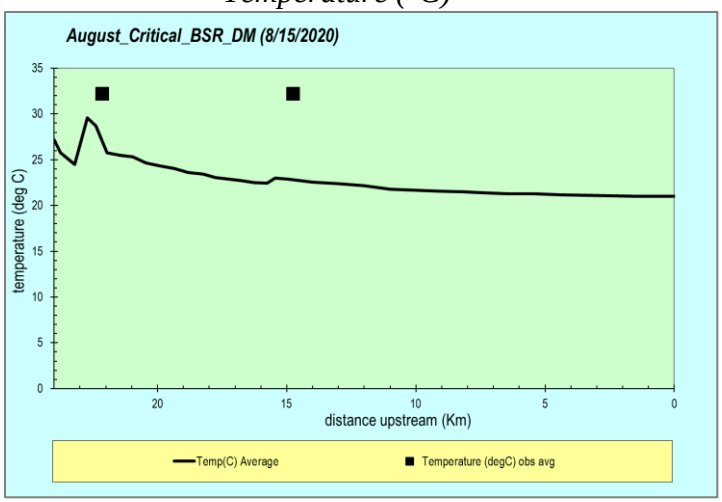
Ammonia (µg/L)



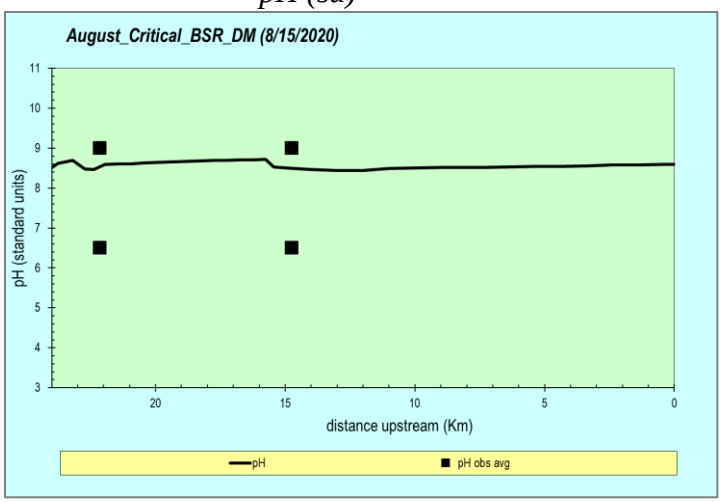
Fast $CBOD_5$ (mg/L)



Temperature (°C)

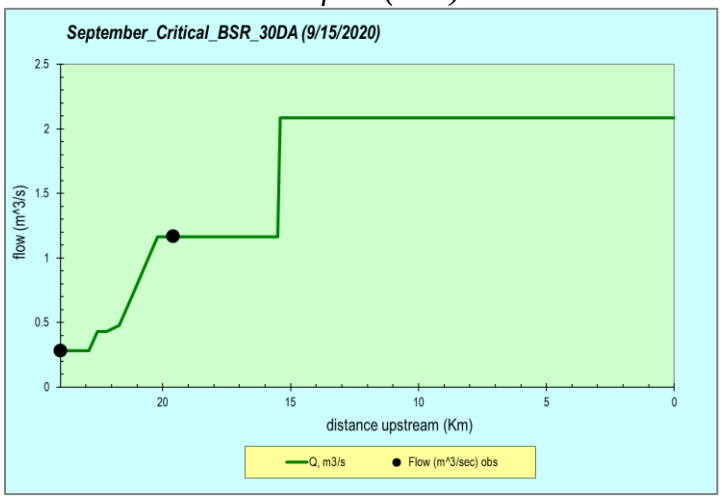


pH (su)

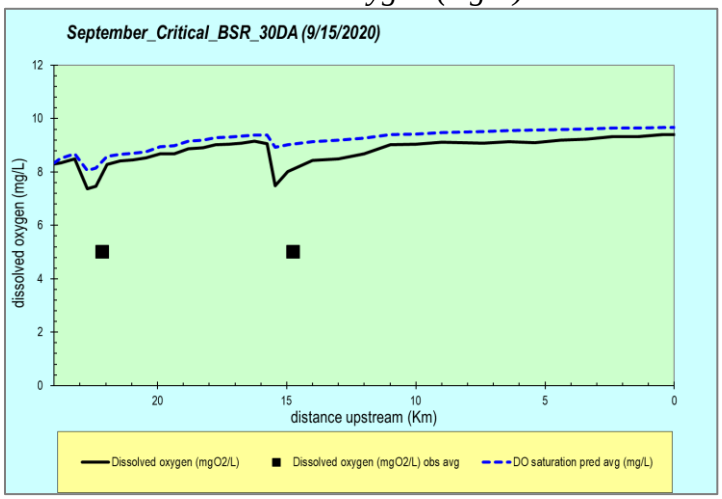


September Critical Conditions
Chronic (30-Day Average)

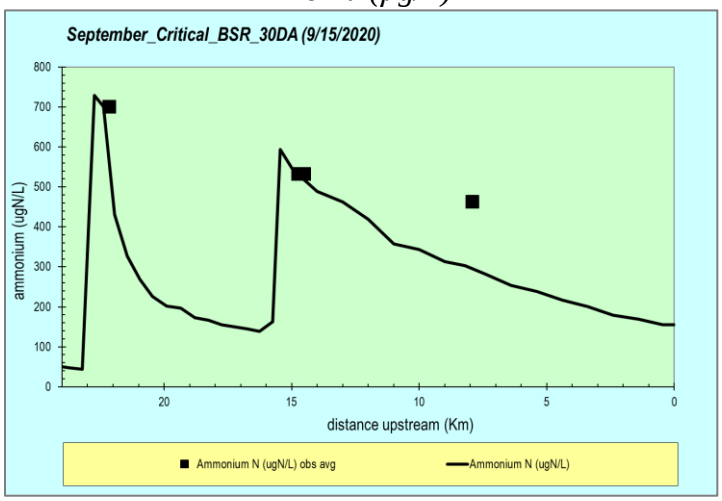
Streamflow (m^3/s)



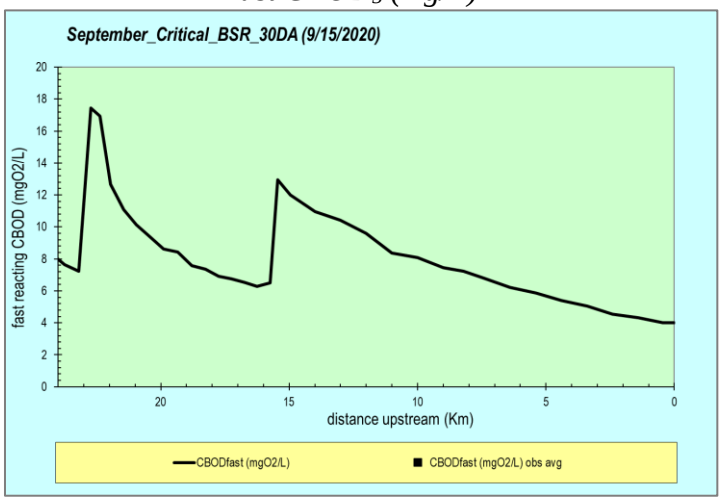
Dissolved Oxygen (mg/L)



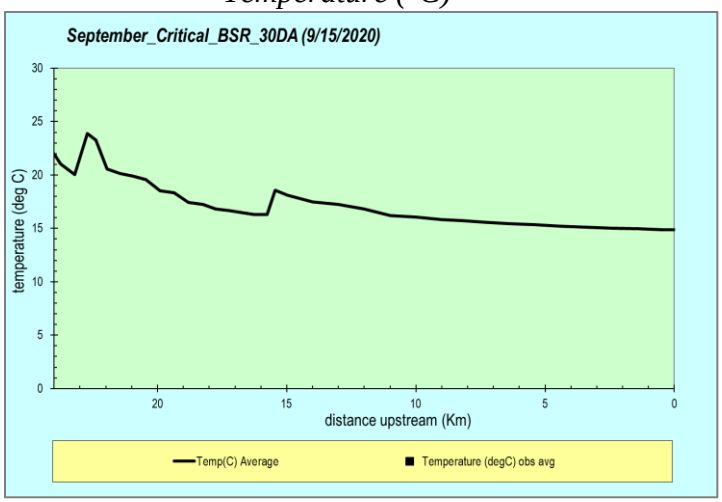
Ammonia (µg/L)



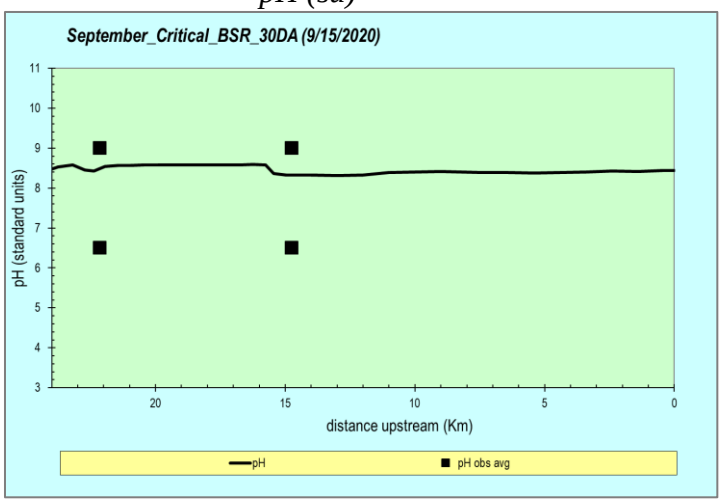
Fast $CBOD_5$ (mg/L)



Temperature (°C)

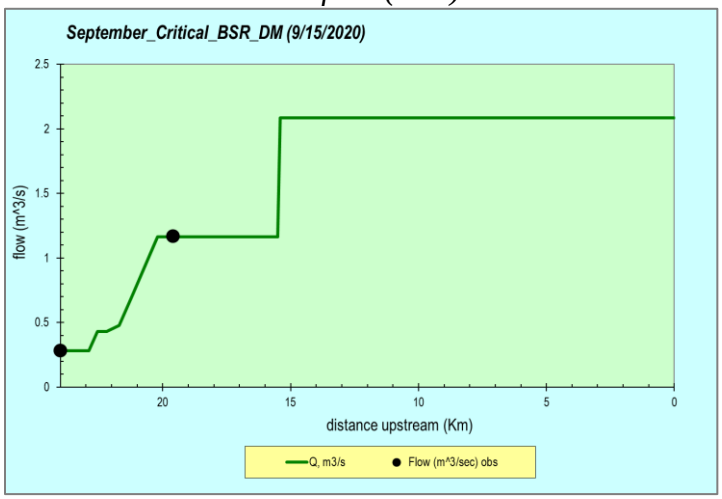


pH (su)

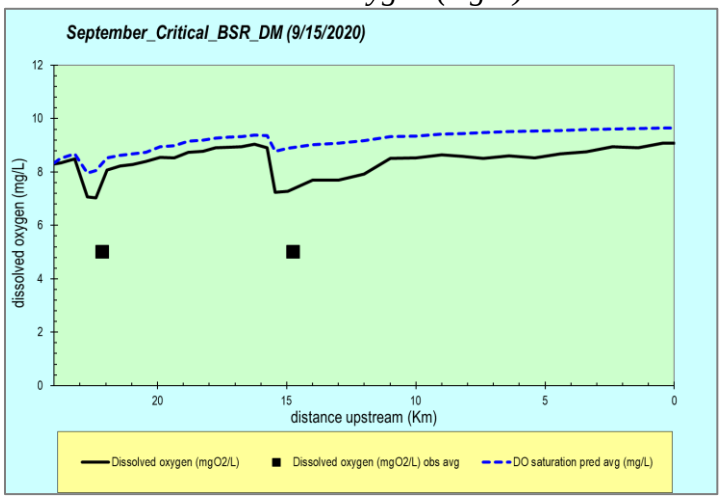


September Critical Conditions
Acute (Daily Maximum)

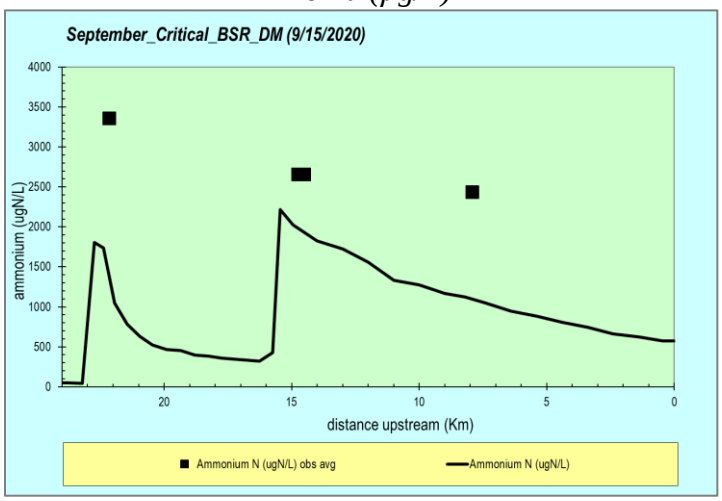
Streamflow (m^3/s)



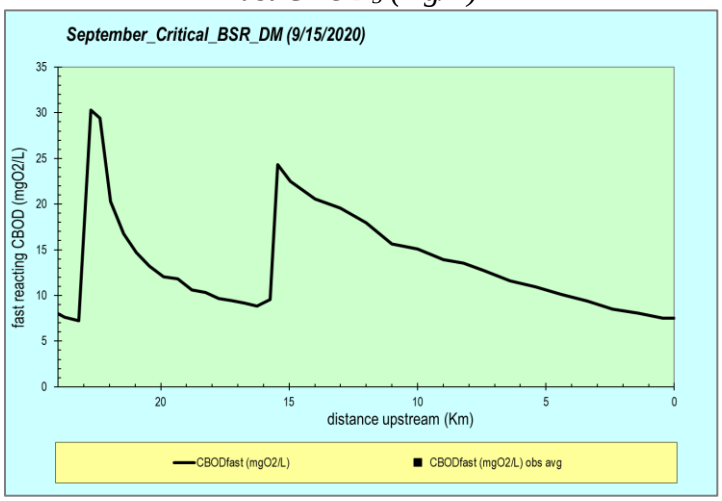
Dissolved Oxygen (mg/L)



