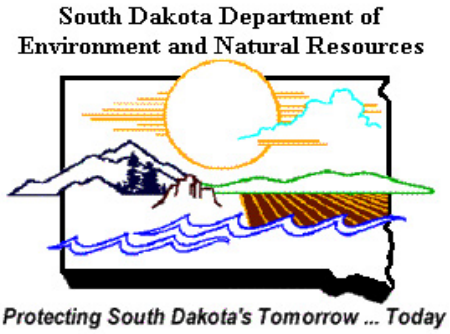
# FECAL COLIFORM TOTAL MAXIMUM DAILY LOAD EVALUATION FOR PIERRE CREEK, HANSON COUNTY, SOUTH DAKOTA




**PREPARED BY:**

**Jesse Wilkens**
**James River Water Development District**

**For**

**SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES**

**May, 2009**

**Pierre Creek Total Maximum Daily Load**

| | |
|---|---|
| ***Waterbody Type:*** | Stream |
| ***303(d) Listing Parameter***: | Fecal Coliform |
| ***Initial Listing date*** | 2008 IR |
| ***Entity ID***: | SD-JA-R-PIERRE_01 |
| ***Designated Use of Concern***: | Limited Contact Recreation |
| ***Stream Miles*** | 2 miles from James River to S11, T102N, R58W |
| ***Size of Watershed*:** | 78 square miles |
| ***Analytical Approach:*** | Aquarius, Load Duration Curve, Targeting |
| ***Indicators:*** | Concentration of Fecal Coliform Bacteria |
| ***Location***: | HUC Code: 10160011 |
| ***Target:*** | < 1000 Colonies/ 100mL mean Concentration with maximum single sample concentrations of < 2000 Colonies/ 100mL |

**Objective:**

The intent of this summary is to clearly identify the components of the TMDL submittal to support adequate public participation and facilitate the US Environmental Protection Agency (EPA) review and approval. The TMDL was developed in accordance with Section 303(d) of the federal Clean Water Act and guidance developed by EPA. This TMDL document addresses the fecal coliform bacteria impairment of Pierre Creek from its confluence with the James River to S11, T102N, R58W, SD-JA-R-PIERRE_01.

**Introduction**

Pierre Creek drains 78 square miles in Central Eastern South Dakota and discharges to the James River in Hanson County. The stream receives runoff from agricultural operations. The watershed is composed of 54% cropland, 37% grasslands (including pastures and hay ground), 7% developed (farmsteads and the town of Alexandria), 2% water and wetlands, and the remaining 1% trees and shelterbelts. The impaired segment of stream starts at the James River and stretches approximately two miles upstream of Lake Hanson. The community of Alexandria is the largest municipality located within the watershed and has a zero discharge waste treatment permit.

Lake Hanson is located within the impaired reach of stream. The portions of the watershed located upstream of Lake Hanson were the target of an EPA section 319 watershed project with a goal of reducing nutrient loadings to the lake.

Pierre Creek was assessed as an individual portion of the larger Lower James River Watershed Assessment which looked at individual streams such as Pierre Creek as well as the entire drainage basin and the cumulative effects of the individual waterbodies. During the assessment, data was collected indicating the creek experiences periods of degraded water quality as a result of fecal coliform bacteria.

Segment SD-JA-R-PIERRE_01 was listed for fecal coliform bacteria impairment in the 2008 integrated report. This TMDL will address the fecal coliform listing.

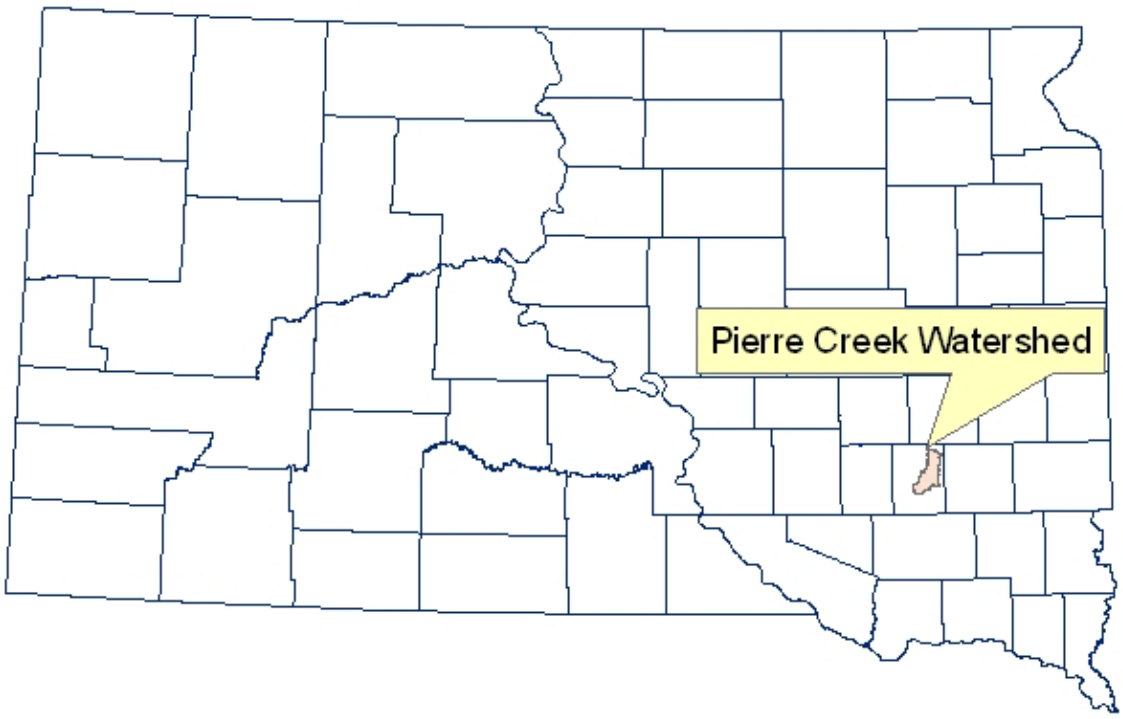



**Figure 1. Pierre Creek Watershed Location**

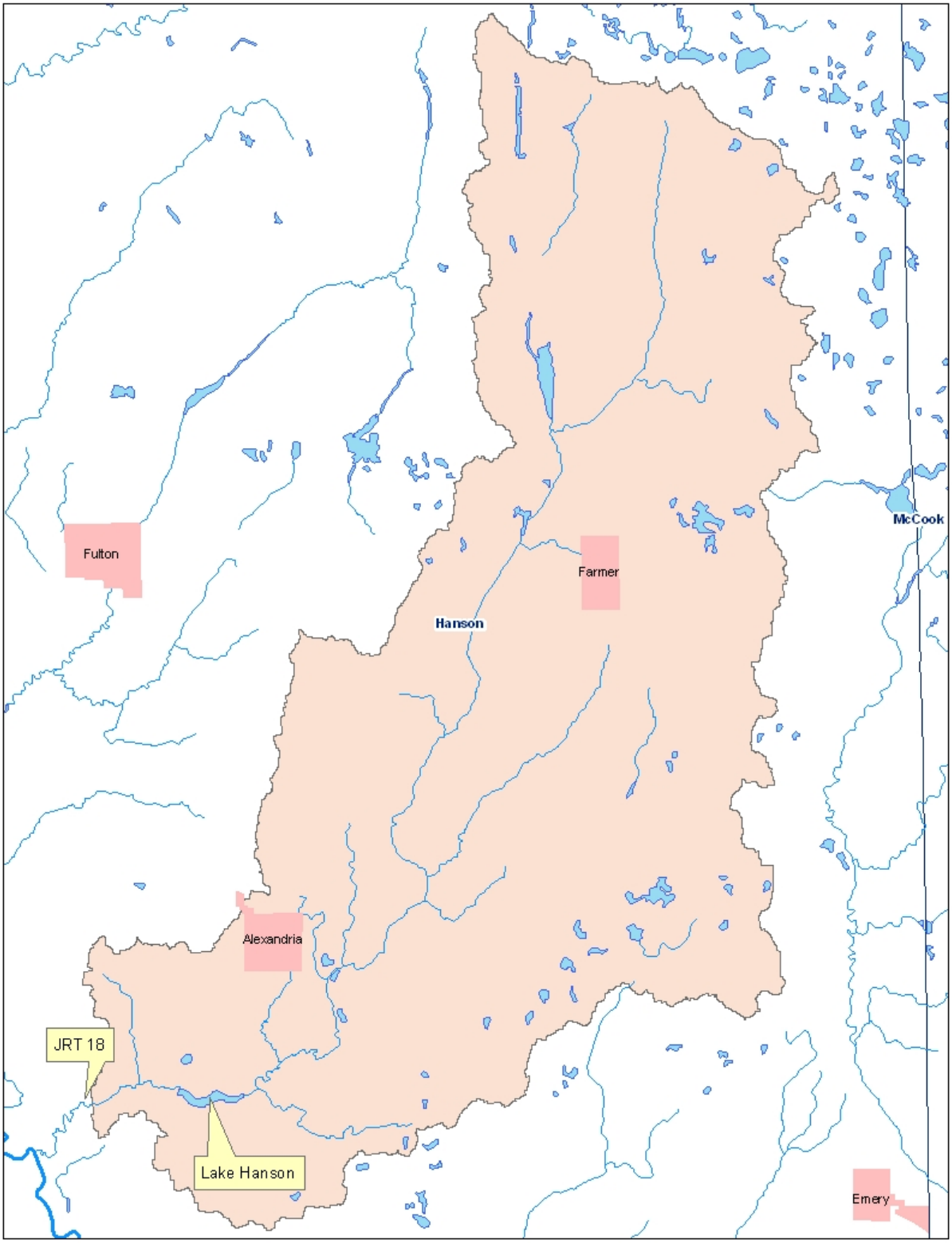



**Figure 2. Pierre Creek Contributing Drainage at Site JRT 18, One Mile Upstream of the James River**

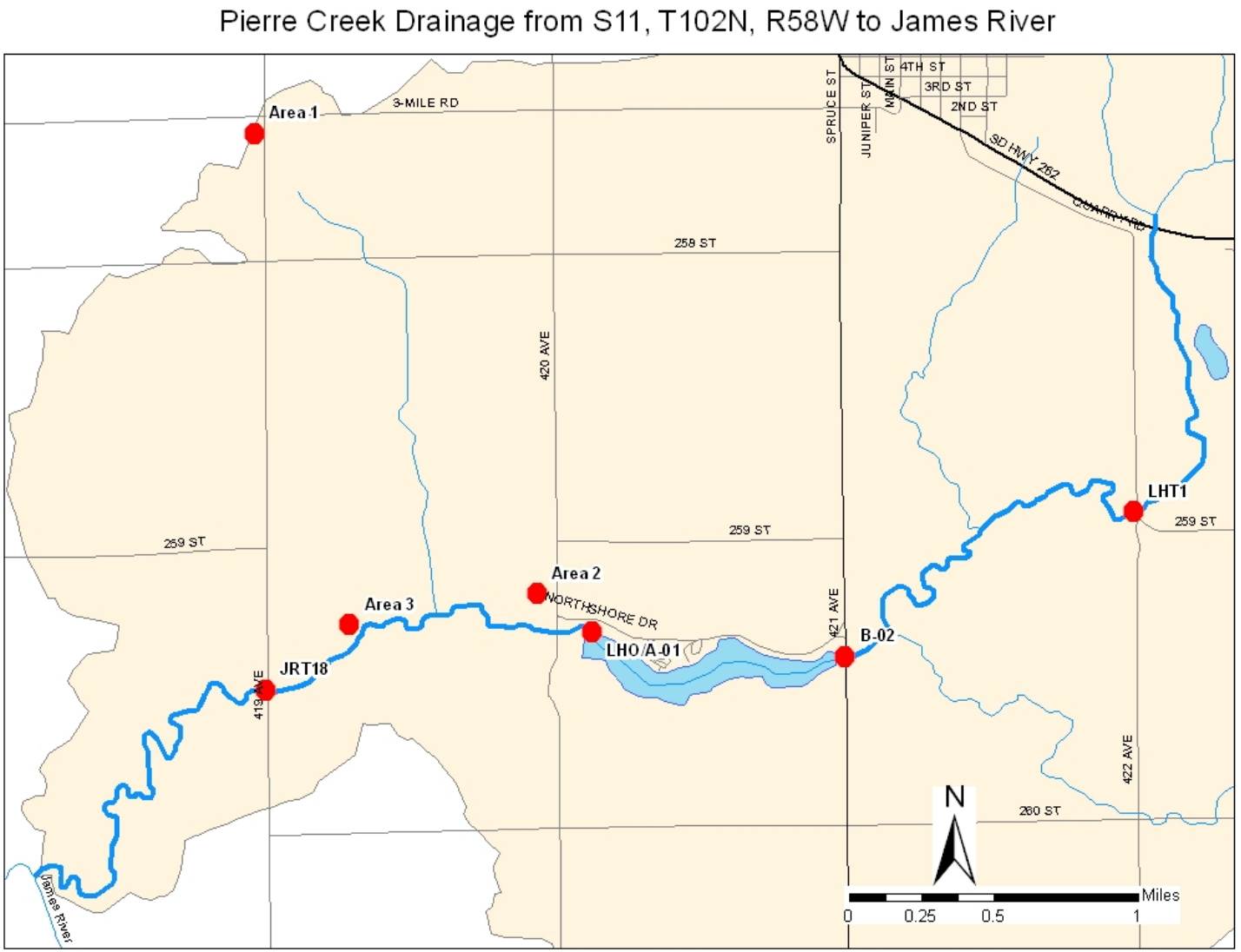



**Figure 3. Listed Segment of Pierre Creek including Sampling Site and Potential Pollutant Source Locations**

## Description of Applicable Water Quality Standards & Numeric Water Quality Targets

Each waterbody within South Dakota is assigned beneficial uses. All waters (both lakes and streams) are designated with the use of fish and wildlife propagation, recreation and stock watering. All streams are assigned the use of irrigation. Additional uses are assigned by the state based on a beneficial use analysis of each waterbody. Water quality standards have been defined in South Dakota state statutes in support of these uses. These standards consist of suites of criteria that provide physical and chemical benchmarks from which management decisions can be developed.