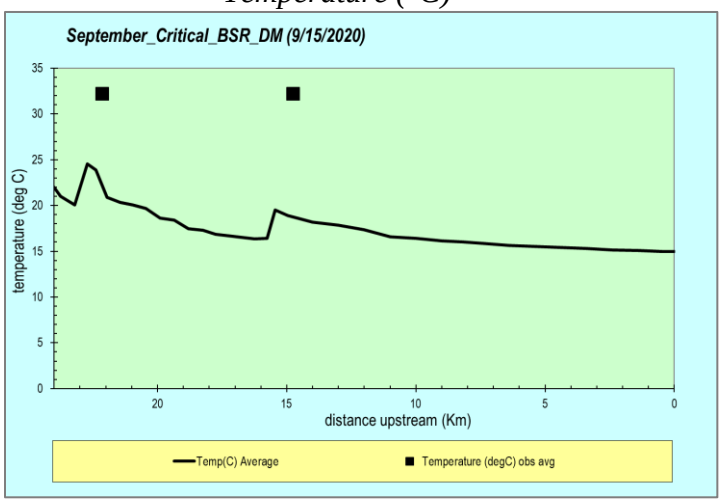
Ammonia (µg/L)



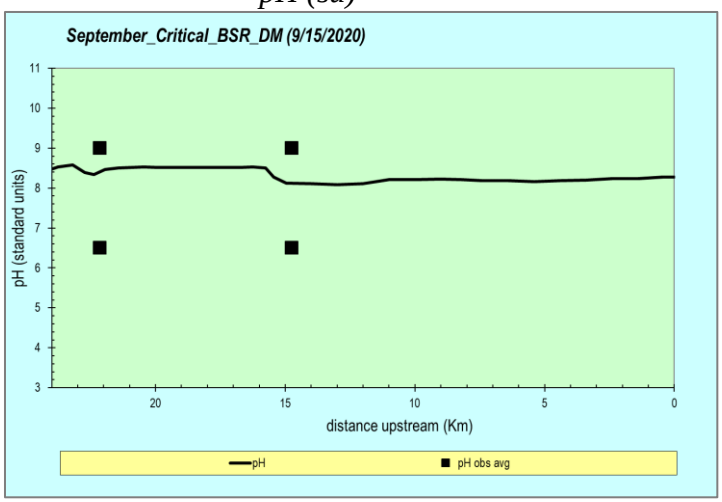
Fast $CBOD_5$ (mg/L)



Temperature (°C)

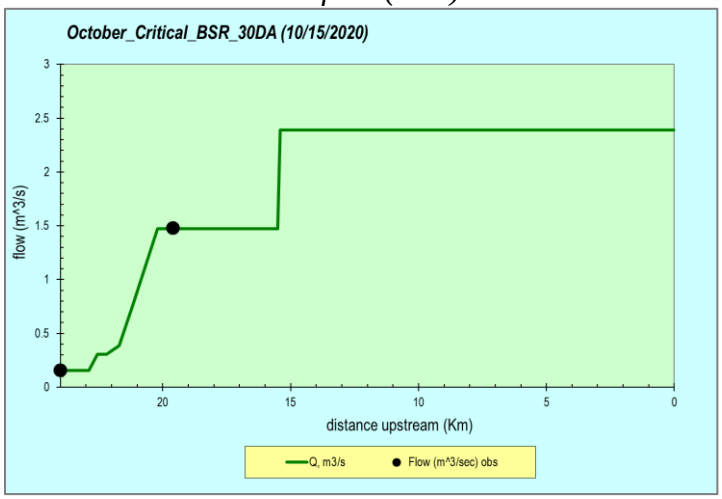


pH (su)

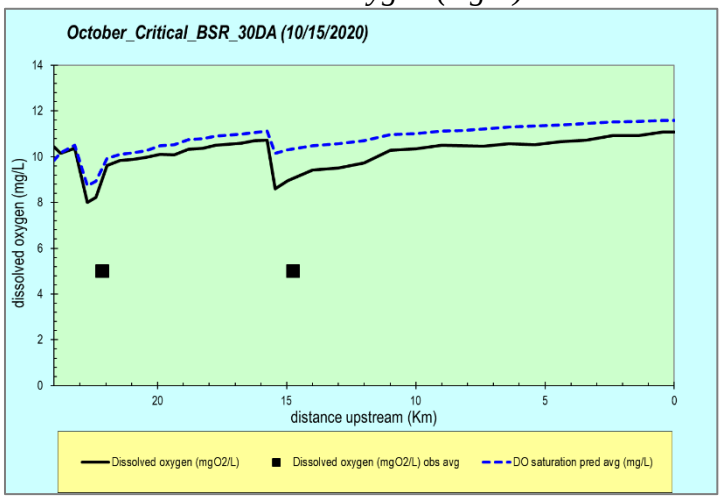


October Critical Conditions
Chronic (30-Day Average)

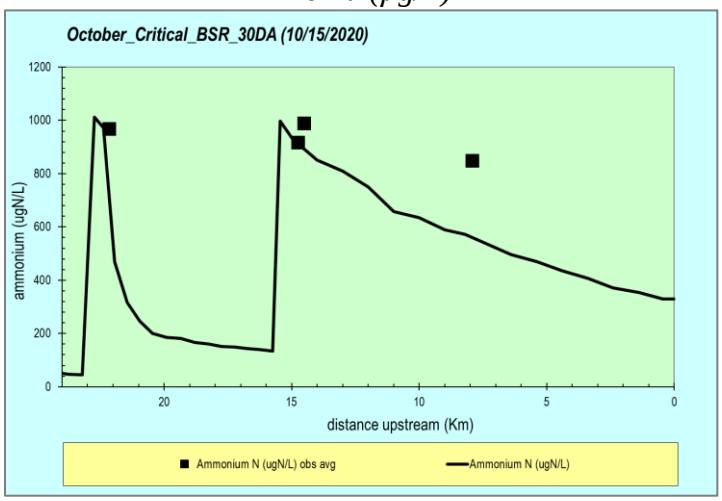
Streamflow (m^3/s)



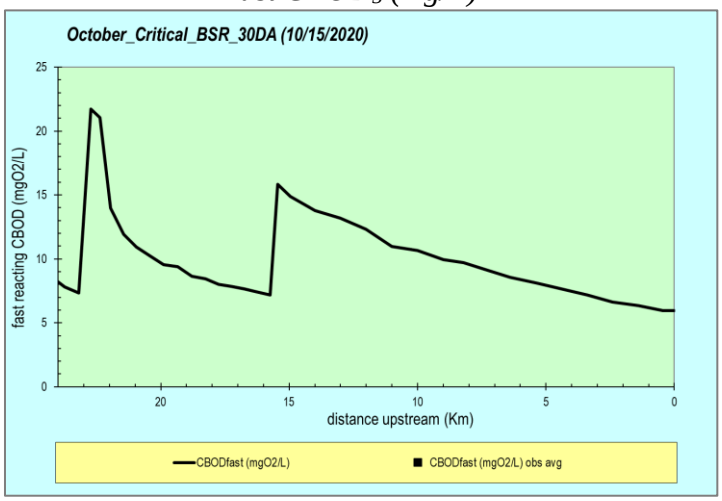
Dissolved Oxygen (mg/L)



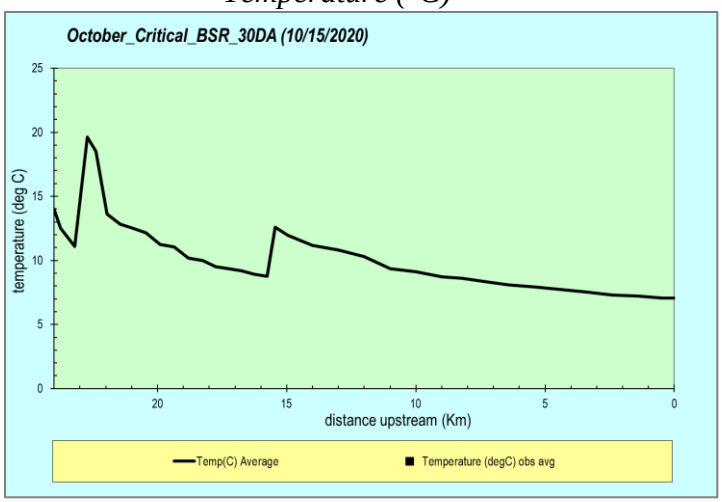
Ammonia (µg/L)



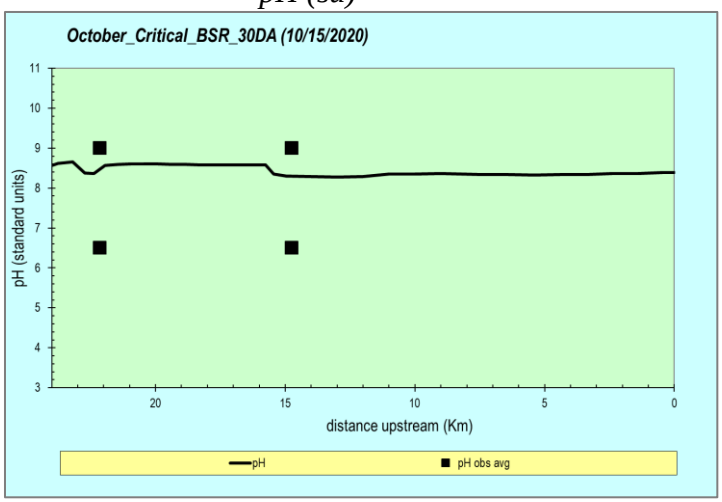
Fast $CBOD_5$ (mg/L)



Temperature (°C)

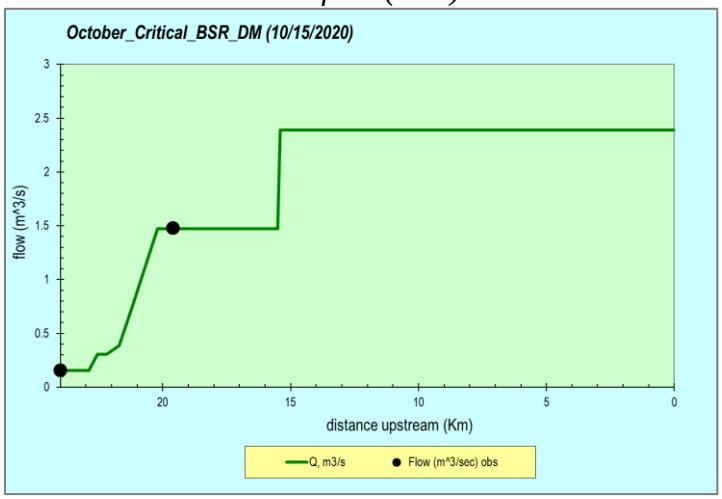


pH (su)

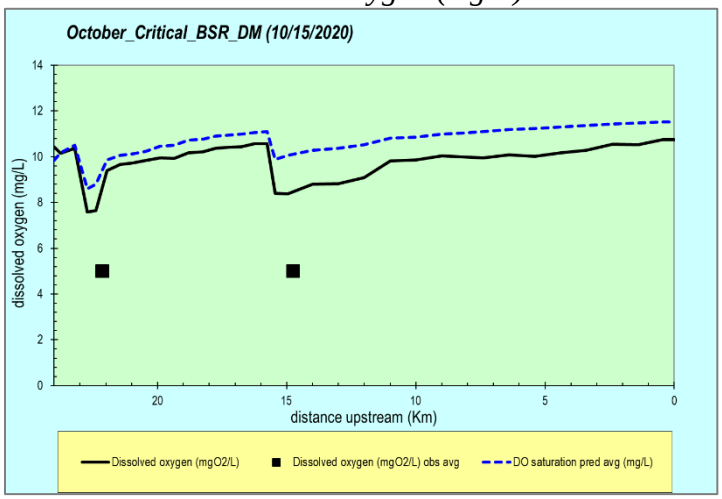


October Critical Conditions
Acute (Daily Maximum)

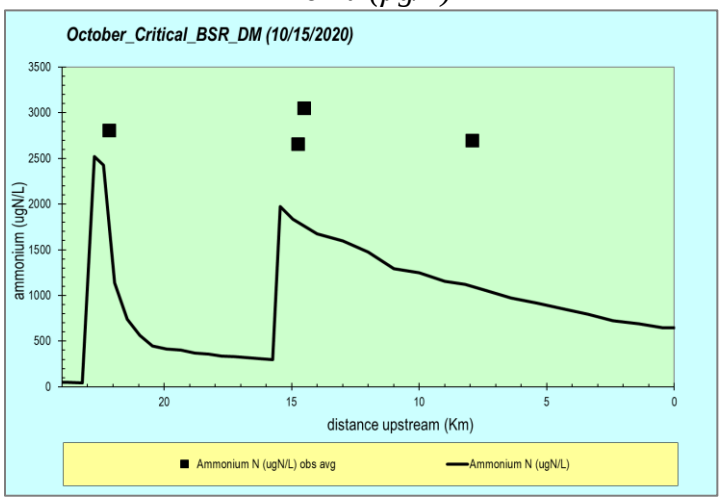
Streamflow (m^3/s)



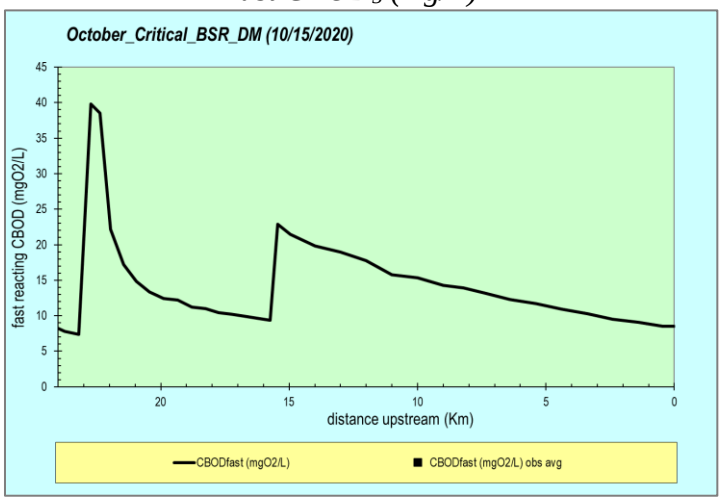
Dissolved Oxygen (mg/L)



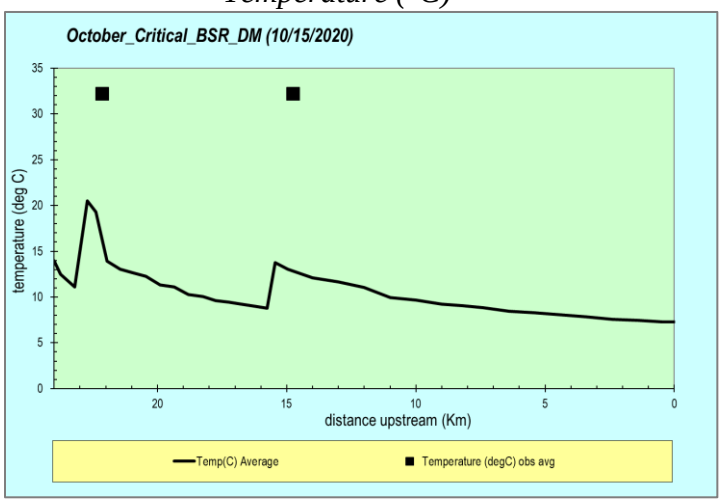
Ammonia (µg/L)



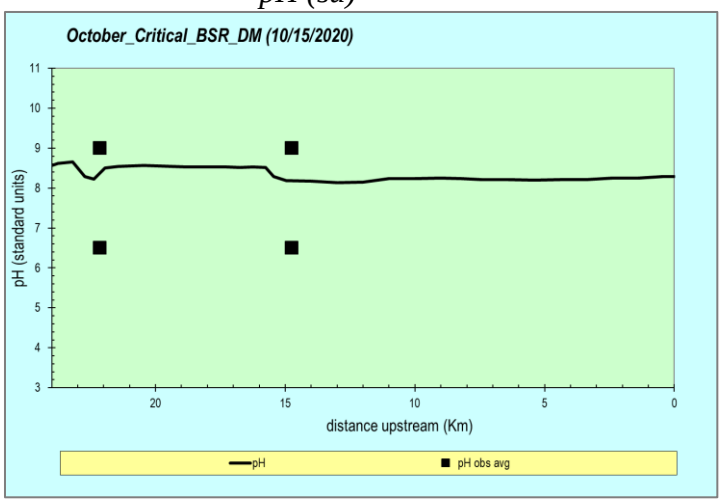
Fast $CBOD_5$ (mg/L)



Temperature (°C)

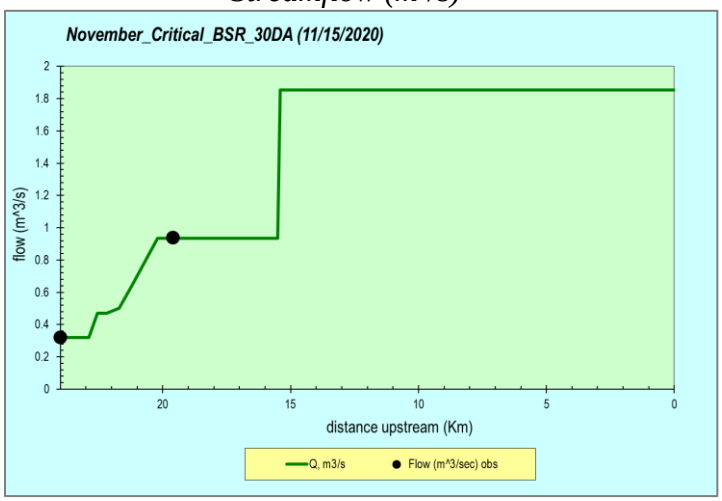


pH (su)

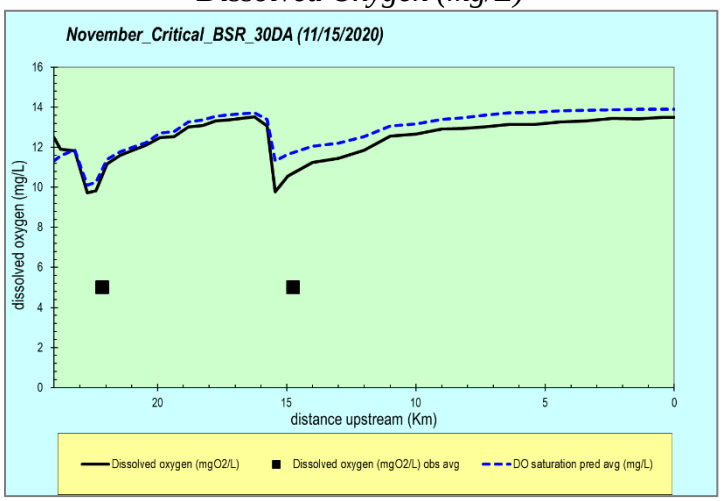


November Critical Conditions
Chronic (30-Day Average)

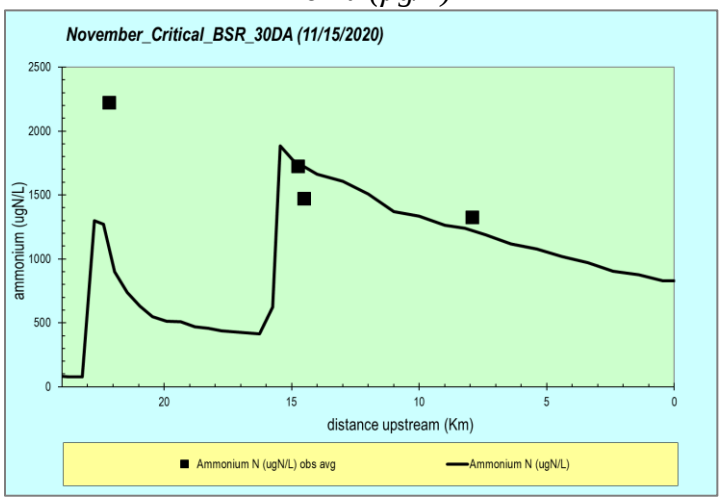
Streamflow (m^3/s)



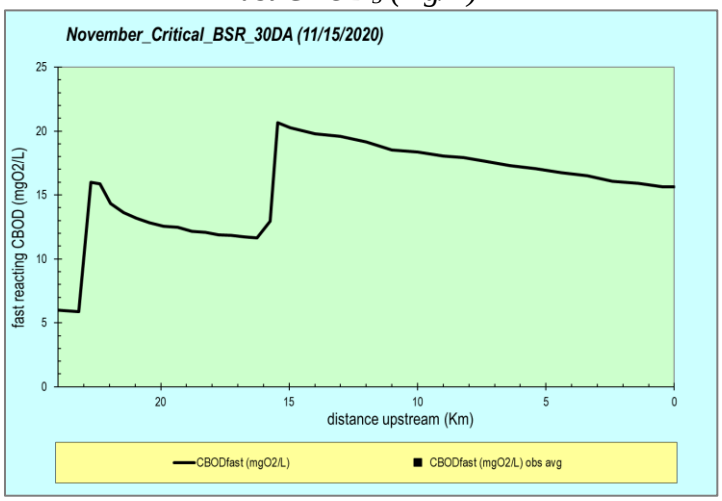
Dissolved Oxygen (mg/L)



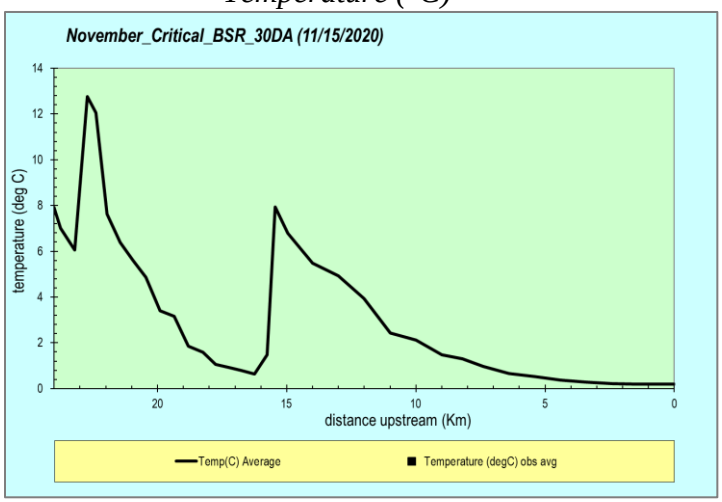
Ammonia (µg/L)



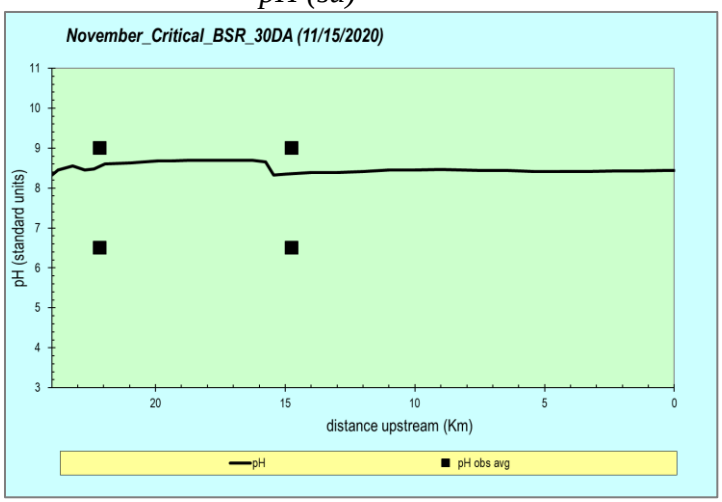
Fast $CBOD_5$ (mg/L)



Temperature (°C)

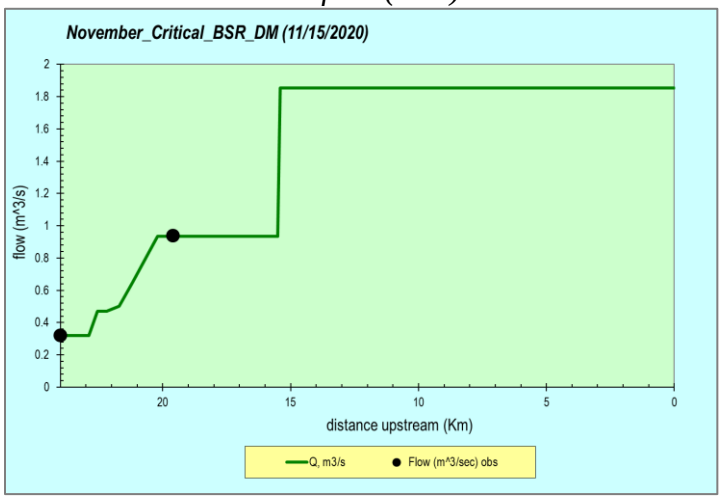


pH (su)

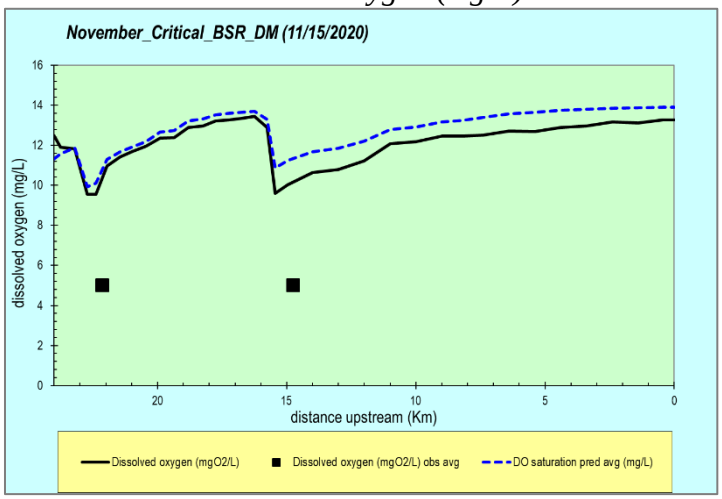


November Critical Conditions
Acute (Daily Maximum)

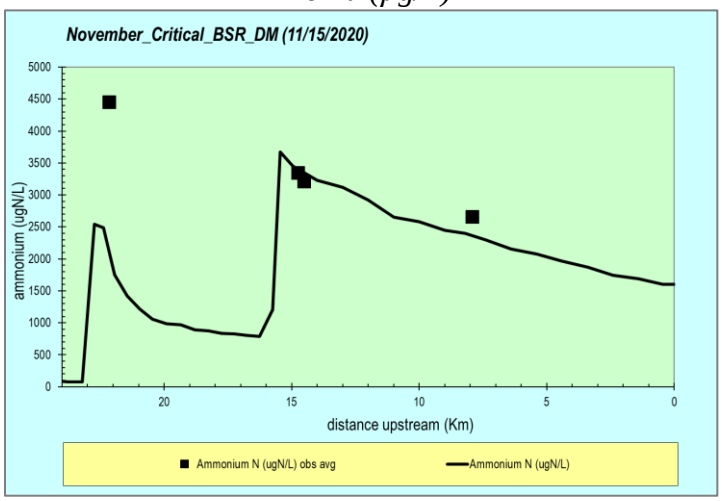
Streamflow (m^3/s)



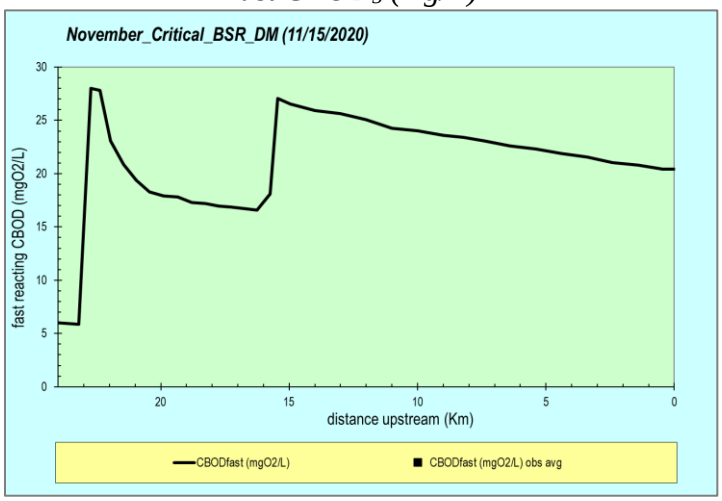
Dissolved Oxygen (mg/L)