Pierre Creek has been assigned the beneficial uses of: warmwater semi-permanent fish life propagation; irrigation waters, limited contact recreation; and fish and wildlife propagation; recreation, and stock watering. Table 1 lists the criteria that must be met to support the specified beneficial uses. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

The numeric TMDL target established for Pierre Creek is based on the current water quality standards. Water quality criteria for the limited contact recreation beneficial use requires that 1) no sample exceeds 2000 CFU/100 mL and 2) during a 30-day period, the geometric mean of minimum of 5 samples collected during separate 24-hour periods must not exceed 1000 CFU/100mL. This criterion is applicable from May 1 through September 30 (SD DENR, 2002).

**Table 1. State Water Quality Standards for Pierre Creek.**

| Parameters | Criteria | Unit of Measure | Beneficial Use Requiring this Standard |
|---|---|---|---|
| Total ammonia nitrogen as N | Equal to or less than the result from Equation 3 in Appendix A of Surface Water Quality Standards | mg/L 30 average May 1 to October 31 | Warmwater Semipermanent Fish Propagation |
| | Equal to or less than the result from Equation 4 in Appendix A of Surface Water Quality Standards | mg/L 30 average November 1 to April 31 | |
| | Equal to or less than the result from Equation c in Appendix A of Surface Water Quality Standards | mg/L Daily Maximum | |
| Dissolved Oxygen | $\geq$4.0 | mg/L | Warmwater Semipermanent Fish Propagation |
| Total Suspended Solids | $\leq$90 (mean)<br>$\leq$158 (single sample) | mg/L | Warmwater Semipermanent Fish Propagation |
| Temperature | $\leq$32 | °C | Warmwater Semipermanent Fish Propagation |
| Fecal Coliform Bacteria (May 1- Sept 30) | $\leq$1000 (geometric mean)<br>$\leq$2000 (single sample) | count/100 mL | Limited Contact Recreation |
| Alkalinity ($CaCO_3$) | $\leq$750 (mean)<br>$\leq$1,313 (single sample) | mg/L | Wildlife Propagation and Stock Watering |
| Conductivity | $\leq$2,500 (mean)<br>$\leq$4,375 (single sample) | µmhos/cm @ 25° C | Irrigation Waters |
| Nitrogen, nitrate as N | $\leq$50 (mean)<br>$\leq$88 (single sample) | mg/L | Wildlife Propagation and Stock Watering |
| pH (standard units) | $\geq$6.5 to $\leq$9.0 | units | Warmwater Semipermanent Fish Propagation |
| Solids, total dissolved | $\leq$2,500 (mean)<br>$\leq$4,375 (single sample) | mg/L | Wildlife Propagation and Stock Watering |
| Total Petroleum Hydrocarbon<br>Oil and Grease | $\leq$10<br>$\leq$10 | mg/L | Wildlife Propagation and Stock Watering |
| Sodium Adsorption Ratio | <10 | ratio | Irrigation Waters |

**Data Collection Method**
Data on Pierre Creek was collected during the Lower James Watershed Assessment. Most data was collected from a single sampling point (JRT18 see Figure 1) approximately 1 mile upstream of the confluence with the James River and 1 mile downstream of Lake Hanson. Discrete samples were taken at the outlet of Lake Hanson and in Pierre Creek upstream of Lake Hanson. These discrete samples were used to show that Lake Hanson is not causing Pierre Creek to exceed state fecal coliform standards, but rather a specific feeding area between Lake Hanson and JRT18.

Modeling for the Pierre Creek watershed was limited to the use of the Aquarius model to validate the hydrology for the load duration curve. Targeting was completed through discrete sampling instead of modeling procedures.

**Pollutant Assessment**

*Nonpoint Sources*
Based on samples collected during the Lower James River Watershed Assessment in 2006 and 2007, Pierre Creek was listed as impaired due to exceedence of fecal coliform criteria. Fecal coliform bacteria concentration exceeded the acute standard at site JRT18 in 3 of the 10 samples or 30% of the time. One additional sample collected upstream of Lake Hanson also exceeded the acute standard. Five samples ranging from May 2 to May 31, 2006 were higher than the chronic standard of 1000 colonies/100mL but did not exceed the geometric mean. The violations do not appear to be storm event driven as the highest concentration (8400 colonies/100mL) occurred at a flow of 2.2 cfs on May 16, 2006. No other violations occurred in any of the higher flow zones.

Table 2 represents the fecal coliform samples collected from Pierre Creek during the Lower James Assessment Project and during the Lake Hanson Assessment that were collected during the recreation season. Table 3 represents data collected during the two projects that were collected outside of the recreation season and were only used in the examination of trends between sites.

**Table 2. Fecal Coliform Samples Collected during the Recreation Season**

| Samples collected during recreation season | | | | |
|---|---|---|---|---|
| Site | Sample Data | Fecal Coliform CFU/100mL | Flow | Flow Zone |
| *B-02* | *05/07/07* | *3400* | *?* | *High* |
| *A-01* | *05/07/07* | *1200* | *?* | *High* |
| *JRT18* | *05/07/07* | *1900* | *?* | *High* |
| JRT18 | 09/26/06 | 360 | 10.9 | High |
| JRT18 | 08/30/06 | 1000 | 4.7 | Mid |
| JRT18 | 08/15/06 | 1400 | 6.5 | Mid |
| JRT18 | 07/26/06 | 2100 | 2.6 | Groundwater |
| JRT18 | 06/06/06 | 2200 | 1.9 | Groundwater |
| JRT18 | 05/31/06 | 900 | 1.9 | Groundwater |
| JRT18 | 05/23/06 | 160 | 2.8 | Groundwater |
| JRT18 | 05/16/06 | 8400 | 2.2 | Groundwater |
| JRT18 | 05/09/06 | 550 | 2.8 | Groundwater |
| JRT18 | 05/02/06 | 100 | 3.0 | Mid |
| LHT1 | 05/30/02 | 570 | 15.4 | High |
| LHT1 | 09/26/01 | 240 | 12.2 | High |
| LHT1 | 08/27/01 | 240 | 12.2 | High |
| LHT1 | 08/27/01 | 320 | 12.2 | High |
| LHO | 08/27/01 | 20 | 12.2 | High |
| LHO | 08/27/01 | 5 | 12.2 | High |
| LHT1 | 07/26/01 | 1300 | 68.5 | High |
| LHO | 07/26/01 | 500 | 68.5 | High |
| LHT1 | 07/17/01 | 860 | 11.2 | High |
| LHT1 | 06/27/01 | 1590 | 13.1 | High |
| LHT1 | 05/10/01 | 100 | 20.2 | High |

**Table 3. Fecal Coliform Samples Collected outside the Recreation Season**

| Samples collected outside of recreation season | | | | |
|---|---|---|---|---|
| Site | Sample Date | Fecal Coliform CFU/100mL | Flow | Flow Zone |
| *B-02* | *03/13/2007* | *120* | *?* | *High* |
| *A-01* | *03/13/2007* | *150* | *?* | *High* |
| *JRT18* | *03/13/07* | *240* | *265.9* | *High* |
| JRT18 | 03/12/07 | 250 | 274.5 | High |
| JRT18 | 10/25/06 | 50 | 6.9 | Mid |
| JRT18 | 04/26/06 | 10 | 1.6 | Groundwater |
| JRT18 | 04/13/06 | 10 | 2.8 | Groundwater |
| JRT18 | 03/14/06 | 10 | 3.8 | Mid |
| LHT1 | 10/30/01 | 100 | 13.8 | High |
| LHO | 10/30/01 | 5 | 13.8 | High |
| LHT1 | 04/26/01 | 90 | 45.7 | High |
| LHO | 04/26/01 | 420 | 45.7 | High |
| LHT1 | 04/23/01 | 11000 | 72.9 | High |
| LHO | 04/23/01 | 2500 | 72.9 | High |

No violations of the state standard were measured during the Lake Hanson Assessment within the lake itself. As a portion of the assessment, 15 feeding areas were identified. Modeling efforts indicated that only 2 presented a potential risk of bacterial contamination to the lake. Of these two, one no longer existed at the start of the Lower James Assessment. The remaining potential source was identified as only presenting a risk during runoff events. This second source may have been a contributing factor to the elevated counts in the sample collected on May 7, 2007 and further effort should be made to mitigate this source.

As part of the Lower James Assessment, discrete samples were taken during spring runoff and storm events at two points on Pierre Creek, one at the inlet to Lake Hanson and one at the outlet (Tables 2 and 3, Figure 3), in order to determine if Lake Hanson was a source of fecal contamination.. In both instances, bacteria counts increased between the outlet of the lake and site JRT18, indicating that the primary source of bacteria is located between these points.

Including samples collected during the Lake Hanson Assessment (both during and outside the recreational season), eight pairs of samples collected on the same dates from the inlet and outlet of the lake may be examined. Six of these 8 sample pairs indicate that bacteria counts are reduced as water moves through the lake. The sample pair collected on March 13, 2007 showed an increase of 30 cfu/ 100 mL. The sample pair collected on April 26, 2001 showed an increase of 330 cfu/ 100mL. There are a number of seasonal cabins and a few permanent residences located on the north shore of Lake Hanson as well as livestock grazing on the south side. The sample pairs suggest these are not likely sources of the bacteria collected at the downstream site.

Aerial photos were used to locate three potential sources of bacterial contamination (Figure 3) within the immediate drainage area of site JRT18. Area 1 (an AFO) was ruled out as a source because the tributary to Pierre Creek indicated on the map (Figure 3) was not detectable on the ground and thus, there is no direct route for fecal coliform bacteria to reach Pierre Creek. There was no evidence of significant livestock near Area 2. A livestock feeder was found near Pierre Creek at Area 3 on the map. At the time of inspection there were no cattle present, however, visual evidence indicated heavy cattle use. There was evidence of trampling and fecal matter in a large area close to the stream. It is most likely that this is the predominant source of fecal contamination between Lake Hanson and JRT 18.

*Point Sources*

The community of Alexandria has a waste water treatment pond located upstream of the listed segment. On May 7, 2008, the department conducted the most recent regularly scheduled inspection of Alexandria's wastewater treatment facility. This inspection noted there was no evidence of excessive seepage from the lagoons. The system was properly operated and maintained. Early in 2009, the department awarded the city of Alexandria an **Excellent Operation and Maintenance Award** for its wastewater treatment system. At this time, there is no evidence to suggest the city of Alexandria's wastewater treatment facility is impacting the ground water or surface water resources in this area. The department will continue to inspect Alexandria's system in accordance with its EPA-approved inspection plan.

**Technical Analysis (Linkage Analysis)**

During the development of the load duration curve, it was noted that the curve did not look like a typical stream curve (there was a strong baseflow component evident). In addition to flow data collected during the Lower James Assessment Project and the Lake Hanson Assessment Project, flow data was available from a USGS gauging station from 1982 through 1983 that had been located at the same point as station JRT18. Due to the limited flow data (about 1320 days), an effort was made to determine if the flow data used in the curve was representative of the streams long-term hydrograph.

Groundwater significantly affects Pierre Creek. The geology of the Pierre Creek basin consists of an alluvium deposit with the potential to hold and release water (DENR staff, 2002). Because of this, surface water often intermingles with the underlying aquifer to such a degree that stream flows are altered. The Alexandria Aquifer underlies the area; however it is too deep to be a likely candidate for the springs discharging to Pierre Creek.

Pierre Creek does not exhibit the hydrograph typical of an eastern South Dakota stream with a 50,000 acre watershed. Channel measurements were taken in the reach below Lake Hanson, resulting in an estimate of the channel forming flow of approximately 4.5 cfs. This is significantly lower than regional curves would suggest.

When significant runoff events occur, Pierre Creek does not respond similarly to neighboring streams. Wolf Creek, Enemy Creek, and Plum Creek were all used for comparisons. Wolf and Enemy adjoin Pierre Creek on the East and West sides respectively. They are both larger watersheds that extend further to the north, but have more substantial daily flow records. Comparing Pierre Creek years of record to these streams indicated that the few years of data for Pierre Creek did provide a good representation of the long term hydrograph.

Plum Creek is approximately 2/3rds the size of Pierre Creek (55 square miles vs 78 square miles) and drains a nearly identical landscape to the south of Pierre Creek. Figure 4 depicts an example of the hydrographs for the two streams over a common timeframe. Pierre Creek maintains a minimum constant flow, while Plum Creek drops to a zero flow condition frequently. The larger watershed size in Pierre Creek would have been expected to generate higher peaks during runoff events; however, the opposite appears to be occurring. Most events in the Pierre Creek drainage appeared to have a smaller peak discharge. Plum Creek was used to help define the flow regimes in Pierre Creek.

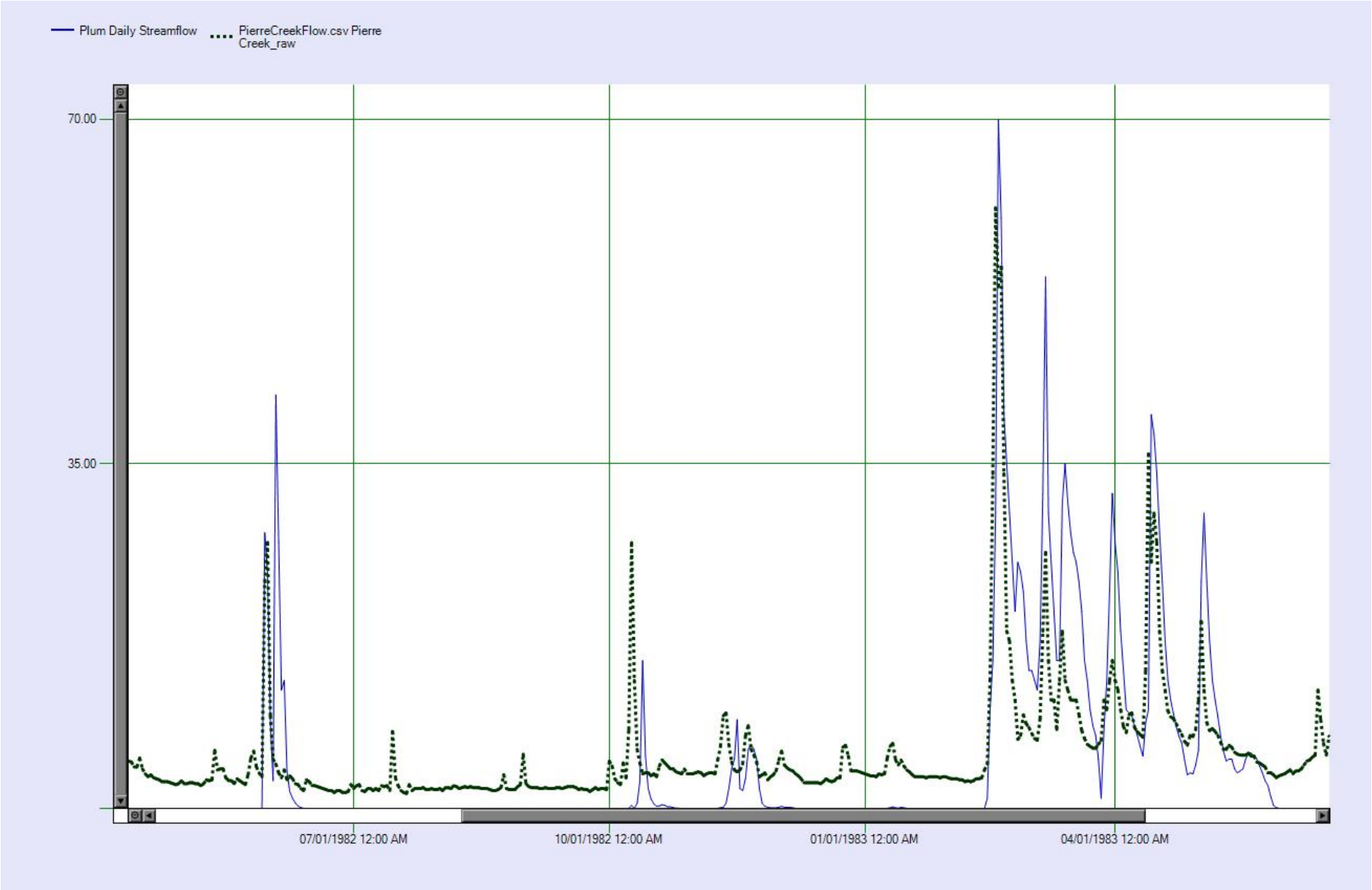



**Figure 4. Pierre Creek to Plum Creek Comparison**

**TMDL and Allocations for Fecal Coliform**

The LDC is a dynamic expression of allowable load for any given day. To aid in interpretation and implementation of the TMDL, the flow intervals were grouped into three flow zones representing high flows (0-21%), mid flow conditions (21-75%), and groundwater flow conditions (76-100%). This method was chosen over the method outlined in EPA's *An Approach for Using Load Duration Curves in the Development of TMDLs* (USEPA, 2006) because of the specific characteristics of Pierre Creek's hydrograph. These characteristics are described in each of the flow zone descriptions.

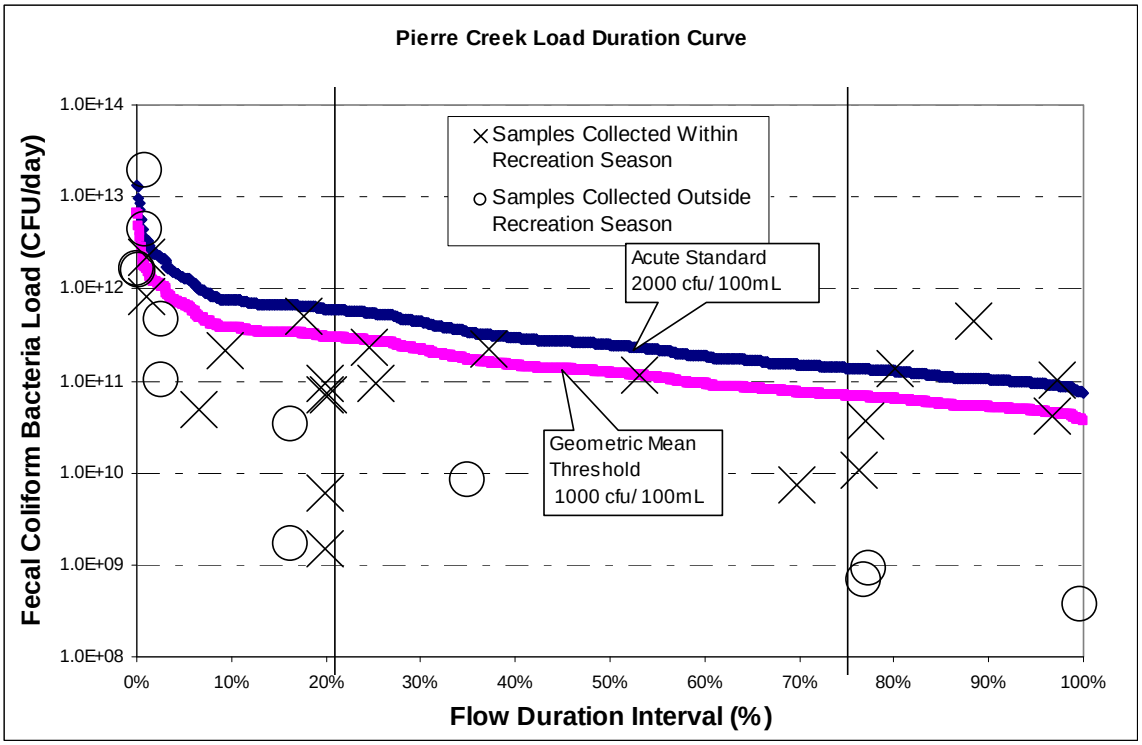



**Figure 4. Fecal Load Duration Curve**

Flows in the highest flow zone are precipitation event driven and are represented by flows greater than 9.2 cfs (0% to 21%). Flows within this range created runoff in both Pierre and neighboring Plum Creek. Flow volumes in this zone can be considered entirely runoff in origin. Sources of bacterial contamination are more likely to be located outside of the stream corridor. Fecal bacteria samples in the highest flow zone exceeded the acute standard in one sample, collected near the inlet to the lake. Some individual samples were above the geometric mean, but the chronic standard was not exceeded.

Mid flows were characterized as those ranging from 2.8 cfs to 9.2 cfs (21% to 75%). Flow volumes in this zone are a mixture of runoff and groundwater. The distinguishing characteristic of this flow zone is that flows in Pierre Creek are elevated above base flow, while neighboring Plum Creek did not experience any runoff. Sources of bacterial contamination are likely to be located adjacent to the stream corridor. Fecal bacteria

samples within this flow zone did not exceed the standard. Some individual samples were above the geometric mean, but the chronic standard was not exceeded

The zone encompassing flows below 2.8 cfs (75% to 100%) are representative of flows attributed solely to groundwater discharges. Sources of bacteria in this flow zone can be expected to be in direct contact with the stream. This flow regime contains the three highest fecal coliform concentrations recorded during the study, all of which exceeded the daily standard.

Instantaneous loads were calculated by multiplying the fecal coliform sample concentrations, discharge data, and a unit conversion factor. When the instantaneous loads are plotted on the LDC, characteristics of the water quality impairment are shown. Instantaneous loads that plot above the acute standard curve are exceeding the TMDL, while those below the curve are in compliance. As the graph shows, fecal coliform samples collected from Pierre Creek only violated the standard in the low flow zone, which is indicative of cattle in the stream. As an additional measure of protection, reductions were calculated using the chronic standard of 1000 colonies/ 100 mL, resulting in reductions in all 3 flow zones.

**Table 4. TMDL Summary**

| TMDL Component | Flow Zone (Expressed as colony forming units/ day) | | |
|---|---|---|---|
| | High Flow | Mid Flow | Groundwater Flow |
| | >9.2 cfs | 2.8-9.2 cfs | <2.8 cfs |
| LA | 9.61E+11 | 1.43E+11 | 5.51E+10 |
| WLA | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MOS | 2.85E+11 | 4.16E+10 | 1.74E+10 |
| TMDL Component | 1.25E+12 | 1.85E+11 | 7.25E+10 |
| | | | |
| Current Load* | 2.18E+12 | 3.66E+11 | 5.40E+11 |
| Load Reduction | 42% | 49% | 86% |
| *Current Load is the highest concentration in each flow zone times the 90th percentile flow in each flow zone | | | |

## Wasteload Allocations (WLAs)

There are no point sources of pollutants in this watershed. Therefore, the "wasteload allocation" component of this TMDL is considered a zero value. The TMDLs are considered wholly included within the "load allocation" component. The community of Alexandria has South Dakota permit number SD0022268. This permit allows for zero discharge, thus the waste load allocation for this TMDL will be 0.

## Load Allocation (LA)

To develop the fecal coliform bacteria load allocation (LA), the loading capacity (LC) was first determined. The LC for Pierre Creek was calculated by multiplying the chronic fecal coliform bacteria criterion in each flow zone by the mean daily average discharge in that flow zone and a units conversion factor. The chronic or geometric mean criterion (1000 CFU/100ml) was used rather than the daily maximum (2000 CFU/100ml). If the

chronic standard is targeted rather than the daily standard, it will ensure that both standards will be met, providing Pierre Creek with maximum protection.

**Seasonal Variation**
Different seasons of the year can yield differences in water quality due to changes in precipitation, groundwater influences, and agricultural practices. The fecal coliform standard only applies to streams from May 1 through September 30, which is the season that the TMDL addresses.

**Margin of Safety**
An explicit MOS identified using a duration curve framework is basically unallocated assimilative capacity intended to account for uncertainty (e.g., loads from tributary streams, effectiveness of controls, etc). An explicit MOS was calculated as the difference between the loading capacity at the mid-point of each of the flow zones and the loading capacity at the minimum flow in each zone. A substantial MOS is provided using this method, because the loading capacity is typically much less at the minimum flow of a zone as compared to the mid-point. Because the allocations are a direct function of flow, accounting for potential flow variability is an appropriate way to address the MOS.

**Critical Conditions**
The impairments to Pierre Creek occurred throughout the fecal sampling period from May 1 to September 30. Critical conditions for Pierre Creek are not related to precipitation or flows, but rather to the presence of cattle in the stream corridor upstream of the sampling site.

**Follow-Up Monitoring and TMDL Review**
It is critical that monitoring of the fecal coliform counts be conducted during the implementation of best management practices at both the start and end of the listed segment. This data will provide information on the effectiveness of the BMPs.