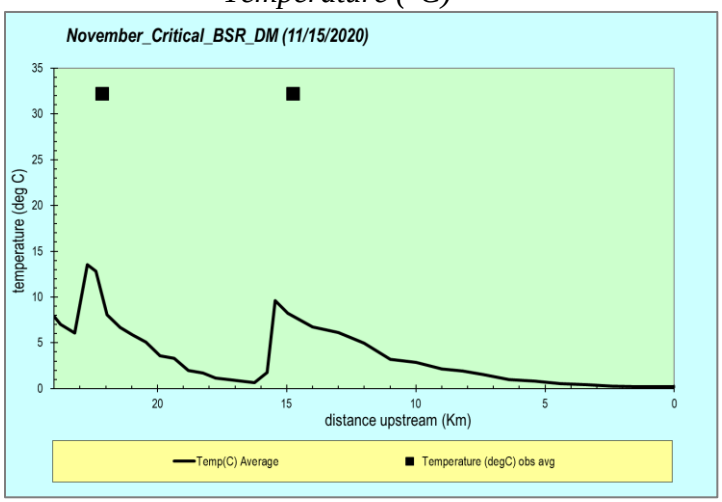
Ammonia (µg/L)



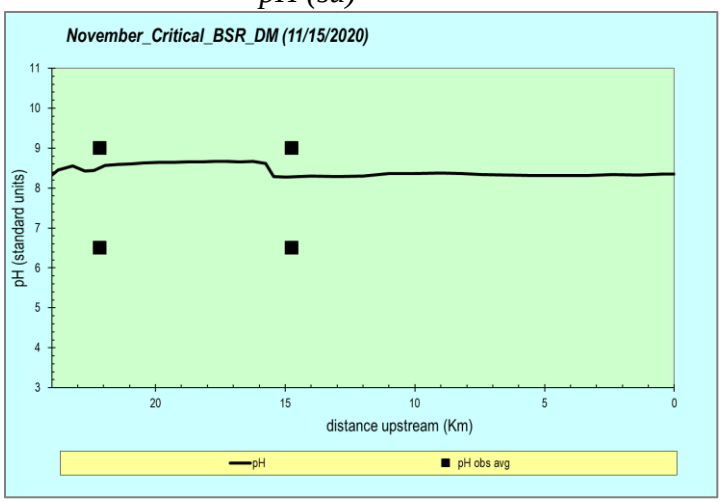
Fast $CBOD_5$ (mg/L)



Temperature (°C)

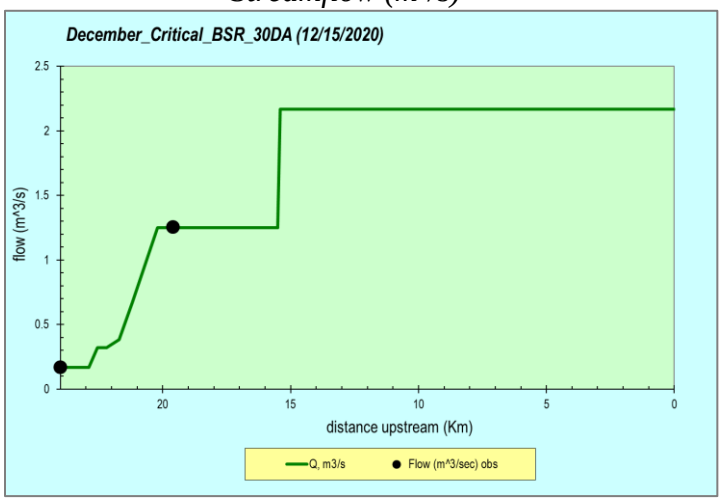


pH (su)

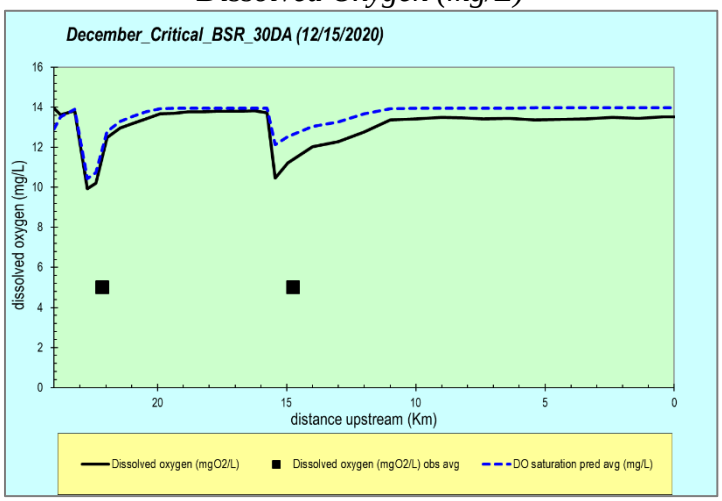


December Critical Conditions
Chronic (30-Day Average)

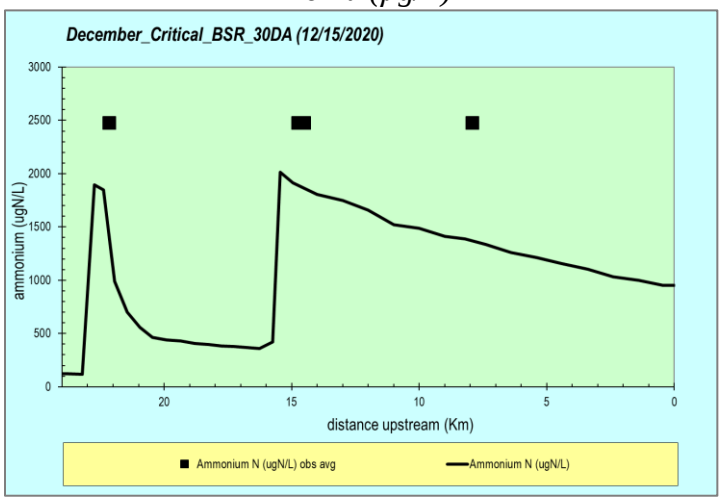
Streamflow (m^3/s)



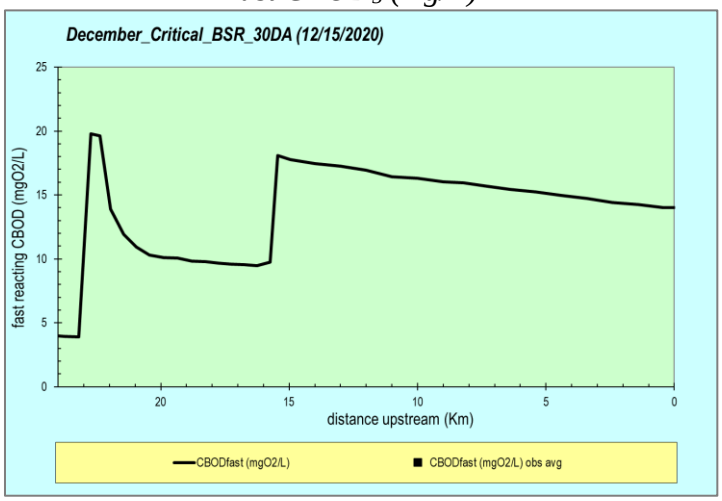
Dissolved Oxygen (mg/L)



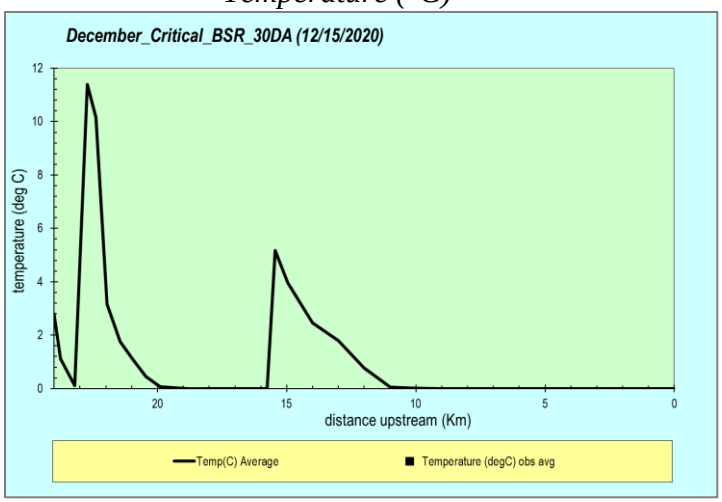
Ammonia (µg/L)



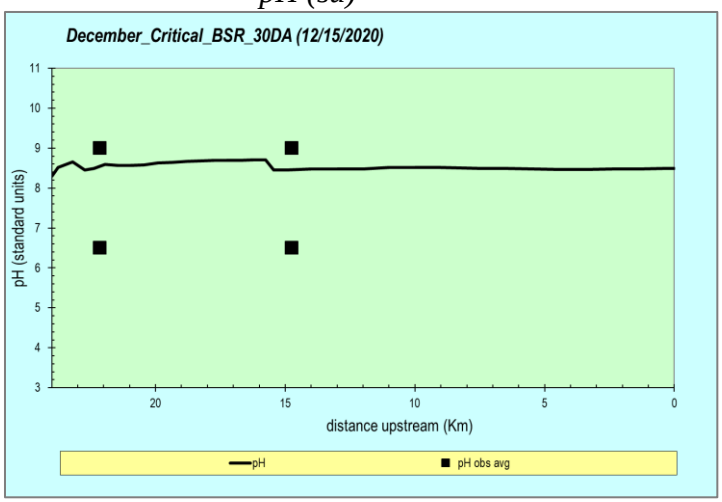
Fast $CBOD_5$ (mg/L)



Temperature (°C)

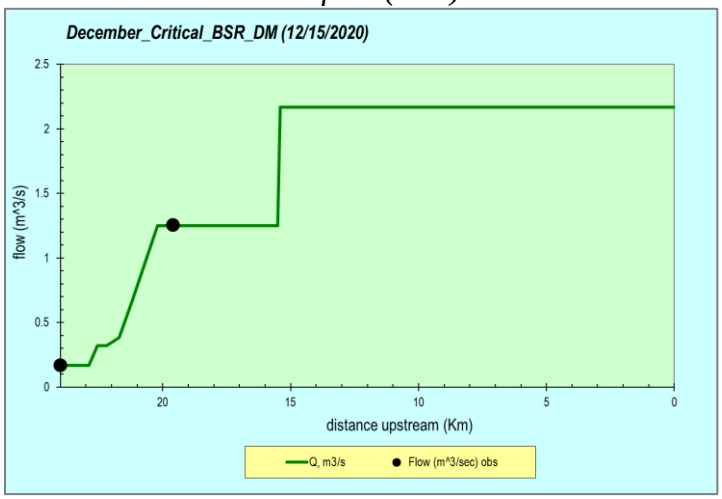


pH (su)

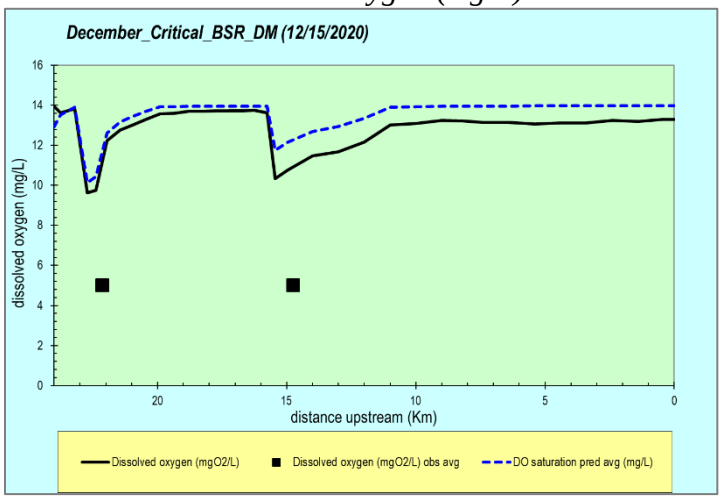


December Critical Conditions
Acute (Daily Maximum)

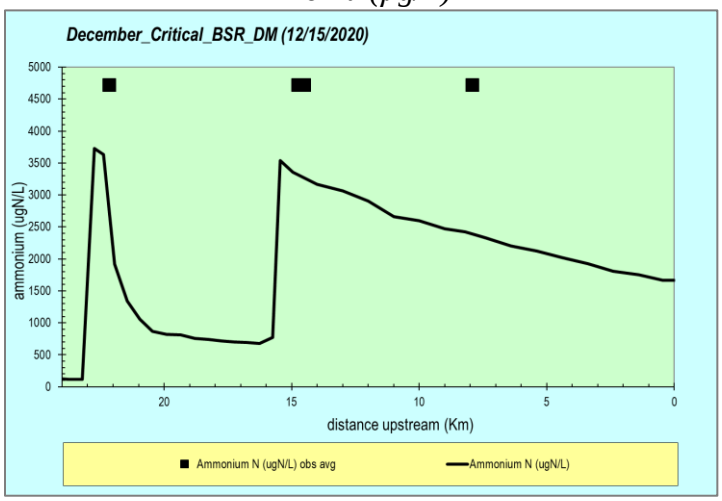
Streamflow (m^3/s)



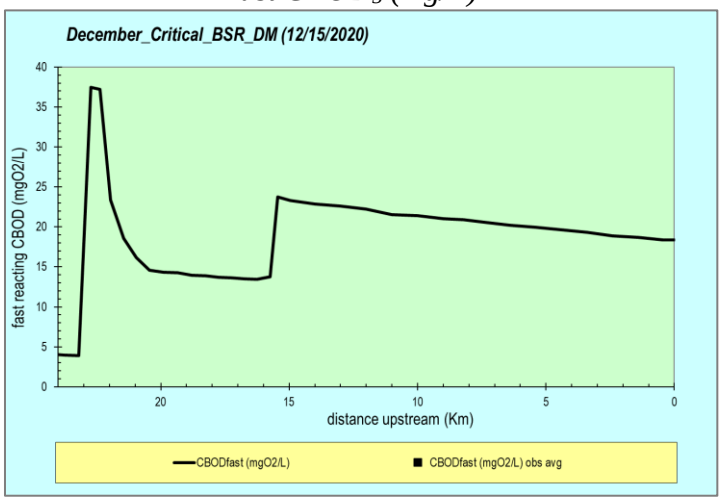
Dissolved Oxygen (mg/L)