The Department may adjust the load and/or wasteload allocations in this TMDL to account for new information or circumstances that are developed or come to light during the implementation of the TMDL and a review of the new information or circumstances indicate that such adjustments are appropriate. Adjustment of the load and waste load allocation will only be made following an opportunity for public participation. New information generated during TMDL implementation may include, among other things, monitoring data, BMP effectiveness information and land use information. The Department will propose adjustments only in the event that any adjusted LA or WLA will not result in a change to the loading capacity; the adjusted TMDL, including its WLAs and LAs, will be set at a level necessary to implement the applicable water quality standards; and any adjusted WLA will be supported by a demonstration that load allocations are practicable. The Department will notify EPA of any adjustments to this TMDL within 30 days of their adoption.

**Public Participation**
The project was presented at many board meetings of the James River Water Development District, which was the lead sponsor of the project. The public was invited to attend all board meetings and discussion was welcomed.

Notice of availability of the proposed TMDL for Pierre Creek was provided in the *Alexandria Herald, Sioux Falls Argus Leader, and Mitchell Daily Republic* in June of 2009. A comment period of 30 days was provided to the public. Comments were received form USEPA Region 8. These comments and responses to them may be found in Appendix A.

**Implementation Plan**
Implementation activities for the Pierre Creek watershed were incorporated within the Lower James River Implementation Project which covers all of the tributaries that drain into the Lower James River.

Available data makes it impossible to allocate a specific load to a particular portion of the watershed. It is most likely that the load may be significantly reduced through the mitigation of sources at Area 3 on Figure 3. Recommendations for implementation include providing an alternate source of drinking water away from the stream and fencing the stream corridor to prevent livestock from entering the water.

**Literature Cited**
Durand, B., Liss, L.A., Giles, C. and Haas, G. (2002). *Bacteria TMDL for the Shawsheen river basin*. Report MA83-01-2002-24.
www.mass.gov/dep/water/resources/shawshee.pdf

USEPA, 2001; Protocol for Developing Pathogen TMDLs EPA 841-R-00-002. Office of Water (4503F), United States Environmental Protection Agency, Washington DC. 132 pp.

Yagow, G., Dillaha, T., Mostaghimi, S., Brannan, K., Heatwole, C. and Wolfe, M.L. (2001). *TMDL modeling of fecal coliform bacteria with HSPF*. ASAE meeting paper No.01-2066. St.Joseph, Mich.

SD DENR, 2002; Lake Hanson/Pierre Creek Watershed Assessment and TMDL Final Report. http://denr.sd.gov/dfta/wp/tmdl/TMDL_HansonAll.pdf

**Appendix A. Comments and DENR Responses**

EPA REGION VIII TMDL REVIEW

TMDL Document Info:

| | |
|---|---|
| **Document Name:** | **Fecal Coliform Total Maximum Daily Load Evaluation for Pierre Creek, Hanson County, South Dakota** |
| **Submitted by:** | **Cheryl Saunders, SD DENR** |
| **Date Received:** | **June 23, 2009** |
| **Review Date:** | **July 23, 2009** |
| **Reviewer:** | **Vern Berry, EPA** |
| **Rough Draft / Public Notice / Final?** | **Public Notice Draft** |
| **Notes:** | |

Reviewers Final Recommendation(s) to EPA Administrator (used for final review only):

- ☐ Approve
- ☐ Partial Approval
- ☐ Disapprove
- ☐ Insufficient Information

**Approval Notes to Administrator:**

This document provides a standard format for EPA Region 8 to provide comments to state TMDL programs on TMDL documents submitted to EPA for either formal or informal review. All TMDL documents are evaluated against the minimum submission requirements and TMDL elements identified in the following 8 sections:

1. Problem Description
   1.1. TMDL Document Submittal Letter
   1.2. Identification of the Waterbody, Impairments, and Study Boundaries
   1.3. Water Quality Standards
2. Water Quality Target
3. Pollutant Source Analysis
4. TMDL Technical Analysis
   4.1. Data Set Description
   4.2. Waste Load Allocations (WLA)
   4.3. Load Allocations (LA)
   4.4. Margin of Safety (MOS)
   4.5. Seasonality and variations in assimilative capacity
5. Public Participation
6. Monitoring Strategy
7. Restoration Strategy
8. Daily Loading Expression

Under Section 303(d) of the Clean Water Act, waterbodies that are not attaining one or more water quality standard (WQS) are considered "impaired." When the cause of the impairment is

determined to be a pollutant, a TMDL analysis is required to assess the appropriate maximum allowable pollutant loading rate. A TMDL document consists of a technical analysis conducted to: (1) assess the maximum pollutant loading rate that a waterbody is able to assimilate while maintaining water quality standards; and (2) allocate that assimilative capacity among the known sources of that pollutant**.** A well written TMDL document will describe a path forward that may be used by those who implement the TMDL recommendations to attain and maintain WQS.

Each of the following eight sections describes the factors that EPA Region 8 staff considers when reviewing TMDL documents. Also included in each section is a list of EPA's minimum submission requirements relative to that section, a brief summary of the EPA reviewer's findings, and the reviewer's comments and/or suggestions. Use of the verb "must" in the minimum submission requirements denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable.

This review template is intended to ensure compliance with the Clean Water Act and that the reviewed documents are technically sound and the conclusions are technically defensible.

# 1. Problem Description

A TMDL document needs to provide a clear explanation of the problem it is intended to address. Included in that description should be a definitive portrayal of the physical boundaries to which the TMDL applies, as well as a clear description of the impairments that the TMDL intends to address and the associated pollutant(s) causing those impairments. While the existence of one or more impairment and stressor may be known, it is important that a comprehensive evaluation of the water quality be conducted prior to development of the TMDL to ensure that all water quality problems and associated stressors are identified. Typically, this step is conducted prior to the 303(d) listing of a waterbody through the monitoring and assessment program. The designated uses and water quality criteria for the waterbody should be examined against available data to provide an evaluation of the water quality relative to all applicable water quality standards. If, as part of this exercise, additional WQS problems are discovered and additional stressor pollutants are identified, consideration should be given to concurrently evaluating TMDLs for those additional pollutants. If it is determined that insufficient data is available to make such an evaluation, this should be noted in the TMDL document.

## 1.1 TMDL Document Submittal Letter

When a TMDL document is submitted to EPA requesting formal comments or a final review and approval, the submittal package should include a letter identifying the document being submitted and the purpose of the submission.

Minimum Submission Requirements.

☐ A TMDL submittal letter should be included with each TMDL document submitted to EPA requesting a formal review.

☒ The submittal letter should specify whether the TMDL document is being submitted for initial review and comments, public review and comments, or final review and approval.

☐ Each TMDL document submitted to EPA for final review and approval should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent

to submit, and EPA's duty to review, the TMDL under the statute**.** The submittal letter should contain such identifying information as the name and location of the waterbody and the pollutant(s) of concern, which matches similar identifying information in the TMDL document for which a review is being requested.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The public notice draft Pierre Creek fecal coliform TMDL was submitted to EPA for review during the public notice period via an email from Cheryl Saunders, SD DENR on 06/23/2009. The email included the draft TMDL document and a public notice announcement requesting review and comment.

**COMMENTS:** None.

## 1.2 Identification of the Waterbody, Impairments, and Study Boundaries

The TMDL document should provide an unambiguous description of the waterbody to which the TMDL is intended to apply and the impairments the TMDL is intended to address. The document should also clearly delineate the physical boundaries of the waterbody and the geographical extent of the watershed area studied. Any additional information needed to tie the TMDL document back to a current 303(d) listing should also be included.

Minimum Submission Requirements:

☒ The TMDL document should clearly identify the pollutant and waterbody segment(s) for which the TMDL is being established. If the TMDL document is submitted to fulfill a TMDL development requirement for a waterbody on the state's current EPA approved 303(d) list, the TMDL document submittal should clearly identify the waterbody and associated impairment(s) as they appear on the State's/Tribe's current EPA approved 303(d) list, including a full waterbody description, assessment unit/waterbody ID, and the priority ranking of the waterbody. This information is necessary to ensure that the administrative record and the national TMDL tracking database properly link the TMDL document to the 303(d) listed waterbody and impairment(s).

☒ One or more maps should be included in the TMDL document showing the general location of the waterbody and, to the maximum extent practical, any other features necessary and/or relevant to the understanding of the TMDL analysis, including but not limited to: watershed boundaries, locations of major pollutant sources, major tributaries included in the analysis, location of sampling points, location of discharge gauges, land use patterns, and the location of nearby waterbodies used to provide surrogate information or reference conditions. Clear and concise descriptions of all key features and their relationship to the waterbody and water quality data should be provided for all key and/or relevant features not represented on the map

☐ If information is available, the waterbody segment to which the TMDL applies should be identified/geo-referenced using the National Hydrography Dataset (NHD). If the boundaries of the TMDL do not correspond to the Waterbody ID(s) (WBID), Entity_ID information or reach code (RCH_Code) information should be provided. If NHD data is not available for the waterbody, an alternative geographical referencing system that unambiguously identifies the physical boundaries to which the TMDL applies may be substituted.

Recommendation:
☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** Pierre Creek is a small stream located in Hanson County, South Dakota and is a tributary of the James River in the Lower James sub-basin (HUC 10160011). The drainage area of the listed segment of Pierre Creek is 78 square miles. The 303(d) listed segment of Pierre Creek includes 2 miles of the Creek from S11, T102N, R85W to the James River (SD-JA-R-PIERRE_01). It is listed as high priority for TMDL development.

The designated uses for Pierre Creek include warmwater semi-permanent fish life propagation waters, limited-contract recreation waters, fish and wildlife propagation, recreation, and stock watering. The segment was listed in 2008 for fecal coliform bacteria which are impairing the limited contact recreation uses.

**COMMENTS:** The geographic description of the watershed and details of the impaired segment are very brief. Does the listed segment begin at the Lake Hansen outlet? What are the landuse breakdowns in the watershed? How many CAFOs or AFOs are in the watershed? Where are they located? When was the Lower James River Watershed Assessment completed, and who wrote it? Figure 1 should include a scale and highlight or label the 303(d) listed segment. What is the significance of the Figure 1 shaded area? Why is the lower part of Pierre Creek not shaded? DENR is asked to provide more information regarding relevant features of the watershed that provide a more complete understanding of the TMDL analysis.

*DENR RESPONSE:*

*Some additional description of the watershed was added to the introduction including a landuse breakdown. A CAFO/AFO discussion was added in the linkage analysis section. The Lower James River Watershed Assessment does not have a final report. Per phone conversation, it was determined that this comment was the result in a difference in terminology and that when DENR references an assessment, it may not include a completed report and may only be the data collection and review. An additional map (Figure 3) was added to the report, this map address the remaining concerns in this section.*

## 1.3 Water Quality Standards

TMDL documents should provide a complete description of the water quality standards for the waterbodies addressed, including a listing of the designated uses and an indication of whether the uses are being met, not being met, or not assessed. If a designated use was not assessed as part of the TMDL analysis (or not otherwise recently assessed), the documents should provide a reason for the lack of assessment (e.g., sufficient data was not available at this time to assess whether or not this designated use was being met).

Water quality criteria (WQC) are established as a component of water quality standard at levels considered necessary to protect the designated uses assigned to that waterbody. WQC identify quantifiable targets and/or qualitative water quality goals which, if attained and maintained, are intended to ensure that the designated uses for the waterbody are protected. TMDLs result in maintaining and attaining water quality standards by determining the appropriate maximum pollutant loading rate to meet water quality criteria, either directly, or through a surrogate measurable target. The TMDL document should include a description of all applicable water quality criteria for the impaired designated uses and address whether or not the criteria are being attained, not attained, or not evaluated as part of the analysis. If the criteria were not evaluated as part of the analysis, a reason should be cited ( e.g. insufficient data were available to determine if this water quality criterion is being attained).

Minimum Submission Requirements:

☒ The TMDL must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the anti-degradation policy. (40 C.F.R. §130.7(c)(1)).

☒ The purpose of a TMDL analysis is to determine the assimilative capacity of the waterbody that corresponds to the existing water quality standards for that waterbody, and to allocate that assimilative capacity between the significant sources. Therefore, all TMDL documents must be written to meet the existing water quality standards for that waterbody (CWA §303(d)(1)(C)).

*Note: In some circumstances, the load reductions determined to be necessary by the TMDL analysis may prove to be infeasible and may possibly indicate that the existing water quality standards and/or assessment methodologies may be erroneous. However, the TMDL must still be determined based on existing water quality standards. Adjustments to water quality standards and/or assessment methodologies may be evaluated separately, from the TMDL.*

☒ The TMDL document should describe the relationship between the pollutant of concern and the water quality standard the pollutant load is intended to meet. This information is necessary for EPA to evaluate whether or not attainment of the prescribed pollutant loadings will result in attainment of the water quality standard in question.

☒ If a standard includes multiple criteria for the pollutant of concern, the document should demonstrate that the TMDL value will result in attainment of all related criteria for the pollutant. For example, both acute and chronic values (if present in the WQS) should be addressed in the document, including consideration of magnitude, frequency and duration requirements.