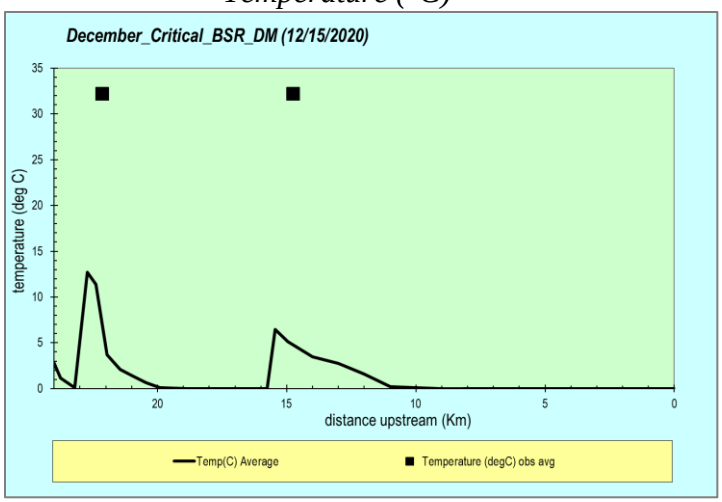
Ammonia (µg/L)



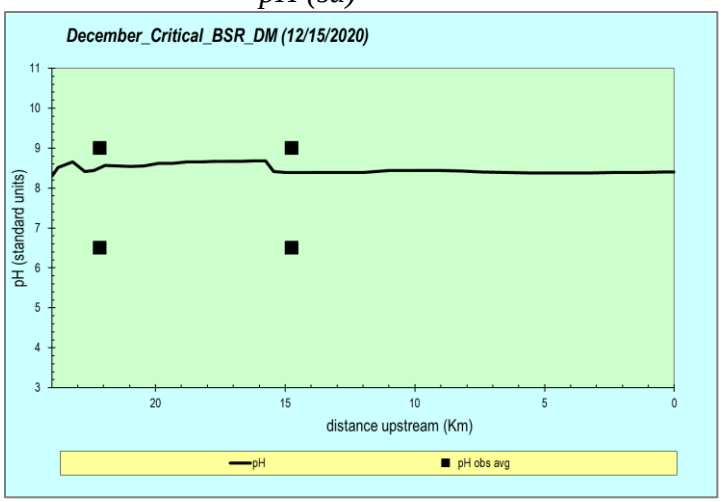
Fast $CBOD_5$ (mg/L)



Temperature (°C)



pH (su)



ATTACHMENT 7

Water Quality Monitoring (WQM) Site Data Statistics

Water Quality Monitoring Site Data Statistics

Water Quality Monitoring (WQM) site data were obtained from the following Sioux Falls area monitoring stations on the Big Sioux River: WQM 64, WQM BS23, WQM BS29, WQM 117, and WQM 31. These data sets were limited to January 1, 1990 to December 31, 2018, and can be downloaded from the Water Quality Portal, https://www.waterqualitydata.us/portal/. Typical sampling frequency is monthly at these WQM sites, though frequency varies based on parameter.

For each water quality parameter, presented in the tables below are the statistics used for limits development in the Statements of Basis (Attachment 4, Reasonable Potential Analysis; Attachment 5, Ammonia Limits Development; and Attachment 6, QUAL2Kw Modeling). A map of the WQM station locations is included in Attachment 5.

For parameters measured as "Present Below Quantification Limit" (PBQL), "Present Above Quantification Limit" (PAQL), or "Non-Detect" (ND), the value used in calculations is the estimated parameter detection limit. These values are as follows:

- Ammonia (as N): 0.05 mg/L for PBQL, ND
- BOD_5: 2.0 mg/L for PBQL, ND
- *E. coli*: 10 #/100 mL for PBQL, ND; 4840 #/100 mL for PAQL
- Nitrate: 0.2 mg/L for PBQL, ND
- TSS: 3 mg/L for PBQL, ND

WQM 64 Data Statistics

WQM 64 Big Sioux River at East Falls Park Drive and North Weber Avenue, located 0.7 miles (3,478 feet) above Smithfield WWTP (Latitude 43.559361°, Longitude -96.721111°).

Ammonia Statistics (mg/L) – WQM 64				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
January	29	0.17	0.15	0.29
February	29	0.26	0.15	0.40
March	29	0.33	0.05	0.73
April	29	0.06	0.05	0.05
May	28	0.06	0.05	0.05
June	29	0.09	0.05	0.08
July	29	0.05	0.05	0.05
August	29	0.05	0.05	0.05
September	29	0.05	0.05	0.05
October	27	0.05	0.05	0.05
November	29	0.07	0.05	0.08
December	29	0.08	0.05	0.12
Annual	345	0.11	0.05	0.12

Temperature Statistics (°C) – WQM 64				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
January	29	1.13	1.00	1.33
February	28	1.50	1.00	1.75
March	29	5.12	5.00	7.24
April	29	13.01	13.33	16.40
May	29	17.07	17.00	19.00
June	29	22.84	23.50	25.00
July	28	26.53	27.00	28.82
August	29	24.69	25.00	27.20
September	29	19.53	20.00	22.00
October	28	12.36	12.10	14.00
November	28	4.59	3.75	7.92
December	28	1.65	1.00	2.80
Annual	343	12.55	12.78	22.78

pH Statistics (su) – WQM 64				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
January	29	8.01	8.10	8.30
February	29	8.05	8.03	8.25
March	29	8.25	8.20	8.42
April	29	8.36	8.40	8.50
May	27	8.31	8.30	8.40
June	29	8.20	8.20	8.36
July	29	8.31	8.31	8.50

pH Statistics (su) – WQM 64				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
August	29	8.31	8.30	8.52
September	28	8.22	8.30	8.48
October	28	8.28	8.31	8.57
November	26	8.14	8.21	8.33
December	28	8.08	8.20	8.30
Annual	340	8.21	8.27	8.43

DO Statistics (mg/L) – WQM 64		
Month	**No. of Samples**	**20th Percentile**
January	28	13.90
February	29	13.30
March	29	12.56
April	29	10.10
May	27	9.26
June	29	7.86
July	29	7.36
August	29	7.72
September	28	8.30
October	28	10.44
November	28	12.48
December	28	13.94
Annual	341	8.50

Nitrate Statistics (mg/L) – WQM 64		
Month	**No. of Samples**	**80th Percentile**
January	29	2.20
February	26	2.00
March	26	1.80
April	29	0.84
May	26	0.90
June	25	1.92
July	29	0.74
August	25	0.72
September	25	0.50
October	27	0.90
November	26	1.90
December	26	2.20
Annual	319	1.80

Total Phosphorus Statistics (mg/L) – WQM 64		
Month	**No. of Samples**	**80th Percentile**
January	28	0.11
February	26	0.36
March	25	0.52
April	27	0.25

Total Phosphorus Statistics (mg/L) – WQM 64		
Month	**No. of Samples**	**80th Percentile**
May	24	0.27
June	24	0.56
July	28	0.42
August	24	0.41
September	24	0.27
October	27	0.22
November	25	0.16
December	25	0.11
Annual	307	0.33

BOD_5 Statistics (mg/L) – WQM 64		
Month	**No. of Samples**	**80th Percentile**
January	26	2.00
February	22	5.80
March	24	8.00
April	27	6.00
May	22	6.00
June	23	7.00
July	26	9.00
August	21	9.00
September	21	8.00
October	25	8.20
November	23	6.00
December	26	4.00
Annual	286	7.00

TSS Statistics (mg/L) – WQM 64		
Month	**No. of Samples**	**80th Percentile**
January	29	9.40
February	29	29.60
March	29	72.00
April	29	80.00
May	29	98.20
June	29	247.60
July	28	126.40
August	29	133.60
September	28	85.20
October	27	64.00
November	29	42.00
December	29	20.80
Annual	344	96.40

Alkalinity Statistics (mg/L) – WQM 64		
Month	**No. of Samples**	**80th Percentile**
January	11	329.00
February	11	336.00
March	11	251.00
April	11	261.00
May	10	284.20
June	10	284.80
July	10	262.60
August	10	256.20
September	10	261.60
October	10	260.00
November	10	318.60
December	11	372.00
Annual	125	302.20

Specific Conductance (µmho/cm) – WQM 64			
Month	**No. of Samples**	**Average**	**80th Percentile**
January	28		1695.80
February	27		1900.60
March	26		1280.00
April	28	1150.29	1337.00
May	26		1359.00
June	25		1281.20
July	28		1204.20
August	25		1140.80
September	25		1148.80
October	27		1190.40
November	25		1378.80
December	26		1570.00
Annual	316		1402.00

E. coli Statistics (#/100 mL) – WQM 64		
Month	**No. of Samples**	**80th Percentile**
January	0	
February	0	
March	0	
April	0	
May	10	488.40
June	10	4440.00
July	11	181.00
August	10	620.40
September	11	147.00
October	0	
November	0	
December	0	
Annual	52	574.80

WQM BS23 Data Statistics

WQM BS23 Big Sioux River at I-90 and North Ditch Road, located above the split between the historic and diversion channels, representing diversion channel water quality as it re-enters the Big Sioux River at 28 feet below Smithfield WWTP (Latitude 43.609722°, Longitude -96.744166°).

Ammonia Statistics (mg/L) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	27	0.18
February	27	0.35
March	27	0.63
April	27	0.05
May	26	0.05
June	28	0.05
July	26	0.05
August	27	0.05
September	27	0.05
October	28	0.05
November	26	0.05
December	28	0.05
Annual	324	0.07

Temperature Statistics (°C) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	26	1.50
February	26	1.80
March	27	6.65
April	27	15.44
May	27	19.00
June	28	26.00
July	25	29.54
August	28	27.00
September	28	22.00
October	28	13.18
November	26	5.80
December	27	1.63
Annual	323	22.91

pH Statistics (su) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	26	8.10
February	27	8.00
March	27	8.42
April	27	8.50
May	25	8.44
June	28	8.40

pH Statistics (su) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
July	26	8.56
August	28	8.50
September	28	8.68
October	28	8.72
November	26	8.57
December	26	8.32
Annual	322	8.50

DO Statistics (mg/L) – WQM BS23		
DO (mg/L)	**No. of Samples**	**20th Percentile**
January	25	11.14
February	27	9.30
March	27	11.60
April	27	9.56
May	26	9.20
June	28	7.20
July	26	7.60
August	28	7.44
September	28	9.42
October	28	10.54
November	26	13.50
December	27	13.02
Annual	323	9.20

Nitrate Statistics (mg/L) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	27	3.76
February	24	3.50
March	24	2.40
April	27	1.48
May	24	0.90
June	24	2.14
July	26	0.70
August	23	0.54
September	23	0.66
October	28	1.12
November	23	2.26
December	25	3.54
Annual	298	2.60

Total Phosphorus Statistics (mg/L) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	26	0.23
February	23	0.45
March	22	0.61
April	25	0.29

Total Phosphorus Statistics (mg/L) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
May	22	0.34
June	23	0.44
July	25	0.36
August	22	0.35
September	23	0.27
October	27	0.26
November	21	0.17
December	24	0.17
Annual	283	0.34

BOD_5 Statistics (mg/L) – WQM BS23			
Month	**No. of Samples**	**Average**	**80th Percentile**
January	13		4.20
February	9		7.00
March	10		8.00
April	12	4.83	6.80
May	7		6.80
June	9		8.40
July	11		8.00
August	7		5.80
September	8		7.60
October	13		10.00
November	8		11.00
December	8		8.20
Annual	115		8.00

TSS Statistics (mg/L) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	27	14.80
February	27	36.80
March	27	123.20
April	27	107.20
May	27	132.00
June	28	188.00
July	26	136.00
August	28	134.40
September	28	98.40
October	28	75.20
November	26	46.00
December	28	34.80
Annual	327	102.00

Alkalinity Statistics (mg/L) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	11	350.00
February	11	347.00
March	11	214.00
April	11	270.00
May	10	294.00
June	10	289.20
July	9	279.20
August	10	263.20
September	10	243.60
October	11	283.00
November	10	302.60
December	11	349.00
Annual	125	307.20

Specific Conductance Statistics (µmho/cm) – WQM BS23			
Month	**No. of Samples**	**Average**	**80th Percentile**
January	26		1268.00
February	25		1254.40
March	24		945.40
April	26	872.15	1010.00
May	24		1084.00
June	25		1038.80
July	26		982.00
August	24		1035.80
September	24		995.00
October	28		1038.00
November	22		1090.40
December	24		1209.40
Annual	298		1101.20

E. coli Statistics (#/100 mL) – WQM BS23		
Month	**No. of Samples**	**80th Percentile**
January	0	
February	0	
March	0	
April	0	
May	11	121.00
June	10	439.00
July	10	144.40
August	10	349.00
September	10	162.60
October	0	
November	0	
December	0	
Annual	51	325.00

WQM BS29 Data Statistics

WQM BS29 Big Sioux River at North Bahnson Avenue, located 2.1 miles (10,942 feet) below Smithfield WWTP and 2.6 miles (13,574 feet) above Sioux Falls WRF (Latitude 43.569934°, Longitude -96.684715°).

Ammonia Statistics (mg/L) – WQM BS29				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
January	29	0.17	0.13	0.25
February	29	0.31	0.24	0.55
March	29	0.31	0.10	0.54
April	28	0.10	0.05	0.08
May	29	0.06	0.05	0.05
June	29	0.08	0.05	0.08
July	28	0.06	0.05	0.05
August	28	0.05	0.05	0.05
September	29	0.05	0.05	0.05
October	27	0.08	0.05	0.05
November	29	0.07	0.05	0.05
December	28	0.06	0.05	0.05
Annual	342	0.12	0.05	0.12

Temperature Statistics (°C) – WQM BS29				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
January	29	1.74	1.00	2.82
February	28	2.15	2.00	3.11
March	29	5.25	4.44	7.61
April	28	12.69	12.78	15.36
May	29	17.09	17.00	19.82
June	29	22.99	23.00	25.76
July	27	27.03	27.00	29.65
August	29	25.31	25.00	27.87
September	29	20.16	21.00	23.00
October	28	12.59	12.79	14.60
November	28	5.22	4.15	8.00
December	28	2.02	1.39	3.00
Annual	341	12.86	12.80	23.00

pH Statistics (su) – WQM BS29				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
January	29	8.06	8.00	8.30
February	29	8.03	8.07	8.21
March	29	8.21	8.20	8.40
April	27	8.30	8.30	8.45
May	27	8.34	8.40	8.50
June	29	8.19	8.20	8.31
July	28	8.34	8.34	8.50

pH Statistics (su) – WQM BS29				
Month	**No. of Samples**	**Average**	**50th Percentile**	**80th Percentile**
August	28	8.30	8.37	8.56
September	28	8.28	8.41	8.60
October	28	8.30	8.40	8.60
November	28	8.22	8.30	8.48
December	28	8.07	8.20	8.30
Annual	338	8.22	8.27	8.47

DO Statistics (mg/L) – WQM BS29		
Month	**No. of Samples**	**20th Percentile**
January	28	13.64
February	28	12.26
March	29	12.80
April	28	10.94
May	27	10.10
June	29	8.20
July	28	8.50
August	29	8.18
September	29	10.10
October	28	11.04
November	28	13.64
December	28	13.90
Annual	339	9.80

Nitrate Statistics (mg/L) – WQM BS29		
Month	**No. of Samples**	**80th Percentile**
January	29	10.32
February	26	12.30
March	26	3.20
April	28	2.02
May	26	1.20
June	25	2.14
July	28	1.82
August	25	2.76
September	25	3.12
October	27	3.68
November	26	4.60
December	25	5.72
Annual	316	4.20

Total Phosphorus Statistics (mg/L) – WQM BS29		
Month	**No. of Samples**	**80th Percentile**
January	28	1.70
February	25	2.41
March	25	0.95
April	26	0.53

Total Phosphorus Statistics (mg/L) – WQM BS29		
Month	**No. of Samples**	**80th Percentile**
May	24	0.45
June	24	0.61
July	27	0.59
August	24	0.76
September	24	0.71
October	27	1.12
November	25	0.98
December	25	1.20
Annual	304	0.82

BOD_5 Statistics (mg/L) – WQM BS29		
Month	**Number of samples**	**80th Percentile**
January	27	2.80
February	22	7.40
March	24	8.00
April	24	6.00
May	22	7.60
June	23	7.00
July	25	8.00
August	22	10.00
September	21	8.00
October	24	8.00
November	24	6.00
December	26	5.00
Annual	284	8.00

TSS Statistics (mg/L) – WQM BS29		
Month	**Number of samples**	**80th Percentile**
January	29	13.40
February	29	56.80
March	29	110.20
April	28	97.20
May	29	130.80
June	29	248.00
July	28	167.20
August	29	147.20
September	29	86.00
October	27	66.00
November	29	37.40
December	29	21.80
Annual	344	103.40

Alkalinity Statistics (mg/L) – WQM BS29			
Month	**No. of Samples**	**Average**	**80th Percentile**
January	11		335.00
February	11		331.00
March	11		217.00
April	11		272.00
May	10		291.20
June	10		282.00
July	10	238.50	281.80
August	10		249.40
September	10		245.00
October	10	248.40	280.80
November	10		307.20
December	11	324.45	347.00
Annual	125		312.20

Specific Conductance (µmho/cm) – WQM BS29			
Month	**No. of Samples**	**Average**	**80th Percentile**
January	28		1582.60
February	27		1916.60
March	26		1049.00
April	27	963.11	1106.80
May	26		1148.00
June	26		1100.00
July	28		1086.00
August	25		1093.20
September	25		1181.00
October	27		1163.80
November	24		1204.00
December	25		1386.40
Annual	314		1265.40

Hardness Statistics (mg/L) – WQM BS29		
Season	**No. of Samples**	**Average**
Annual	344	518.45

E. coli Statistics (#/100 mL) – WQM BS29		
Month	**No. of Samples**	**80th Percentile**
January	0	
February	0	
March	0	
April	0	
May	18	159.80
June	18	3042.00
July	19	1468.00
August	18	998.00
September	19	213.80

E. coli Statistics (#/100 mL) – WQM BS29		
Month	**No. of Samples**	**80th Percentile**
October	1	35.40
November	1	12.20
December	0	
Annual	94	980.00

WQM 117 Data Statistics

WQM 117 Big Sioux River at North Timberline Road, located 0.6 miles (3,268 feet) below Sioux Falls WRF (Latitude 43.599880°, Longitude -96.652501°).

Ammonia Statistics (mg/L) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	28	0.16
February	28	0.34
March	27	0.68
April	27	0.05
May	28	0.05
June	27	0.05
July	26	0.05
August	28	0.05
September	27	0.05
October	28	0.05
November	28	0.05
December	30	0.05
Annual	332	0.08

Temperature Statistics (°C) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	28	3.72
February	27	3.00
March	27	7.44
April	27	15.91
May	27	19.00
June	27	25.54
July	25	29.00
August	28	27.13
September	28	23.00
October	28	15.36
November	27	9.90
December	28	3.73
Annual	327	23.00

pH (su) Statistics – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	26	8.10
February	28	8.10
March	27	8.40
April	27	8.50
May	26	8.46
June	27	8.42
July	26	8.50
August	28	8.57

pH (su) Statistics – WQM 117		
Month	**No. of Samples**	**80th Percentile**
September	28	8.60
October	28	8.53
November	27	8.50
December	28	8.30
Annual	326	8.50

DO Statistics (mg/L) – WQM 117		
Month	**No. of Samples**	**20th Percentile**
January	27	12.92
February	26	11.80
March	27	13.10
April	26	11.00
May	28	10.04
June	26	8.10
July	26	8.30
August	28	8.24
September	27	10.12
October	28	11.84
November	27	13.32
December	28	13.54
Annual	324	10.10

Nitrate Statistics (mg/L) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	28	14.42
February	25	16.82
March	24	4.94
April	27	3.36
May	25	2.12
June	23	3.42
July	26	3.20
August	24	5.50
September	23	6.92
October	28	5.86
November	25	7.24
December	27	8.60
Annual	305	7.10

Total Phosphorus Statistics (mg/L) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	27	2.37
February	24	3.04
March	22	1.15
April	25	0.63
May	23	0.55

Total Phosphorus Statistics (mg/L) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
June	22	0.74
July	25	0.75
August	23	1.29
September	22	1.39
October	27	1.62
November	24	1.35
December	26	1.69
Annual	290	1.25

BOD_5 Statistics (mg/L) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	26	5.00
February	23	7.00
March	23	9.00
April	25	8.00
May	22	6.80
June	22	7.80
July	22	9.00
August	21	8.00
September	22	8.00
October	25	8.20
November	23	6.00
December	23	5.60
Annual	277	8.00

TSS Statistics (mg/L) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	28	12.60
February	28	26.20
March	27	136.80
April	27	109.60
May	28	104.80
June	27	226.40
July	26	148.00
August	28	163.20
September	28	88.00
October	28	71.20
November	28	32.00
December	30	21.00
Annual	333	102.00

Alkalinity Statistics (mg/L) – WQM 117			
Month	**No. of Samples**	**Average**	**80th Percentile**
January	11		301.00
February	11		306.00

Alkalinity Statistics (mg/L) – WQM 117			
Month	**No. of Samples**	**Average**	**80th Percentile**
March	10		201.80
April	11		267.00
May	10		286.80
June	10		283.00
July	9	238.78	272.20
August	10		255.00
September	10		246.60
October	11	236.00	275.00
November	10		301.40
December	11	311.09	341.00
Annual	124		286.00

Specific Conductance (µmhos/cm) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	27	1550.00
February	26	1706.00
March	24	1039.00
April	26	1120.00
May	25	1166.00
June	24	1111.20
July	26	1107.00
August	24	1144.40
September	24	1186.20
October	28	1229.20
November	24	1233.60
December	27	1399.60
Annual	305	1311.40

E. coli Statistics (#/100 mL) – WQM 117		
Month	**No. of Samples**	**80th Percentile**
January	0	
February	0	
March	0	
April	0	
May	18	336.20
June	17	732.40
July	16	377.00
August	18	149.40
September	18	783.60
October	1	91.00
November	1	82.00
December	0	
Annual	89	395.60

WQM 31 Data Statistics

WQM 31 Big Sioux River near Brandon at West Holly Boulevard, located 4.7 miles below Sioux Falls WRF (Latitude 43.594722°, Longitude -96.599722°).

Ammonia Statistics (mg/L) – WQM 31		
Month	**No. of Samples**	**80th Percentile**
January	28	0.19
February	29	0.63
March	28	0.49
April	29	0.20
May	28	0.05
June	29	0.05
July	29	0.05
August	27	0.05
September	29	0.05
October	26	0.05
November	30	0.05
December	29	0.05
Annual	341	0.09

Temperature Statistics (°C) – WQM 31		
Month	**No. of Samples**	**80th Percentile**
January	28	3.00
February	28	2.56
March	28	6.92
April	29	15.52
May	29	18.00
June	29	25.76
July	28	29.00
August	28	28.00
September	29	24.00
October	27	16.00
November	29	8.88
December	28	3.00
Annual	340	23.89

pH Statistics (su) – WQM 31		
Month	**No. of Samples**	**80th Percentile**
January	27	8.20
February	29	8.22
March	28	8.39
April	29	8.48
May	28	8.40
June	29	8.45
July	29	8.66
August	28	8.80

pH Statistics (su) – WQM 31		
Month	**No. of Samples**	**80th Percentile**
September	29	8.65
October	27	8.59
November	29	8.60
December	27	8.30
Annual	339	8.50

DO Statistics (mg/L) – WQM 31		
Month	**No. of Samples**	**20th Percentile**
January	27	13.20
February	28	12.14
March	28	13.00
April	28	10.54
May	27	9.76
June	29	7.70
July	29	8.20
August	28	8.66
September	29	10.94
October	27	11.02
November	29	13.46
December	28	13.70
Annual	337	10.12

ATTACHMENT 8

Receiving Streamflow Data

Receiving Streamflow Data
USGS 06482000 and 06482020 Gaging Stations

The data to develop the seasonal 7Q5 low flows were obtained from USGS stream gaging stations 06482000 for the Big Sioux River above Smithfield Wastewater Treatment Plant (WWTP), and 06482020 for the Big Sioux River above the city of Sioux Falls Water Reclamation Facility (WRF). Based on data availability, the data sets were limited to January 1, 2005 to December 31, 2018. The Log Pearson type III statistical analyses for each gaging station were conducted using USGS SWToolbox, a stream flow analysis tool. USGS stream gage data can be downloaded from USGS at http://waterdata.usgs.gov/sd/nwis/sw.

USGS 06482000

06482000 Big Sioux River at Sioux Falls, SD near West 57th Street and South Old Yankton Road, located 7.9 miles (41,724 feet) above Smithfield WWTP (Latitude 43.501111°, Longitude -96.748056°).

Figure 1: USGS 06482000 Seasonal 7Q5 Flows

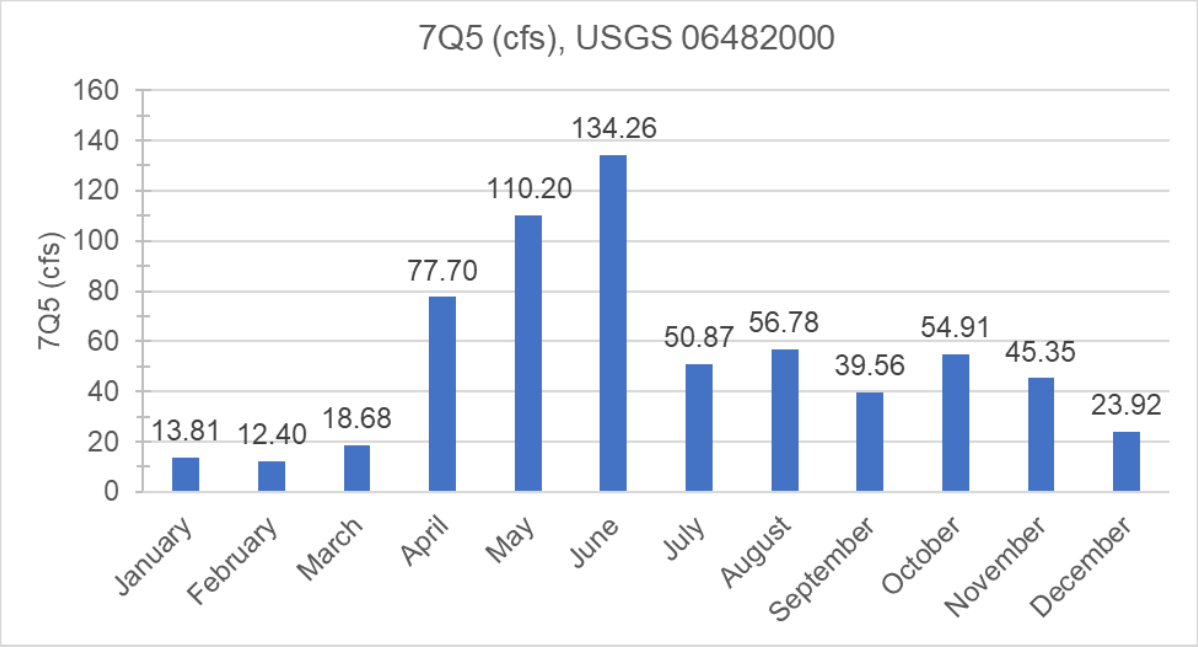


Table 1: USGS 06482000 Seasonal 7Q5 Flows and Trend Statistics

Season	7Q5 (cfs)	Kendall Tau	P-Value	Sen Median Slope	Count	Not Used
January	13.81	0.333330	0.127200	1.60650	13	0
February	12.40	0.454550	0.061707	3.32540	11	0
March	18.68	0.163640	0.533420	3.00240	11	0
April	77.70	-0.345450	0.161120	-18.24500	11	0
May	110.20	-0.090909	0.755500	-3.42860	11	0
June	134.26	0.254550	0.310040	8.77550	11	0
July	50.87	0.200000	0.436280	15.45600	11	0
August	56.78	0.381820	0.119470	17.89400	11	0
September	39.56	0.345450	0.161120	11.15700	11	0
October	54.91	0.309090	0.212910	7.63570	11	0
November	45.35	0.127270	0.640430	2.92140	11	0
December	23.92	0.121210	0.631220	0.61429	12	1

Table 2: USGS 06482000 Frequency Statistics

Log Pearson Type III Frequency Curve Parameters (based on logs of the non-zero values)							
Season	Mean	Variance	Standard Deviation	Skewness	Standard Error of Skewness	Serial Correlation Coefficient	Coefficient of Variation
January	1.452	0.134	0.365	0.362	0.616	0.111	0.252
February	1.384	0.139	0.373	-0.803	0.637	0.134	0.269
March	1.635	0.219	0.468	-0.827	0.637	0.270	0.286
April	2.267	0.204	0.451	-0.149	0.637	0.321	0.199
May	2.310	0.109	0.331	-0.489	0.637	0.275	0.143
June	2.343	0.074	0.272	-0.710	0.637	-0.298	0.116
July	2.077	0.219	0.468	-0.691	0.637	0.382	0.225
August	2.094	0.194	0.441	-0.878	0.637	0.195	0.210
September	1.925	0.162	0.402	-0.404	0.637	0.094	0.209
October	2.031	0.124	0.353	-0.277	0.637	0.268	0.174
November	1.886	0.072	0.269	0.263	0.637	0.009	0.143
December	1.539	0.036	0.189	1.166	0.637	0.106	0.123

USGS 06482020

06482020 Big Sioux River at North Cliff Avenue at Sioux Falls, SD, located 0.5 miles (2,569 feet) below Smithfield WWTP and 4.2 miles (22,098 feet) above Sioux Falls WRF (Latitude 43.567028°, Longitude -96.771000°).