Recommendation:
☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek segment addressed by this TMDL is impaired based on fecal coliform concentrations for limited contact recreation. South Dakota has applicable numeric standards for fecal coliforms that may be applied to this river segment. The numeric standards being implemented in this TMDL are: a daily maximum value of fecal coliform of 2000 CFU/100 mL in any one sample, or a maximum geometric mean of 1000 CFU/100 mL for 5 samples over a 30 day period. Both standards are applicable from May 1 through September 30. Discussion of additional applicable water quality standards for Pierre Creek can be found on pages 4 and 5 of the TMDL.

**COMMENTS:** The chronic fecal coliform standard shown in Table 1 says "≤ 1000 (mean)." The fecal coliform standard for South Dakota is calculated as a geometric mean not an arithmetic mean.

*DENR RESPONSE:*
*The table was modified to correctly state geometric mean.*

# 2. Water Quality Targets

TMDL analyses establish numeric targets that are used to determine whether water quality standards are being achieved. Quantified water quality targets or endpoints should be provided to evaluate each listed pollutant/water body combination addressed by the TMDL, and should represent achievement of applicable water quality standards and support of associated beneficial uses. For pollutants with numeric water quality standards, the numeric criteria are generally used as the water quality target. For pollutants with narrative standards, the narrative standard should

be translated into a measurable value. At a minimum, one target is required for each pollutant/water body combination. It is generally desirable, however, to include several targets that represent achievement of the standard and support of beneficial uses (e.g., for a sediment impairment issue it may be appropriate to include a variety of targets representing water column sediment such as TSS, embeddeness, stream morphology, up-slope conditions and a measure of biota).

Minimum Submission Requirements:

☒ The TMDL should identify a numeric water quality target(s) for each waterbody pollutant combination. The TMDL target is a quantitative value used to measure whether or not the applicable water quality standard is attained.

*Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. Occasionally, the pollutant of concern is different from the parameter that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as a numerical dissolved oxygen criterion). In such cases, the TMDL should explain the linkage between the pollutant(s) of concern, and express the quantitative relationship between the TMDL target and pollutant of concern. In all cases, TMDL targets must represent the attainment of current water quality standards.*

☐ When a numeric TMDL target is established to ensure the attainment of a narrative water quality criterion, the numeric target, the methodology used to determine the numeric target, and the link between the pollutant of concern and the narrative water quality criterion should all be described in the TMDL document. Any additional information supporting the numeric target and linkage should also be included in the document.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The water quality targets for this TMDL are based on the numeric water quality standards for fecal coliform bacteria based on the limited contact recreational beneficial use for Pierre Creek. The fecal coliform daily maximum value is $\leq$ 2000 CFU/100 mL in any one sample, and the maximum geometric mean is $\leq$ 1000 CFU/100 mL for 5 samples over a 30 day period. Both criteria are applicable from May 1st through September 30th.

**COMMENTS:** None.

# 3. Pollutant Source Analysis

A TMDL analysis is conducted when a pollutant load is known or suspected to be exceeding the loading capacity of the waterbody. Logically then, a TMDL analysis should consider all sources of the pollutant of concern in some manner. The detail provided in the source assessment step drives the rigor of the pollutant load allocation. In other words, it is only possible to specifically allocate quantifiable loads or load reductions to each significant source (or source category) when the relative load contribution from each source has been estimated. Therefore, the pollutant load from each significant source (or source category) should be identified and quantified to the maximum practical extent. This may be accomplished using site-specific monitoring data, modeling, or application of other assessment techniques. If insufficient time or resources are available to accomplish this step, a phased/adaptive management approach may be appropriate. The approach should be clearly defined in the document.

Minimum Submission Requirements:

☐ The TMDL should include an identification of all potentially significant point and nonpoint sources of the pollutant of concern, including the geographical location of the source(s) and the quantity of the loading, e.g., lbs/per day. This information is necessary for EPA to evaluate the WLA, LA and MOS components of the TMDL.

☐ The level of detail provided in the source assessment should be commensurate with the nature of the watershed and the nature of the pollutant being studied. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of both the natural background loads and the nonpoint source loads.

☐ Natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g. measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified, characterized, and properly quantified.

☐ The sampling data relied upon to discover, characterize, and quantify the pollutant sources should be included in the document (e.g. a data appendix) along with a description of how the data were analyzed to characterize and quantify the pollutant sources. A discussion of the known deficiencies and/or gaps in the data set and their potential implications should also be included.

Recommendation:
☐ Approve ☐ Partial Approval ☐ Disapprove ☒ Insufficient Information

**SUMMARY:** The TMDL document mentions a feeding area, half a mile upstream of the sampling station, to be the single pollutant source identified in the listed stream segment. Two other feeding areas are ruled out as potential sources to the Pierre Creek impairment.

**COMMENTS:** The data collection description on page 5 mentions discrete samples taken at the inlet and outlet of Lake Hanson. It goes on to say that these samples were used to show that Lake Hanson is not the cause of the fecal coliform standards exceedances. It would be helpful to include a summary of this data and an explanation of how it was used to show that Lake Hanson is not a source for this TMDL. Also, the only reference of a source analysis is the statement that the sole pollutant source has been located. There is little detail provided on the landuses in the drainage area of the listed segment. Similar fecal coliform TMDLs specified the breakdown of the landuses in the watershed, and evaluated the potential contributions from septic systems and from a variety of animal sources. Additional details on potential sources contributing to the impaired segment need to be included in the TMDL document.

The fecal coliform data set and analysis on pages 6 and 7 are confusing. There is mention that the fecal coliform exceedances all occurred during base flow conditions, however there is no flow data provided in Table 2 – the flow data should be added to this table. In the statement that 3 of 16 samples exceeded the "standard" 19% of the time, it is not clear which standard is being exceeded (acute or chronic). The next sentence says that the 5 samples taken in May 2006 exceed the chronic standard with a mean value of 2022. The "average" of those 5 samples is 2022; however the chronic standard is calculated based on the "geometric mean" not the average. The geometric mean of the 5 samples is 582 cfu/100mL – well below the chronic standard for that month. That doesn't necessarily mean that the chronic standard would be met during other months of the year, but without additional data it's difficult to draw conclusions for months other than May 2006.

The legacy samples in Table 2 include samples above and below Lake Hanson, but it's not clear which are which because the Table does not define "LHT1" and "LHO." Also, it would be

helpful to provide more details about the upstream implementation project (i.e., types of BMPs implemented, when it was completed).

The data presented in Table 3 represent one spring runoff event and one storm event. Given that it's only 2 sampling events, both with different characteristics (snowmelt vs. rainfall); it seems to be an overstatement that these two events could be used to detect a "trend" in fecal coliform concentrations. Typically, many more sampling events would be needed at each site to make statistically significant statements about the trend of data. We suggest that downplaying the conclusions or adding a caveat to the conclusions drawn from this data.

Figure 4 mentions that the red polygons are potential sources of fecal coliform. It is not clear if the smaller polygons mean lower potential and the larger polygon means higher potential – please clarify. The text mentions Area 1, 2 and 3, but they are not shown on the figure. More information about each area and why they were thought to be potential sources would be helpful.

*DENR RESPONSE:*

*A number of changes were made throughout the document to address the concerns in this comment section. The legacy sites were more clearly defined on the map as were the potential sources. Discussion was added on other sources in the watershed to further explain their evaluation process.*

# 4. TMDL Technical Analysis

TMDL determinations should be supported by a robust data set and an appropriate level of technical analysis**.** This applies to **all** of the components of a TMDL document. It is vitally important that the technical basis for **all** conclusions be articulated in a manner that is easily understandable and readily apparent to the reader.

A TMDL analysis determines the maximum pollutant loading rate that may be allowed to a waterbody without violating water quality standards. The TMDL analysis should demonstrate an understanding of the relationship between the rate of pollutant loading into the waterbody and the resultant water quality impacts. This stressor $\rightarrow$ response relationship between the pollutant and impairment and between the selected targets, sources, TMDLs, and load allocations needs to be clearly articulated and supported by an appropriate level of technical analysis. Every effort should be made to be as detailed as possible, and to base all conclusions on the best available scientific principles.

The pollutant loading allocation is at the heart of the TMDL analysis. TMDLs apportion responsibility for taking actions by allocating the available assimilative capacity among the various point, nonpoint, and natural pollutant sources. Allocations may be expressed in a variety of ways, such as by individual discharger, by tributary watershed, by source or land use category, by land parcel, or other appropriate scale or division of responsibility.

The pollutant loading allocation that will result in achievement of the water quality target is expressed in the form of the standard TMDL equation:

$$TMDL = \sum LAs + \sum WLAs + MOS$$

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

MOS = The portion of the Load Capacity allocated to the Margin of safety.

Minimum Submission Requirements:

☒ A TMDL must identify the loading capacity of a waterbody for the applicable pollutant, taking into consideration temporal variations in that capacity. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

☒ The total loading capacity of the waterbody should be clearly demonstrated to equate back to the pollutant load allocations through a balanced TMDL equation. In instances where numerous LA, WLA and seasonal TMDL capacities make expression in the form of an equation cumbersome, a table may be substituted as long as it is clear that the total TMDL capacity equates to the sum of the allocations.

☐ The TMDL document should describe the methodology and technical analysis used to establish and quantify the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

☐ It is necessary for EPA staff to be aware of any assumptions used in the technical analysis to understand and evaluate the methodology used to derive the TMDL value and associated loading allocations. Therefore, the TMDL document should contain a description of any important assumptions (including the basis for those assumptions) made in developing the TMDL, including but not limited to:

(1) the spatial extent of the watershed in which the impaired waterbody is located and the spatial extent of the TMDL technical analysis;
(2) the distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) a presentation of relevant information affecting the characterization of the pollutant of concern and its allocation to sources such as population characteristics, wildlife resources, industrial activities etc…;
(4) present and future growth trends, if taken into consideration in determining the TMDL and preparing the TMDL document (e.g., the TMDL could include the design capacity of an existing or planned wastewater treatment facility);
(5) an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

☐ The TMDL document should contain documentation supporting the TMDL analysis, including an inventory of the data set used, a description of the methodology used to analyze the data, a discussion of strengths and weaknesses in the analytical process, and the results from any water quality modeling used. This information is necessary for EPA to review the loading capacity determination, and the associated load, wasteload, and margin of safety allocations.

☒ TMDLs must take critical conditions (e.g., steam flow, loading, and water quality parameters, seasonality, etc…) into account as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1) ). TMDLs should define applicable critical conditions and describe the approach used to determine both point and nonpoint source loadings under such critical conditions. In particular, the document should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

☐ Where both nonpoint sources and NPDES permitted point sources are included in the TMDL loading allocation, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the

TMDL document must include a demonstration that nonpoint source loading reductions needed to implement the load allocations are actually practicable [40 CFR 130.2(i) and 122.44(d)].

Recommendation:
☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Pierre Creek TMDL describes how the fecal coliform loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segment.

Data on Pierre Creek was collected during the Lower James River Watershed Assessment. All data was collected from a single sampling point 1 mile upstream of the confluence with the James River. The flow data was collected from a gage located on Pierre Creek at sampling site JRT18. No information was provided about who maintains the flow gage or how many years of flow records exist. Modeling for the Pierre Creek watershed was limited to the use of the Aquarius model to validate the hydrology for the load duration curve.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDC was divided into 4 distinct flow regimes – high flow ($\geq$ 12.4 cfs), moist flow (between 12.4 cfs and 9.2 cfs), dry flow (between 9.2 cfs and 2.8 cfs), and low flow ($\leq$ 2.8 cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 4 of the TMDL document. The LDC is a dynamic expression of the allowable load for any given daily flow. Loading capacities were derived from this approach at the 90$^{th}$ percentile flow in each flow regime: high flow = 1.25E+12 cfu/day; moist flow = 3.71E+11 cfu/day; dry flow = 1.85E+11 cfu/day; and low flow = 7.25E+10 cfu/day.

**COMMENTS:** Quite a bit of the Technical Analysis section is dedicated to explaining the validation of the Pierre Creek hydrograph. However, very little space is dedicated to describing the data and information used to develop the actual hydrograph. Questions such as the following should be answered in the technical analysis section: 1) where is the Pierre Creek gage located? 2) who maintains the gage? 3) how many years of flow record from that gage were used to develop the hydrograph?

There are two Figure 4s in the document (pp 10 & 11).

Page 11 mentions that 4 flows zones were chosen instead of 5 "…because of the specific characteristics of Pierre Creek's hydrograph. What specific characteristics of the Pierre Creek hydrograph are unique such that it deviates from the EPA LDC guidance?

Table 4 says that the current loads were derived from the highest concentration in each flow zone times the 90$^{th}$ percentile flow in each zone. Typically in other TMDLs developed by DENR, the current loads are derived from the midpoint (50$^{th}$ percentile) flow in each zone times the highest concentration. It's not clear why the 90$^{th}$ percentile flow was chosen or why it may be a better representation of the current load – this needs to be corrected or explained in greater detail why a new approach is being used.

The paragraph (page 12) explaining the moist flow, as well as the moist flow column in Table 4, says that no reduction in fecal coliform loading is necessary in this zone. However, the LDC

seems to show one data point (at approx. 38% flow interval) above the chronic curve in this zone. If that data point is plotted correctly, then fecal coliform loading reductions are needed in the moist zone and the paragraph and table should be revised accordingly.

Table 4 TMDL summary does not include any units for the loads. Typically, the TMDL loads for fecal coliform are expressed in units of cfu/day.

*DENR RESPONSE:*

*As was the case in the previous section, number of changes were made throughout the document to address the concerns in this comment section. Most notable on the changes were that after verbal discussions with EPA regarding the flow zones, it was deemed that the most appropriate divisions for this stream would be three instead of 4 flow zones. This change affects several of the comments as well as the LDC chart and table.*

## 4.1 Data Set Description

TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis. An inventory of the data used for the TMDL analysis should be provided to document, for the record, the data used in decision making. This also provides the reader with the opportunity to independently review the data. The TMDL analysis should make use of all readily available data for the waterbody under analysis unless the TMDL writer determines that the data are not relevant or appropriate. For relevant data that were known but rejected, an explanation of why the data were not utilized should be provided (e.g., samples exceeded holding times, data collected prior to a specific date were not considered timely, etc…).

Minimum Submission Requirements:

☒ TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis such that the water quality impairments are clearly defined and linked to the impaired beneficial uses and appropriate water quality criteria.

☒ The TMDL document submitted should be accompanied by the data set utilized during the TMDL analysis. If possible, it is preferred that the data set be provided in an electronic format and referenced in the document. If electronic submission of the data is not possible, the data set may be included as an appendix to the document.

Recommendation:
☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. The recent water quality monitoring was conducted during spring and summer in 2006 and included 16 fecal coliform samples. The data set also includes the flow record on Pierre Creek that was use to develop a load duration curve for Pierre Creek.

**COMMENTS:** As mentioned above, the data in Table 2 needs to include the flow data so that the public and EPA readers can see how the statements were drawn about fecal coliform exceedances that occurred during base flow conditions.

*DENR RESPONSE:*

*Flow data as well as the associated flow zones were added to the table. This table was also spit into 2 tables to better facilitate discussions in the document.*

## 4.2 Waste Load Allocations (WLA):

Waste Load Allocations represent point source pollutant loads to the waterbody. Point source loads are typically better understood and more easily monitored and quantified than nonpoint source loads. Whenever practical, each point source should be given a separate waste load allocation. All NPDES permitted dischargers that discharge the pollutant under analysis directly to the waterbody should be identified and given separate waste load allocations. The finalized WLAs are required to be incorporated into future NPDES permit renewals.

Minimum Submission Requirements:

☒ EPA regulations require that a TMDL include WLAs for all significant and/or NPDES permitted point sources of the pollutant. TMDLs must identify the portion of the loading capacity allocated to individual existing and/or future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit. If no allocations are to be made to point sources, then the TMDL should include a value of zero for the WLA.

☒ All NPDES permitted dischargers given WLA as part of the TMDL should be identified in the TMDL, including the specific NPDES permit numbers, their geographical locations, and their associated waste load allocations.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek TMDL document says that there are no municipal or other point source discharges to Pierre Creek. The town of Alexandria is located within the watershed, and maintains a wastewater lagoon, but it is not allowed to discharge to surface water. Therefore, the WLA for this TMDL is zero.

**COMMENTS:** We recognize that the wastewater treatment facility for the town of Alexandria has a no discharge permit and it is located quite some distance from the impaired segment of Pierre Creek. However, most "no discharge" lagoons are designed to treat and infiltrate the wastewater, which could contribute to surface water impairment after the groundwater intersects a creek or stream. Based on statements made in the TMDL, it appears that groundwater is a significant contributor of water to Pierre Creek. We recommend that the lagoon be inspected to ensure that it's not contributing to the impairment of Pierre Creek, as part of the TMDL implementation.

*DENR RESPONSE:*

*While it is accurate that lagoon systems seep, South Dakota has established allowable seepage criteria for lagoon systems to ensure the protection of both surface and ground water. When lagoons are properly designed, constructed, and operated in accordance with these criteria, South Dakota has not documented impairments to either ground water or surface water from lagoons systems.*

*On May 7, 2008, the department conducted the most recent regularly scheduled inspection of Alexandria's wastewater treatment facility. This inspection noted there was no evidence of excessive seepage from the lagoons. The system was properly operated and maintained. Early in*

*2009, the department awarded the city of Alexandria an **Excellent Operation and Maintenance Award** for its wastewater treatment system. At this time, there is no evidence to suggest the city of Alexandria's wastewater treatment facility is impacting the ground water or surface water resources in this area. The department will continue to inspect Alexandria's system in accordance with its EPA-approved inspection plan.*
.

## 4.3 Load Allocations (LA):

Load allocations include the nonpoint source, natural, and background loads. These types of loads are typically more difficult to quantify than point source loads, and may include a significant degree of uncertainty. Often it is necessary to group these loads into larger categories and estimate the loading rates based on limited monitoring data and/or modeling results. The background load represents a composite of all upstream pollutant loads into the waterbody. In addition to the upstream nonpoint and upstream natural load, the background load often includes upstream point source loads that are not given specific waste load allocations in this particular TMDL analysis. In instances where nonpoint source loading rates are particularly difficult to quantify, a performance-based allocation approach, in which a detailed monitoring plan and adaptive management strategy are employed for the application of BMPs, may be appropriate.

Minimum Submission Requirements:

☒ EPA regulations require that TMDL expressions include LAs which identify the portion of the loading capacity attributed to nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Load allocations may be included for both existing and future nonpoint source loads. Where possible, load allocations should be described separately for natural background and nonpoint sources.

☒ Load allocations assigned to natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g., measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified and given proper load or waste load allocations.

Recommendation:
☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The TMDL and Allocations section of the TMDL describes how the load allocations were derived.

**COMMENTS:** As mentioned above in the Technical Analysis section, it appears that there should be some reduction specified in Table 4 during moist flow conditions. Also, the other corrections/clarifications previously mentioned need to be addressed.

*DENR RESPONSE:*
*As mentioned earlier, the number of flow zones was shifted from 4 to 3, and as a result there are reductions in every flow zone.*

## 4.4 Margin of Safety (MOS):

Natural systems are inherently complex. Any mathematical relationship used to quantify the stressor → response relationship between pollutant loading rates and the resultant water quality

impacts, no matter how rigorous, will include some level of uncertainty and error. To compensate for this uncertainty and ensure water quality standards will be attained, a margin of safety is required as a component of each TMDL. The MOS may take the form of a explicit load allocation (e.g., 10 lbs/day), or may be implicitly built into the TMDL analysis through the use of conservative assumptions and values for the various factors that determine the TMDL pollutant load → water quality effect relationship. Whether explicit or implicit, the MOS should be supported by an appropriate level of discussion that addresses the level of uncertainty in the various components of the TMDL technical analysis, the assumptions used in that analysis, and the relative effect of those assumptions on the final TMDL. The discussion should demonstrate that the MOS used is sufficient to ensure that the water quality standards would be attained if the TMDL pollutant loading rates are met. In cases where there is substantial uncertainty regarding the linkage between the proposed allocations and achievement of water quality standards, it may be necessary to employ a phased or adaptive management approach (e.g., establish a monitoring plan to determine if the proposed allocations are, in fact, leading to the desired water quality improvements).

Minimum Submission Requirements:

☒ TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ). EPA's 1991 TMDL Guidance explains that the MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as loadings set aside for the MOS).

- ☐ If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS should be identified and described. The document should discuss why the assumptions are considered conservative and the effect of the assumption on the final TMDL value determined.
- ☒ If the MOS is explicit, the loading set aside for the MOS should be identified. The document should discuss how the explicit MOS chosen is related to the uncertainty and/or potential error in the linkage analysis between the WQS, the TMDL target, and the TMDL loading rate.
- ☐ If, rather than an explicit or implicit MOS, the TMDL relies upon a phased approach to deal with large and/or unquantifiable uncertainties in the linkage analysis, the document should include a description of the planned phases for the TMDL as well as a monitoring plan and adaptive management strategy.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek TMDL includes an explicit MOS derived as the difference between the loading capacity at the mid-point of each flow zone and the loading capacity at the minimum flow in each zone.

**COMMENTS:** The text in the MOS section mentions 3 flow zones, but 4 zones are included in other parts of the document – correct or revise the MOS language.

*DENR RESPONSE:*
*Modifications to the MOS section have eliminated any reference to a number of flow zones.*

### 4.5 Seasonality and variations in assimilative capacity:

The TMDL relationship is a factor of both the loading rate of the pollutant to the waterbody and the amount of pollutant the waterbody can assimilate and still attain water quality standards. Water quality standards often vary based on seasonal considerations. Therefore, it is appropriate that the TMDL analysis consider seasonal variations, such as critical flow periods (high flow, low flow), when establishing TMDLs, targets, and allocations.

Minimum Submission Requirements:

☒ The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variability as a factor. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ).

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** By using the load duration curve approach to develop the TMDL allocations seasonal variability in fecal coliform loads is taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months. Also, the TMDL is seasonal since the fecal coliform criteria are in effect from May 1 to September 30, therefore the TMDL is only applicable during that period.

**COMMENTS:** None.

# 5. Public Participation

EPA regulations require that the establishment of TMDLs be conducted in a process open to the public, and that the public be afforded an opportunity to participate. To meaningfully participate in the TMDL process it is necessary that stakeholders, including members of the general public, be able to understand the problem and the proposed solution. TMDL documents should include language that explains the issues to the general public in understandable terms, as well as provides additional detailed technical information for the scientific community. Notifications or solicitations for comments regarding the TMDL should be made available to the general public, widely circulated, and clearly identify the product as a TMDL and the fact that it will be submitted to EPA for review. When the final TMDL is submitted to EPA for approval, a copy of the comments received by the state and the state responses to those comments should be included with the document.

Minimum Submission Requirements:
☒ The TMDL must include a description of the public participation process used during the development of the TMDL (40 C.F.R. §130.7(c)(1)(ii) ).

☐ TMDLs submitted to EPA for review and approval should include a summary of significant comments and the State's/Tribe's responses to those comments.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The State's submittal includes a summary of the public participation process that has occurred which describes the ways the public has been given an opportunity to be involved in the TMDL development process. In particular, the State has encouraged participation through

public board meetings in the watershed. This draft TMDL was also available for a 30-day public notice period prior to finalization.

**COMMENTS:** None.

# 6. Monitoring Strategy

TMDLs may have significant uncertainty associated with the selection of appropriate numeric targets and estimates of source loadings and assimilative capacity. In these cases, a phased TMDL approach may be necessary. For Phased TMDLs, it is EPA's expectation that a monitoring plan will be included as a component of the TMDL document to articulate the means by which the TMDL will be evaluated in the field, and to provide for future supplemental data that will address any uncertainties that may exist when the document is prepared.

Minimum Submission Requirements:

☒ When a TMDL involves both NPDES permitted point source(s) and nonpoint source(s) allocations, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring.

☒ Under certain circumstances, a phased TMDL approach may be utilized when limited existing data are relied upon to develop a TMDL, and the State believes that the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation and merit development of a second phase TMDL. EPA recommends that a phased TMDL document or its implementation plan include a monitoring plan and a scheduled timeframe for revision of the TMDL. These elements would not be an intrinsic part of the TMDL and would not be approved by EPA, but may be necessary to support a rationale for approving the TMDL. http://www.epa.gov/owow/tmdl/tmdl_clarification_letter.pdf

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** Pierre Creek should continue to be monitored as part of the Lower James River implementation project. Post-implementation monitoring will be necessary to assure the TMDL has been reached and maintenance of the beneficial use occurs.

**COMMENTS:** The limited amount of data currently available for Pierre Creek suggests that this would be a good candidate for an adaptive management approach to implementation, or even a phased TMDL. Collecting additional data during and after implementation would be a necessary part of any implementation and follow-up scenario.

*DENR RESPONSE:*
*DENR recognizes that the data is limited but has taken steps to provide substantial margins of safety and feels that this TMDL will meet the water quality standards.*

# 7. Restoration Strategy

The overall purpose of the TMDL analysis is to determine what actions are necessary to ensure that the pollutant load in a waterbody does not result in water quality impairment. Adding

additional detail regarding the proposed approach for the restoration of water quality is not currently a regulatory requirement, but is considered a value added component of a TMDL document. During the TMDL analytical process, information is often gained that may serve to point restoration efforts in the right direction and help ensure that resources are spent in the most efficient manner possible. For example, watershed models used to analyze the linkage between the pollutant loading rates and resultant water quality impacts might also be used to conduct "what if" scenarios to help direct BMP installations to locations that provide the greatest pollutant reductions. Once a TMDL has been written and approved, it is often the responsibility of other water quality programs to see that it is implemented. The level of quality and detail provided in the restoration strategy will greatly influence the future success in achieving the needed pollutant load reductions.