Figure 2: USGS 06482020 Seasonal 7Q5 Flows

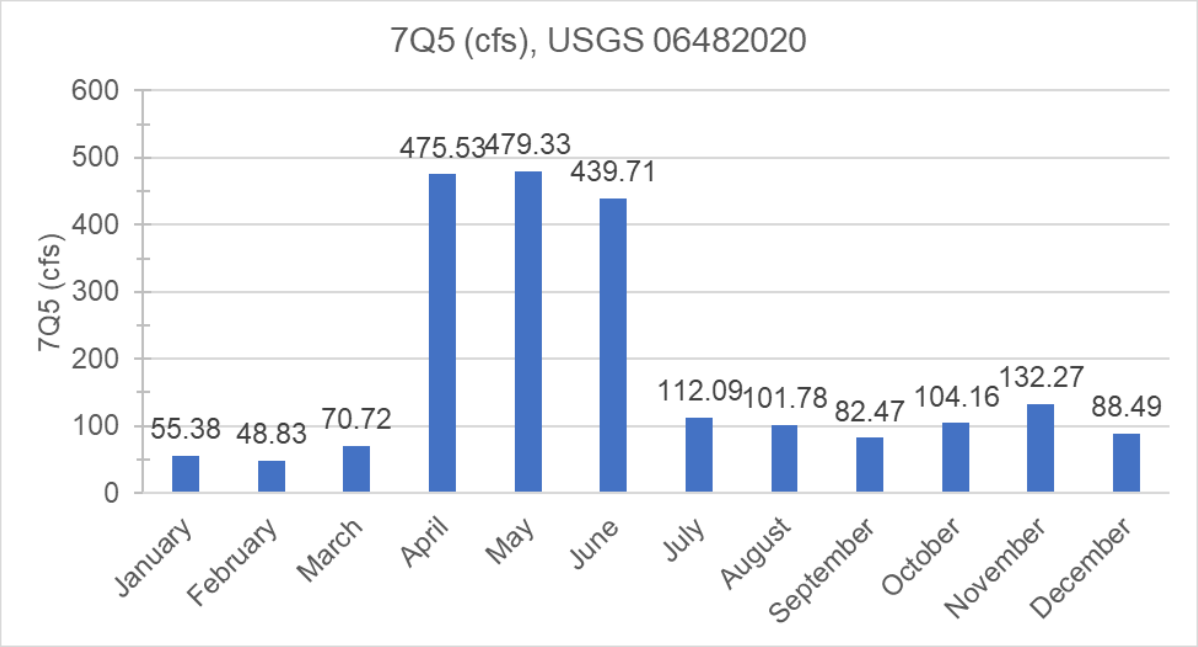


Table 3: USGS 06482020 Seasonal 7Q5 Flows and Trend Statistics

Season	7Q5 (cfs)	Kendall Tau	P-Value	Sen Median Slope	Count	Not Used
January	55.38	0.15385	0.50216	7.9107	13	0
February	48.83	0.34545	0.16112	19.229	11	0
March	70.72	0.27273	0.27576	40.514	11	0
April	475.53	-0.27273	0.27576	-92.829	11	0
May	479.33	-0.12727	0.64043	-23.548	11	0
June	439.71	0.054545	0.87627	13.557	11	0
July	112.09	0.054545	0.87627	5.7619	11	0
August	101.78	0.30909	0.21291	25.524	11	0
September	82.47	0.30909	0.21291	29.5	11	0
October	104.16	0.12727	0.64043	30.786	11	0
November	132.27	0.054545	0.87627	7.3061	11	0
December	88.49	0.30303	0.19262	22.993	12	1

Table 4: USGS 06482020 Frequency Statistics

Log Pearson Type III Frequency Curve Parameters (based on logs of the non-zero values)							
Season	Mean	Variance	Standard Deviation	Skewness	Standard Error of Skewness	Serial Correlation Coefficient	Coefficient of Variation
January	2.055	0.138	0.372	-0.059	0.616	-0.008	0.181
February	2.043	0.184	0.429	-0.280	0.637	0.332	0.210
March	2.266	0.265	0.514	-0.493	0.637	0.353	0.227
April	3.003	0.144	0.380	0.722	0.637	0.175	0.126
May	2.930	0.085	0.291	0.693	0.637	0.287	0.099
June	2.884	0.079	0.281	0.483	0.637	-0.175	0.097
July	2.522	0.314	0.560	0.058	0.637	0.086	0.222
August	2.371	0.194	0.440	-0.272	0.637	0.094	0.186
September	2.326	0.231	0.480	0.294	0.637	0.079	0.206
October	2.395	0.197	0.444	0.174	0.637	0.267	0.186
November	2.395	0.111	0.333	-0.348	0.637	0.456	0.139
December	2.211	0.112	0.335	-0.726	0.637	0.411	0.152

ATTACHMENT 9

Discharge Monitoring Data (DMR) Effluent Data Statistics

DMR Effluent Data Statistics

Effluent data statistics from Discharge Monitoring Reports (DMRs) for Smithfield Wastewater Treatment Plant (WWTP) and Sioux Falls Water Reclamation Facility (WRF) are presented below. Data for these calculations were retrieved through the ICIS database, accessed on July 24, 2019. The data span the facilities' current permit cycles: April 1, 2000 to June 30, 2019 for Smithfield WWTP; and July 1, 2000 to June 30, 2019 for Sioux Falls WRF. Public access to the facility's monitoring data is available at EPA's Enforcement and Compliance History Online (ECHO) website: https://echo.epa.gov/ . The DMR data are also presented in the draft Statements of Basis for each facility in Attachment 3.

Smithfield WWTP

Five-Day Biochemical Oxygen Demand (BOD_5) and Carbonaceous BOD_5 ($CBOD_5$)

Month	Statistic	BOD_5				$CBOD_5$	
		30-Day Av		Daily Max		30-Day Av	Daily Max
		mg/L	lb/d	mg/L	lb/d	mg/L	mg/L
January	No. of Values	19	19	19	19	19	19
	80th Percentile	23.70	459.38	42.60	866.02	10.40	10.40
February	No. of Values	19	19	19	19	19	19
	80th Percentile	21.14	409.38	43.60	754.20	11.80	11.80
March	No. of Values	19	19	19	19	19	19
	80th Percentile	17.32	341.52	34.40	740.80	12.40	12.40
April	No. of Values	20	20	20	20	20	20
	80th Percentile	15.14	294.40	29.00	674.54	11.40	11.40
May	No. of Values	20	20	20	20	20	20
	80th Percentile	13.92	270.80	26.60	550.68	8.60	8.60
June	No. of Values	20	20	20	20	20	20
	80th Percentile	12.64	283.00	28.00	590.40	9.20	9.20
July	No. of Values	19	19	19	19	19	19
	80th Percentile	11.16	218.52	19.80	428.44	6.40	6.40
August	No. of Values	19	19	19	19	18	18
	80th Percentile	16.28	317.80	34.60	705.20	11.20	11.20
September	No. of Values	19	19	19	19	19	19
	80th Percentile	15.24	308.68	34.00	701.80	9.00	9.00
October	No. of Values	19	19	19	19	19	19
	80th Percentile	17.66	329.24	36.00	690.80	13.00	13.00
November	No. of Values	19	19	19	19	19	19
	80th Percentile	17.28	311.40	33.00	651.60	8.00	8.00
December	No. of Values	19	19	19	19	19	19
	80th Percentile	21.04	383.76	47.20	944.20	10.80	10.80

Ammonia and Nitrate

Month	Statistic	Ammonia-Nitrogen (as N)				Nitrate-Nitrogen (as N)	
		30-Day Av		Daily Max		30-Day Av	Daily Max
		mg/L	lb/d	mg/L	lb/d	mg/L	mg/L
January	No. of Values	19	19	19	19	19	19
	80th Percentile	1.16	22.00	1.84	36.87	97.60	97.60
February	No. of Values	19	19	19	19	19	19
	80th Percentile	1.08	19.47	2.14	35.93	115.80	115.80
March	No. of Values	19	19	19	19	19	19
	80th Percentile	1.24	24.40	2.80	55.02	112.80	112.80
April	No. of Values	20	20	20	20	20	20
	80th Percentile	1.16	21.29	1.90	36.17	105.60	105.60
May	No. of Values	20	20	20	20	20	20
	80th Percentile	0.84	15.09	1.92	34.85	109.20	109.20
June	No. of Values	20	20	20	20	20	20
	80th Percentile	0.87	16.30	1.42	23.54	112.00	112.00
July	No. of Values	19	19	19	19	19	19
	80th Percentile	0.93	18.52	2.42	43.15	131.20	131.20
August	No. of Values	19	19	19	19	19	19
	80th Percentile	1.09	21.25	2.86	50.78	107.40	107.40
September	No. of Values	19	19	19	19	19	19
	80th Percentile	0.96	18.73	4.60	90.07	112.00	112.00
October	No. of Values	19	19	19	19	19	19
	80th Percentile	0.98	20.42	1.70	38.60	116.20	116.20
November	No. of Values	19	19	19	19	19	19
	80th Percentile	0.84	15.60	1.56	31.63	120.40	120.40
December	No. of Values	19	19	19	19	19	19
	80th Percentile	1.07	19.00	1.88	36.20	105.80	105.80

Fecal Coliform and Total Suspended Solids (TSS)

Month	Statistic	Fecal Coliform		TSS			
		30-Day Geo. Mean	Daily Max	30-Day Av		Daily Max	
		#/100 mL	# / 100 mL	mg/L	lb/d	mg/L	lb/d
January	No. of Values	18	19	19	19	19	19
	80th Percentile	4.57	102.80	33.80	687.40	73.40	1381.36
February	No. of Values	19	19	19	19	19	19
	80th Percentile	4.32	48.80	35.26	688.60	67.80	1267.40
March	No. of Values	19	19	19	19	19	19
	80th Percentile	6.55	396.80	32.60	587.40	66.00	1296.68
April	No. of Values	20	20	20	20	20	20
	80th Percentile	3.96	68.60	28.60	485.20	52.80	1201.60
May	No. of Values	19	20	20	20	20	20
	80th Percentile	2.99	92.00	27.00	516.40	49.20	1189.10
June	No. of Values	19	20	20	20	20	20
	80th Percentile	4.42	292.00	21.20	443.60	38.00	838.40
July	No. of Values	18	19	19	19	19	19
	80th Percentile	5.68	368.00	22.80	497.00	43.80	1040.40
August	No. of Values	19	19	19	19	19	19
	80th Percentile	6.82	211.60	24.72	656.40	57.20	1278.40
September	No. of Values	19	19	19	19	19	19
	80th Percentile	6.54	260.00	30.20	608.20	57.20	1385.06
October	No. of Values	19	19	19	19	19	19
	80th Percentile	7.17	338.00	33.20	671.40	60.00	1299.80
November	No. of Values	19	19	19	19	19	19
	80th Percentile	6.48	196.00	33.20	612.80	54.20	1106.20
December	No. of Values	19	19	19	19	19	19
	80th Percentile	4.39	144.80	39.14	754.40	86.00	1611.20

Flow Rate, pH, Temperature, and Dissolved Oxygen (DO)

Month	Statistic	Flow rate		pH		Temperature		DO
		30-Day Av	Daily Max	Daily Min	Daily Max	30-Day Av	Daily Max	Daily Min
		MGD	MGD	su	su	°C	°C	mg/L
January	No. of Values	19	19	19	19	18	19	19
	20th Percentile			6.06				6.06
	80th Percentile	2.38	2.90		7.72	26.00	29.00	
February	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.59				6.00
	80th Percentile	2.31	2.76		7.72	26.08	28.40	
March	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.54				6.00
	80th Percentile	2.27	2.92		7.84	28.00	31.00	
April	No. of Values	20	20	20	20	20	20	20
	20th Percentile			6.60				6.36
	80th Percentile	2.35	2.99		7.73	29.00	31.00	
May	No. of Values	20	20	20	20	20	20	20
	20th Percentile			6.54				6.13
	80th Percentile	2.26	2.99		7.84	30.10	33.20	
June	No. of Values	20	20	20	20	20	20	20
	20th Percentile			6.50				5.96
	80th Percentile	2.51	3.31		7.90	33.02	36.00	
July	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.60				5.70
	80th Percentile	2.39	2.94		7.92	35.00	37.00	
August	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.62				5.83
	80th Percentile	2.52	3.23		7.86	34.60	37.00	
September	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.50				5.96
	80th Percentile	2.47	3.14		7.92	33.00	35.00	
October	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.60				6.03
	80th Percentile	2.55	3.06		7.82	31.00	33.00	
November	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.70				6.36
	80th Percentile	2.45	2.96		7.91	29.40	32.00	
December	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.72				6.05
	80th Percentile	2.28	2.85		7.82	27.00	30.00	

Sioux Falls WRF

Five-Day Biochemical Oxygen Demand (BOD_5) and Carbonaceous BOD_5 ($CBOD_5$)