Minimum Submission Requirements:

☒ EPA is not required to and does not approve TMDL implementation plans. However, in cases where a WLA is dependent upon the achievement of a LA, "reasonable assurance" is required to demonstrate the necessary LA called for in the document is practicable). A discussion of the BMPs (or other load reduction measures) that are to be relied upon to achieve the LA(s), and programs and funding sources that will be relied upon to implement the load reductions called for in the document, may be included in the implementation/restoration section of the TMDL document to support a demonstration of "reasonable assurance".

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Implementation Plan section of the TMDL document says that implementation activities for Pierre Creek were incorporated into the Lower James River Implementation Project. Since there are no point source discharges to Pierre Creek, there is no need to include a discussion of reasonable assurance in this TMDL document.

**COMMENTS:** None.

# 8. Daily Loading Expression

The goal of a TMDL analysis is to determine what actions are necessary to attain and maintain WQS. The appropriate averaging period that corresponds to this goal will vary depending on the pollutant and the nature of the waterbody under analysis. When selecting an appropriate averaging period for a TMDL analysis, primary concern should be given to the nature of the pollutant in question and the achievement of the underlying WQS. However, recent federal appeals court decisions have pointed out that the title TMDL implies a "daily" loading rate. While the most appropriate averaging period to be used for developing a TMDL analysis may vary according to the pollutant, a daily loading rate can provide a more practical indication of whether or not the overall needed load reductions are being achieved. When limited monitoring resources are available, a daily loading target that takes into account the natural variability of the system can serve as a useful indicator for whether or not the overall load reductions are likely to be met. Therefore, a daily expression of the required pollutant loading rate is a required element in all TMDLs, in addition to any other load averaging periods that may have been used to conduct the TMDL analysis. The level of effort spent to develop the daily load indicator should be based on the overall utility it can provide as an indicator for the total load reductions needed.

Minimum Submission Requirements:

☒ The document should include an expression of the TMDL in terms of a daily load. However, the TMDL may also be expressed in temporal terms other than daily (e.g., an annual or monthly load). If the document expresses the TMDL in additional "non-daily" terms the document should explain why it is appropriate or advantageous to express the TMDL in the additional unit of measurement chosen.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek fecal coliform TMDL includes daily loads expressed as colonies per day. The daily TMDL loads are include in TMDL and Allocations section of the TMDL document.

**COMMENTS:** None.

WP/SWQ

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION 8**
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

RECEIVED
OCT 2 2009
DEPT. OF ENVIRONMENT AND NATURAL RESOURCES, SECRETARY'S OFFICE

SEP 29 2009

Ref: 8EPR-EP

Steven M. Pirner
Secretary
South Dakota Department of Environment & Natural Resources
Joe Foss Building
523 East Capitol
Pierre, SD 57501-3181

Re: TMDL Approvals
*Pierre Creek fecal coliform; SD-JA-R-PIERRE_01*

Dear Mr. Pirner:

We have completed our review of the total maximum daily loads (TMDLs) as submitted by your office for the waterbodies listed in the enclosure to this letter. In accordance with the Clean Water Act (33 U.S.C. 1251 *et. seq.*), we approve all aspects of the TMDLs as developed for the water quality limited waterbodies as described in Section 303(d)(1). Based on our review, we feel the separate elements of the TMDLs listed in the enclosed table adequately address the pollutants of concern as given in the table, taking into consideration seasonal variation and a margin of safety.

Thank you for submitting these TMDLs for our review and approval. If you have any questions, the most knowledgeable person on my staff is Vern Berry and he may be reached at 303-312-6234.

Sincerely,

Carol L. Campbell

Carol L. Campbell
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

Enclosures

ENCLOSURE 1

## APPROVED TMDLS

1 Pollutant TMDL completed
1 cause addressed from the 2008 303(d) list
0 Determinations made that no pollutant TMDL was needed

| Waterbody Name & AU ID | TMDL Parameter/ Pollutant (303(d) list cause) | Water Quality Targets | TMDL WLA / LA / MOS** | Supporting Documentation (not an exhaustive list of supporting documents) |
|---|---|---|---|---|
| Pierre Creek (from S11, T102N, R85W to its confluence with the James River)* SD-JA-R-PIERRE_01 | Fecal Coliform (fecal coliform) | ≤ 2000 CFU/100 mL daily maximum in any one sample; ≤ 1000 CFU/100 mL 30 day geometric mean. | LC = 7.25E+10 cfu/day at groundwater flow<br>LA = 5.51E+10 cfu/day at groundwater flow<br>WLA = 0 cfu/day at groundwater flow<br>MOS = 1.74E+10 cfu/day at groundwater flow | ■ Fecal Coliform Bacteria Total Maximum Daily Load for Pierre Creek, Hanson County, South Dakota (SD DENR, May 2009) |

* Indicates that the waterbody has been included on the State's Section 303(d) list of waterbodies in need of TMDLs.
** Loads shown represent the average loads during low (groundwater) flow periods as defined by the load duration curve for Pierre Creek (see Figure 4 and Table 4 of the TMDL). The lower flows are when the biggest differences occur between the instream flows and the water quality targets, therefore the greatest load reductions are needed to meet the water quality standards.
LC = loading capacity; WLA = wasteload allocation; LA = load allocation; MOS = margin of safety
TMDL = LC = $\sum$ WLAs + $\sum$ LAs + MOS

ENCLOSURE 2

# EPA REGION VIII TMDL REVIEW

TMDL Document Info:

| | |
|---|---|
| **Document Name:** | **Fecal Coliform Total Maximum Daily Load Evaluation for Pierre Creek, Hanson County, South Dakota** |
| **Submitted by:** | **Cheryl Saunders, SD DENR** |
| **Date Received:** | **September 1, 2009** |
| **Review Date:** | **September 24, 2009** |
| **Reviewer:** | **Vern Berry, EPA** |
| **Rough Draft / Public Notice / Final?** | **Public Notice Draft** |
| **Notes:** | |

Reviewers Final Recommendation(s) to EPA Administrator (used for final review only):

- ☒ Approve
- ☐ Partial Approval
- ☐ Disapprove
- ☐ Insufficient Information

**Approval Notes to Administrator:**

This document provides a standard format for EPA Region 8 to provide comments to state TMDL programs on TMDL documents submitted to EPA for either formal or informal review. All TMDL documents are evaluated against the minimum submission requirements and TMDL elements identified in the following 8 sections:

1. Problem Description
   - 1.1. .TMDL Document Submittal Letter
   - 1.2. Identification of the Waterbody, Impairments, and Study Boundaries
   - 1.3. Water Quality Standards
2. Water Quality Target
3. Pollutant Source Analysis
4. TMDL Technical Analysis
   - 4.1. Data Set Description
   - 4.2. Waste Load Allocations (WLA)
   - 4.3. Load Allocations (LA)
   - 4.4. Margin of Safety (MOS)
   - 4.5. Seasonality and variations in assimilative capacity
5. Public Participation
6. Monitoring Strategy
7. Restoration Strategy
8. Daily Loading Expression

Under Section 303(d) of the Clean Water Act, waterbodies that are not attaining one or more water quality standard (WQS) are considered "impaired." When the cause of the impairment is determined to be a pollutant, a TMDL analysis is required to assess the appropriate maximum allowable pollutant loading rate. A TMDL document consists of a technical analysis conducted to: (1) assess the maximum pollutant loading

rate that a waterbody is able to assimilate while maintaining water quality standards; and (2) allocate that assimilative capacity among the known sources of that pollutant. A well written TMDL document will describe a path forward that may be used by those who implement the TMDL recommendations to attain and maintain WQS.

Each of the following eight sections describes the factors that EPA Region 8 staff considers when reviewing TMDL documents. Also included in each section is a list of EPA's minimum submission requirements relative to that section, a brief summary of the EPA reviewer's findings, and the reviewer's comments and/or suggestions. Use of the verb "must" in the minimum submission requirements denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable.

This review template is intended to ensure compliance with the Clean Water Act and that the reviewed documents are technically sound and the conclusions are technically defensible.

# 1. Problem Description

A TMDL document needs to provide a clear explanation of the problem it is intended to address. Included in that description should be a definitive portrayal of the physical boundaries to which the TMDL applies, as well as a clear description of the impairments that the TMDL intends to address and the associated pollutant(s) causing those impairments. While the existence of one or more impairment and stressor may be known, it is important that a comprehensive evaluation of the water quality be conducted prior to development of the TMDL to ensure that all water quality problems and associated stressors are identified. Typically, this step is conducted prior to the 303(d) listing of a waterbody through the monitoring and assessment program. The designated uses and water quality criteria for the waterbody should be examined against available data to provide an evaluation of the water quality relative to all applicable water quality standards. If, as part of this exercise, additional WQS problems are discovered and additional stressor pollutants are identified, consideration should be given to concurrently evaluating TMDLs for those additional pollutants. If it is determined that insufficient data is available to make such an evaluation, this should be noted in the TMDL document.

## 1.1 TMDL Document Submittal Letter

When a TMDL document is submitted to EPA requesting formal comments or a final review and approval, the submittal package should include a letter identifying the document being submitted and the purpose of the submission.

Minimum Submission Requirements.

☒ A TMDL submittal letter should be included with each TMDL document submitted to EPA requesting a formal review.

☒ The submittal letter should specify whether the TMDL document is being submitted for initial review and comments, public review and comments, or final review and approval.

☒ Each TMDL document submitted to EPA for final review and approval should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter should contain such identifying information as the name and location of the waterbody and the pollutant(s) of concern, which matches similar identifying information in the TMDL document for which a review is being requested.

Recommendation:

☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The public notice draft Pierre Creek fecal coliform TMDL was submitted to EPA for review and approval via an email from Cheryl Saunders, SD DENR on September 1, 2009. The email included the final TMDL document and a letter requesting approval of the TMDLs.

**COMMENTS:** None.

## 1.2 Identification of the Waterbody, Impairments, and Study Boundaries

The TMDL document should provide an unambiguous description of the waterbody to which the TMDL is intended to apply and the impairments the TMDL is intended to address. The document should also clearly delineate the physical boundaries of the waterbody and the geographical extent of the watershed area studied. Any additional information needed to tie the TMDL document back to a current 303(d) listing should also be included.

Minimum Submission Requirements:

☒ The TMDL document should clearly identify the pollutant and waterbody segment(s) for which the TMDL is being established. If the TMDL document is submitted to fulfill a TMDL development requirement for a waterbody on the state's current EPA approved 303(d) list, the TMDL document submittal should clearly identify the waterbody and associated impairment(s) as they appear on the State's/Tribe's current EPA approved 303(d) list, including a full waterbody description, assessment unit/waterbody ID, and the priority ranking of the waterbody. This information is necessary to ensure that the administrative record and the national TMDL tracking database properly link the TMDL document to the 303(d) listed waterbody and impairment(s).

☒ One or more maps should be included in the TMDL document showing the general location of the waterbody and, to the maximum extent practical, any other features necessary and/or relevant to the understanding of the TMDL analysis, including but not limited to: watershed boundaries, locations of major pollutant sources, major tributaries included in the analysis, location of sampling points, location of discharge gauges, land use patterns, and the location of nearby waterbodies used to provide surrogate information or reference conditions. Clear and concise descriptions of all key features and their relationship to the waterbody and water quality data should be provided for all key and/or relevant features not represented on the map

☐ If information is available, the waterbody segment to which the TMDL applies should be identified/geo-referenced using the National Hydrography Dataset (NHD). If the boundaries of the TMDL do not correspond to the Waterbody ID(s) (WBID), Entity_ID information or reach code (RCH_Code) information should be provided. If NHD data is not available for the waterbody, an alternative geographical referencing system that unambiguously identifies the physical boundaries to which the TMDL applies may be substituted.

Recommendation:

☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** Pierre Creek is a small stream located in Hanson County, South Dakota and is a tributary of the James River in the Lower James sub-basin (HUC 10160011). The drainage area of the listed segment of Pierre Creek is 78 square miles. The 303(d) listed segment of Pierre Creek includes approximately 6 miles of the Creek from S11, T102N, R85W (i.e., near the point where SD highway 262 crosses the creek) to its confluence with the James River (SD-JA-R-PIERRE_01). It is listed as high priority for TMDL development.

The designated uses for Pierre Creek include warmwater semi-permanent fish life propagation waters, limited-contract recreation waters, fish and wildlife propagation, recreation, and stock watering. The segment was listed in 2008 for fecal coliform bacteria which are impairing the limited contact recreation uses.

**COMMENTS:** None.

## 1.3 Water Quality Standards

TMDL documents should provide a complete description of the water quality standards for the waterbodies addressed, including a listing of the designated uses and an indication of whether the uses are being met, not being met, or not assessed. If a designated use was not assessed as part of the TMDL analysis (or not otherwise recently assessed), the documents should provide a reason for the lack of assessment (e.g., sufficient data was not available at this time to assess whether or not this designated use was being met).