Statistics	Month	Effluent BOD_5		$CBOD_5$	Effluent TSS	
		30-Day Av	Max 7-Day Av	30-Day Av	30-Day Av	Max 7-Day Av
		mg/L	mg/L	mg/L	mg/L	mg/L
January	No. of Values	19	19	19	19	19
	80th Percentile	7.70	10.02	4.38	5.30	6.86
February	No. of Values	19	19	19	19	19
	80th Percentile	7.84	9.80	4.72	6.68	7.62
March	No. of Values	19	19	19	19	19
	80th Percentile	9.76	11.98	5.48	7.70	9.44
April	No. of Values	19	19	19	19	19
	80th Percentile	7.32	9.54	5.12	5.82	7.08
May	No. of Values	19	19	19	19	19
	80th Percentile	5.46	7.48	3.64	5.54	8.18
June	No. of Values	19	19	19	19	19
	80th Percentile	4.84	6.82	3.48	5.70	7.98
July	No. of Values	19	19	19	19	19
	80th Percentile	5.02	6.68	3.24	6.34	8.74
August	No. of Values	19	19	19	19	19
	80th Percentile	4.02	5.36	3.12	3.68	6.40
September	No. of Values	19	19	19	19	19
	80th Percentile	4.61	5.40	2.92	3.94	5.39
October	No. of Values	19	19	19	19	19
	80th Percentile	4.92	6.01	3.42	3.60	5.28
November	No. of Values	19	19	19	19	19
	80th Percentile	6.06	7.20	3.64	4.74	5.88
December	No. of Values	19	19	19	19	19
	80th Percentile	7.72	9.00	4.34	5.22	7.42

Fecal Coliform, Ammonia, and Nitrate

Month	Statistic	Fecal Coliform		Ammonia-Nitrogen (as N)		Nitrate-Nitrogen (as N)	
		30-Day Geo. Mean	Daily Max	30-Day Av	Daily Max	30-Day Av	Daily Max
		#/100 mL	#/100 mL	mg/L	mg/L	mg/L	mg/L
January	No. of Values			19	19	19	19
	80th Percentile			0.22	0.34	35.64	39.40
February	No. of Values			19	19	19	19
	80th Percentile			0.22	0.36	35.40	38.80
March	No. of Values			19	19	19	19
	80th Percentile			0.25	0.49	34.40	39.40
April	No. of Values			19	19	19	19
	80th Percentile			0.22	0.40	35.84	40.20
May	No. of Values	19	19	19	19	19	19
	80th Percentile	54.80	156.60	0.23	0.43	30.56	35.40
June	No. of Values	19	19	19	19	19	19
	80th Percentile	58.60	421.80	0.27	0.46	30.58	33.08
July	No. of Values	19	19	19	19	19	19
	80th Percentile	61.20	272.80	0.24	0.49	31.32	36.40
August	No. of Values	19	19	19	19	19	19
	80th Percentile	43.80	135.20	0.26	0.48	32.00	34.00
September	No. of Values	19	19	19	19	19	19
	80th Percentile	55.60	167.00	0.24	0.35	30.75	32.20
October	No. of Values			19	19	19	19
	80th Percentile			0.23	0.42	34.26	37.00
November	No. of Values			19	19	19	19
	80th Percentile			0.21	0.37	35.42	36.40
December	No. of Values			19	19	19	19
	80th Percentile			0.23	0.42	35.06	37.20

Flow, pH, Temperature, and Dissolved Oxygen (DO)

Month	Statistic	Flow rate		pH		Temperature		DO
		30-Day Av	Daily Max	Daily Min	Daily Max	30-Day Av	Daily Max	Daily Min
		MGD	MGD	su	su	°C	°C	mg/L
January	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.96				7.88
	80th Percentile	14.14	15.59		7.70	10.64	15.00	
February	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.90				7.96
	80th Percentile	14.16	15.51		7.60	10.42	13.40	
March	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.86				7.66
	80th Percentile	17.34	22.04		7.60	12.00	15.00	
April	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.00				7.64
	80th Percentile	20.30	28.69		7.80	15.00	18.00	
May	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.00				7.60
	80th Percentile	20.53	28.09		7.84	17.40	20.80	
June	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.06				6.94
	80th Percentile	20.84	32.33		7.94	20.00	22.00	
July	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.00				6.90
	80th Percentile	17.05	20.56		7.90	22.00	24.00	
August	No. of Values	19	19	19	19	19	19	19
	20th Percentile			6.90				6.80
	80th Percentile	17.33	25.57		7.90	23.00	24.40	
September	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.00				6.92
	80th Percentile	17.29	21.86		7.80	21.88	24.00	
October	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.00				7.12
	80th Percentile	16.79	20.23		7.74	19.00	22.00	
November	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.00				7.20
	80th Percentile	14.90	18.35		7.70	16.00	19.40	
December	No. of Values	19	19	19	19	19	19	19
	20th Percentile			7.00				7.88
	80th Percentile	15.24	17.44		7.70	12.92	16.00	

ATTACHMENT 10

Technology Based Effluent Limit (TBEL) Development for Smithfield WWTP

Technology-Based Effluent Limit (TBEL) Development for Smithfield WWTP

Smithfield Foods operates a meat packing facility and wastewater treatment plant (WWTP) in Sioux Falls, South Dakota. Smithfield is a complex slaughterhouse with a full line of meat processing, where approximately 20,000 hogs are slaughtered per day. The hogs are killed, and the carcasses are trimmed, washed, and hung in cooling rooms where they are later processed into bacon, hams, and franks. The production of sausages, canning of meat, and other edible and inedible products are also included in the production processes. Most of the wastewater flow to the wastewater treatment facility is generated during meat processing operations (2.305 MGD of 3.000 MGD total, as of the 2017 on-site compliance inspection).

The Environmental Protection Agency (EPA) has established effluent guidelines with technology-based effluent limits (TBELs). Effluent guidelines for the "Meat and Poultry Products Point Source Category" are available through eCFR at https://ecfr.io/Title-40/cfr432_main. Additional information is available in *Technical Development Document for the Final Effluent Limitations Guidelines and Standards for the Meat and Poultry Products Point Source Category (40 CFR 432)*, EPA 2004 (https://www.epa.gov/sites/production/files/2015-11/documents/meat-poultry-products_tdd_2004_0.pdf).

Smithfield WWTP's TBELs are based on the Best Practicable Control Technology (BPT) currently available in 40 CFR 432.22 which became effective on October 8, 2004 (Title 40, Protection of the Environment; Chapter I, Environmental Protection Agency; Subchapter N, Effluent Guidelines and Standards; Part 432, Meat and Poultry Point Source Category; Subpart B, Complex Slaughterhouses; Section 22, Effluent limitations attainable by application of the best practicable control technology currently available (BPT)).

Live Weight Killed (LWK) is "the total weight of animals slaughtered," as defined in 40 CFR Part 432. Effluent limits for some parameters below are calculated based on LWK, as required by 40 CFR 432.22. The current permit's TBELs were based on a LWK of 4,401,564 pounds per day and a prior version of 40 CFR 432.22. The proposed effluent limits in this draft permit are based on an updated LWK of 5,299,895 pounds per day, to reflect the recent production-based loading to the WWTP, based on the annual production data from 2018: 294 production days; 5,496,187 total head killed; and 283.5 pounds average live weight per head.

TBELs for Smithfield WWTP are to be developed for the following parameters: Ammonia (as N); Five-Day Biochemical Oxygen Demand (BOD_5); Fecal Coliform; Oil and Grease (O&G); and Total Suspended Solids (TSS). According to 40 CFR 432.22, TBELs are based on concentration (ammonia and fecal coliform), or LWK (BOD_5, O&G, and TSS). The applicable BPT effluent limitations are compiled in Table 1 below.

Table 1: BPT Effluent Limitations (40 CFR 432.22)

Parameter	Maximum Monthly Average	Maximum Daily
Ammonia (as N)	4.0 mg/L	8.0 mg/L
BOD_5	0.21 lbs per 1,000 lbs LWK	0.42 lbs per 1,000 lbs LWK
Fecal Coliform	N/A	400 #/100 mL
O&G	0.08 lbs per 1,000 lbs LWK	0.16 lbs per 1,000 lbs LWK
TSS	0.25 lbs per 1,000 lbs LWK	0.50 lbs per 1,000 lbs LWK

Final effluent limits proposed in the draft permit for Smithfield WWTP must be the most stringent of the applicable TBELs, water-quality based effluent limits (WQBELs), and South Dakota Surface Water Quality Standards (SDSWQS) in the Administrative Rules of South Dakota (ARSD). Fecal coliform standards have been replaced with *Escherichia coli* (*E. coli*) standards in the SDSWQS; effluent limits are included for both *E. coli* (126 per 100 mL 30-day geometric mean and 235 per 100 mL daily maximum, May 1 to September 30) and fecal coliform (400 per 100 mL daily maximum, year-round). Mass-based ammonia-nitrogen (as N) limits for Smithfield WWTP have been developed on a monthly basis, taking into account the TBELs established in 40CFR 432.22 and the WQBELs developed in Attachment 5; refer to this attachment for more information.

For this draft permit, the mass-based TBELs calculated using a LWK of 5,299,895 lb/d for BOD_5, O&G, and TSS are presented in Table 2 below.

Table 2: Calculated TBELs, lb/d

Parameter	TBEL	
	Maximum Monthly Average (lb/d)	Maximum Daily (lb/d)
BOD_5	1,113	2,226
O&G	424	848
TSS	1,325	2,650

Smithfield WWTP's average design flow is 3.5 MGD (5.42 cfs). The equivalent concentration-based values for BOD_5, O&G, and TSS are presented in Table 3 below, along with the applicable SDSWQS for comparison. The mass-based limit to concentration-based limit conversion is below in Equation 1.

Table 3: Equivalent Concentration-Based TBEL Values and Applicable SDSWQS

Parameter	Concentration-Equivalent TBEL		Standard from SDSWQS
	Maximum Monthly Average (mg/L)	Maximum Daily (mg/L)	
BOD_5	38	76	N/A
O&G	15	29	*ARSD Section 74:51:01:52:* 10 mg/L (daily maximum)
TSS	45	91	*ARSD Section 74:51:01:48:* 90 mg/L (30-day average), 158 mg/L (daily maximum)

Equation 1: Conversion from Mass-Based Limit to Concentration-Based Limit

$$\text{Concentration Limit (mg/L)} = \frac{\text{Mass Limit (lb/d)}}{\text{Effluent Flow (cfs) x 5.3934 (conversion factor)}}$$

To prevent limit backsliding during the summer season, the 30-day average BOD_5 limit will be reduced to 779 lb/d for June 1 to August 31 as a WQBEL. This limit is based on the current permit's Total Maximum Daily Load (TMDL) wasteload allocation (WLA) of 667 lb/d, which would have an equivalent concentration of 27 mg/L as calculated using the facility's previous design flow of 3.0 MGD (4.64 cfs). The current permit's mass-based TBEL limits for BOD_5 for daily maximum (year-round) and 30-day average (September 1 – May 31) were calculated based on production, and did not have to be reduced according to the water quality modeling conducted in the current permit. These current mass-based TBEL limits for BOD_5 would have equivalent concentrations that are comparable to those proposed in the draft permit: 40 mg/L 30-day average (September 1 – May 31); and 74 mg/L daily maximum (year-round).

The O&G TBELs calculated for the draft permit are less stringent that the SDSWQS. Therefore, the O&G limit proposed in the draft permit is 10 mg/L daily maximum.

The mass-based TBELs in Table 2 above for TSS will be proposed in the draft permit. The current permit's mass-based TBEL limits for TSS were calculated based on production, and would have equivalent concentrations that are comparable to those proposed in the draft permit: 44 mg/L 30-day average; and 88 mg/L daily maximum.

The proposed limits for all TBELs are presented in Tables 4 and 5 below.

Table 4: 30-Day Average Effluent Limits proposed in Smithfield WWTP's Draft Permit for parameters with applicable BPT Effluent Limitations

Parameter	Season	30-Day Average Limit	Limit based on TBEL, WQBEL, or SDSWQS
Ammonia-Nitrogen (as N)	January 1 – 31	117 lb/d	TBEL (40 CFR 432.22)
	February 1 – 29	117 lb/d	TBEL (40 CFR 432.22)
	March 1 – 31	73 lb/d	WQBEL (ARSD 74:51:01:48)
	April 1 – 30	81 lb/d	WQBEL (ARSD 74:51:01:48)
	May 1 – 31	82 lb/d	WQBEL (ARSD 74:51:01:48)
	June 1 – 30	67 lb/d	WQBEL (ARSD 74:51:01:48)
	July 1 – 31	53 lb/d	WQBEL (ARSD 74:51:01:48)
	August 1 – 31	37 lb/d	WQBEL (ARSD 74:51:01:48)
	September 1 – 30	61 lb/d	WQBEL (ARSD 74:51:01:48)
	October 1 – 31	61 lb/d	WQBEL (ARSD 74:51:01:48)
	November 1 – 30	117 lb/d	TBEL (40 CFR 432.22)
	December 1 – 31	117 lb/d	TBEL (40 CFR 432.22)
BOD_5	September 1 – May 31	1,113 lb/d	TBEL (40 CFR 432.22)
	June 1 – August 31	779 lb/d	WQBEL (current permit TMDL WLA)
Fecal Coliform	Year-Round	N/A	N/A
O&G	Year-Round	N/A	N/A
TSS	Year-Round	1,325 lb/d	TBEL (40 CFR 432.22)

Table 5: Daily Maximum Effluent Limits proposed in Smithfield WWTP's Draft Permit for parameters with applicable BPT Effluent Limitations

Parameter	Season	Daily Maximum Limit	Limit based on TBEL, WQBEL, or SDSWQS
Ammonia-Nitrogen (as N)	January 1 – 31	234	TBEL (40 CFR 432.22)
	February 1 – 29	234	TBEL (40 CFR 432.22)
	March 1 – 31	234	TBEL (40 CFR 432.22)
	April 1 – 30	143	WQBEL (ARSD 74:51:01:48)
	May 1 – 31	143	WQBEL (ARSD 74:51:01:48)
	June 1 – 30	117	WQBEL (ARSD 74:51:01:48)
	July 1 – 31	117	WQBEL (ARSD 74:51:01:48)
	August 1 – 31	117	WQBEL (ARSD 74:51:01:48)
	September 1 – 30	155	WQBEL (ARSD 74:51:01:48)
	October 1 – 31	155	WQBEL (ARSD 74:51:01:48)
	November 1 – 30	234	TBEL (40 CFR 432.22)
	December 1 – 31	234	TBEL (40 CFR 432.22)
BOD_5	Year-Round	2,226 lb/d	TBEL (40 CFR 432.22)
Fecal Coliform	Year-Round	400 # / 100 mL	TBEL (40 CFR 432.22)
O&G	Year-Round	10 mg/L	SDSWQS (ARSD 74:51:01:52)
TSS	Year-Round	2,650 lb/d	TBEL (40 CFR 432.22)