Water quality criteria (WQC) are established as a component of water quality standard at levels considered necessary to protect the designated uses assigned to that waterbody. WQC identify quantifiable targets and/or qualitative water quality goals which, if attained and maintained, are intended to ensure that the designated uses for the waterbody are protected. TMDLs result in maintaining and attaining water quality standards by determining the appropriate maximum pollutant loading rate to meet water quality criteria, either directly, or through a surrogate measurable target. The TMDL document should include a description of all applicable water quality criteria for the impaired designated uses and address whether or not the criteria are being attained, not attained, or not evaluated as part of the analysis. If the criteria were not evaluated as part of the analysis, a reason should be cited ( e.g. insufficient data were available to determine if this water quality criterion is being attained).

Minimum Submission Requirements:

☒ The TMDL must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the anti-degradation policy. (40 C.F.R. §130.7(c)(1)).

☒ The purpose of a TMDL analysis is to determine the assimilative capacity of the waterbody that corresponds to the existing water quality standards for that waterbody, and to allocate that assimilative capacity between the significant sources. Therefore, all TMDL documents must be written to meet the existing water quality standards for that waterbody (CWA §303(d)(1)(C)).

*Note: In some circumstances, the load reductions determined to be necessary by the TMDL analysis may prove to be infeasible and may possibly indicate that the existing water quality standards and/or assessment methodologies may be erroneous. However, the TMDL must still be determined based on existing water quality standards. Adjustments to water quality standards and/or assessment methodologies may be evaluated separately, from the TMDL.*

☒ The TMDL document should describe the relationship between the pollutant of concern and the water quality standard the pollutant load is intended to meet. This information is necessary for EPA to evaluate whether or not attainment of the prescribed pollutant loadings will result in attainment of the water quality standard in question.

☒ If a standard includes multiple criteria for the pollutant of concern, the document should demonstrate that the TMDL value will result in attainment of all related criteria for the pollutant. For example, both acute and chronic values (if present in the WQS) should be addressed in the document, including consideration of magnitude, frequency and duration requirements.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek segment addressed by this TMDL is impaired based on fecal coliform concentrations for limited contact recreation. South Dakota has applicable numeric standards for fecal coliforms that may be applied to this river segment. The numeric standards being implemented in this TMDL are: a daily maximum value of fecal coliform of 2000 CFU/100 mL in any one sample, or a maximum geometric mean of 1000 CFU/100 mL for 5 samples over a 30 day period. Both standards are

applicable from May 1 through September 30. Discussion of additional applicable water quality standards for Pierre Creek can be found on page 6 of the TMDL.

**COMMENTS:** None.

# 2. Water Quality Targets

TMDL analyses establish numeric targets that are used to determine whether water quality standards are being achieved. Quantified water quality targets or endpoints should be provided to evaluate each listed pollutant/water body combination addressed by the TMDL, and should represent achievement of applicable water quality standards and support of associated beneficial uses. For pollutants with numeric water quality standards, the numeric criteria are generally used as the water quality target. For pollutants with narrative standards, the narrative standard should be translated into a measurable value. At a minimum, one target is required for each pollutant/water body combination. It is generally desirable, however, to include several targets that represent achievement of the standard and support of beneficial uses (e.g., for a sediment impairment issue it may be appropriate to include a variety of targets representing water column sediment such as TSS, embeddeness, stream morphology, up-slope conditions and a measure of biota).

Minimum Submission Requirements:

☒ The TMDL should identify a numeric water quality target(s) for each waterbody pollutant combination. The TMDL target is a quantitative value used to measure whether or not the applicable water quality standard is attained.

*Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. Occasionally, the pollutant of concern is different from the parameter that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as a numerical dissolved oxygen criterion). In such cases, the TMDL should explain the linkage between the pollutant(s) of concern, and express the quantitative relationship between the TMDL target and pollutant of concern. In all cases, TMDL targets must represent the attainment of current water quality standards.*

☐ When a numeric TMDL target is established to ensure the attainment of a narrative water quality criterion, the numeric target, the methodology used to determine the numeric target, and the link between the pollutant of concern and the narrative water quality criterion should all be described in the TMDL document. Any additional information supporting the numeric target and linkage should also be included in the document.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The water quality targets for this TMDL are based on the numeric water quality standards for fecal coliform bacteria based on the limited contact recreational beneficial use for Pierre Creek. The fecal coliform daily maximum value is $\leq$ 2000 CFU/100 mL in any one sample, and the maximum geometric mean is $\leq$ 1000 CFU/100 mL for 5 samples over a 30 day period. Both criteria are applicable from May 1st through September 30th.

**COMMENTS:** None.

# 3. Pollutant Source Analysis

A TMDL analysis is conducted when a pollutant load is known or suspected to be exceeding the loading capacity of the waterbody. Logically then, a TMDL analysis should consider all sources of the pollutant of concern in some manner. The detail provided in the source assessment step drives the rigor of the pollutant load allocation. In other words, it is only possible to specifically allocate quantifiable loads or load reductions to each significant source (or source category) when the relative load contribution from each source has been estimated. Therefore, the pollutant load from each significant source (or source category) should be identified and quantified to the maximum practical extent. This may be accomplished using site-specific monitoring data, modeling, or application of other assessment techniques. If insufficient time or resources are available to accomplish this step, a phased/adaptive management approach may be appropriate. The approach should be clearly defined in the document.

Minimum Submission Requirements:

☒ The TMDL should include an identification of all potentially significant point and nonpoint sources of the pollutant of concern, including the geographical location of the source(s) and the quantity of the loading, e.g., lbs/per day. This information is necessary for EPA to evaluate the WLA, LA and MOS components of the TMDL.

☒ The level of detail provided in the source assessment should be commensurate with the nature of the watershed and the nature of the pollutant being studied. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of both the natural background loads and the nonpoint source loads.

☒ Natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g. measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified, characterized, and properly quantified.

☒ The sampling data relied upon to discover, characterize, and quantify the pollutant sources should be included in the document (e.g. a data appendix) along with a description of how the data were analyzed to characterize and quantify the pollutant sources. A discussion of the known deficiencies and/or gaps in the data set and their potential implications should also be included.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The TMDL document identifies the land use in the watershed as predominately agricultural consisting of cropland (54%) and grazing or pasture land (37%), with the remaining 9% of the watershed composed of water, wetlands, roads, housing and forested lands.

Aerial photos were used to locate three potential sources of bacterial contamination (see the map in Figure 3 in the TMDL document) within the immediate drainage area of monitoring site JRT18. Area 1, an animal feeding operation, was ruled out as a source because the tributary to Pierre Creek indicated on the map was not detectable on the ground and thus, there is no direct route for fecal coliform bacteria to reach Pierre Creek. There was no evidence of significant livestock near Area 2. A livestock feeder was found near Pierre Creek at Area 3 on the map. At the time of inspection there were no cattle present at Area 3, however, visual evidence indicated heavy cattle use. There was evidence of trampling and fecal matter in a large area close to the stream. It is most likely that this is the predominant source of fecal contamination between Lake Hanson and monitoring site JRT 18.

The community of Alexandria has a non-discharging waste water treatment pond located upstream of the listed segment. SD DENR conducted an inspection of Alexandria's wastewater treatment facility in May

2008 and found no evidence to suggest the city of Alexandria's wastewater treatment facility is impacting the ground water or surface water resources in this area.

**COMMENTS:** None.

# 4. TMDL Technical Analysis

TMDL determinations should be supported by a robust data set and an appropriate level of technical analysis. This applies to **all** of the components of a TMDL document. It is vitally important that the technical basis for **all** conclusions be articulated in a manner that is easily understandable and readily apparent to the reader.

A TMDL analysis determines the maximum pollutant loading rate that may be allowed to a waterbody without violating water quality standards. The TMDL analysis should demonstrate an understanding of the relationship between the rate of pollutant loading into the waterbody and the resultant water quality impacts. This stressor → response relationship between the pollutant and impairment and between the selected targets, sources, TMDLs, and load allocations needs to be clearly articulated and supported by an appropriate level of technical analysis. Every effort should be made to be as detailed as possible, and to base all conclusions on the best available scientific principles.

The pollutant loading allocation is at the heart of the TMDL analysis. TMDLs apportion responsibility for taking actions by allocating the available assimilative capacity among the various point, nonpoint, and natural pollutant sources. Allocations may be expressed in a variety of ways, such as by individual discharger, by tributary watershed, by source or land use category, by land parcel, or other appropriate scale or division of responsibility.

The pollutant loading allocation that will result in achievement of the water quality target is expressed in the form of the standard TMDL equation:

$$TMDL = \sum LAs + \sum WLAs + MOS$$

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

MOS = The portion of the Load Capacity allocated to the Margin of safety.

Minimum Submission Requirements:

☒ A TMDL must identify the loading capacity of a waterbody for the applicable pollutant, taking into consideration temporal variations in that capacity. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

☒ The total loading capacity of the waterbody should be clearly demonstrated to equate back to the pollutant load allocations through a balanced TMDL equation. In instances where numerous LA, WLA and seasonal TMDL capacities make expression in the form of an equation cumbersome, a table may be substituted as long as it is clear that the total TMDL capacity equates to the sum of the allocations.

☒ The TMDL document should describe the methodology and technical analysis used to establish and quantify the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

☒ It is necessary for EPA staff to be aware of any assumptions used in the technical analysis to understand and evaluate the methodology used to derive the TMDL value and associated loading allocations. Therefore, the TMDL document should contain a description of any important assumptions (including the basis for those assumptions) made in developing the TMDL, including but not limited to:

(1) the spatial extent of the watershed in which the impaired waterbody is located and the spatial extent of the TMDL technical analysis;
(2) the distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) a presentation of relevant information affecting the characterization of the pollutant of concern and its allocation to sources such as population characteristics, wildlife resources, industrial activities etc…;
(4) present and future growth trends, if taken into consideration in determining the TMDL and preparing the TMDL document (e.g., the TMDL could include the design capacity of an existing or planned wastewater treatment facility);
(5) an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

☒ The TMDL document should contain documentation supporting the TMDL analysis, including an inventory of the data set used, a description of the methodology used to analyze the data, a discussion of strengths and weaknesses in the analytical process, and the results from any water quality modeling used. This information is necessary for EPA to review the loading capacity determination, and the associated load, wasteload, and margin of safety allocations.

☒ TMDLs must take critical conditions (e.g., steam flow, loading, and water quality parameters, seasonality, etc…) into account as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1) ). TMDLs should define applicable critical conditions and describe the approach used to determine both point and nonpoint source loadings under such critical conditions. In particular, the document should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

☐ Where both nonpoint sources and NPDES permitted point sources are included in the TMDL loading allocation, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document must include a demonstration that nonpoint source loading reductions needed to implement the load allocations are actually practicable [40 CFR 130.2(i) and 122.44(d)].

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Pierre Creek TMDL describes how the fecal coliform loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segment.

Data on Pierre Creek was collected during the Lower James River Watershed Assessment. The data used to derive the TMDL loads was collected from a single sampling point 1 mile upstream of the confluence with the James River (monitoring site JRT18). The flow data was collected from a USGS gage from 1982 to 1983 at the same monitoring site. Modeling for the Pierre Creek watershed was limited to the use of the Aquarius model to validate the hydrology for the load duration curve.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDC was divided into 3 distinct flow regimes – high flow ($\geq$ 9.2 cfs), midrange flow (between 9.2 cfs and 2.8 cfs), and groundwater flow ($\leq$ 2.8 cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 4 of the TMDL document. The LDC is a dynamic expression of the allowable load for any given daily flow. Instantaneous loads were calculated by multiplying the fecal coliform sample concentrations, discharge data, and a unit conversion factor. When the instantaneous loads are plotted on

the LDC, characteristics of the water quality impairment are shown. Instantaneous loads that plot above the acute standard curve are exceeding the TMDL, while those below the curve are in compliance. As the LDC shows, fecal coliform samples collected from Pierre Creek only violated the standard in the low flow zone, which is indicative of cattle in the stream. As an additional measure of protection, reductions were calculated using the chronic standard of 1000 colonies/ 100 mL, resulting in reductions in all 3 flow zones. Loading capacities were derived from this approach at the 90$^{th}$ percentile flow in each flow regime: high flow = 1.25E+12 cfu/day; midrange flow = 1.85E+11 cfu/day; and groundwater flow = 7.25E+10 cfu/day.

**COMMENTS:** None.

## 4.1 Data Set Description

TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis. An inventory of the data used for the TMDL analysis should be provided to document, for the record, the data used in decision making. This also provides the reader with the opportunity to independently review the data. The TMDL analysis should make use of all readily available data for the waterbody under analysis unless the TMDL writer determines that the data are not relevant or appropriate. For relevant data that were known but rejected, an explanation of why the data were not utilized should be provided (e.g., samples exceeded holding times, data collected prior to a specific date were not considered timely, etc...).

Minimum Submission Requirements:

☒ TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis such that the water quality impairments are clearly defined and linked to the impaired beneficial uses and appropriate water quality criteria.

☒ The TMDL document submitted should be accompanied by the data set utilized during the TMDL analysis. If possible, it is preferred that the data set be provided in an electronic format and referenced in the document. If electronic submission of the data is not possible, the data set may be included as an appendix to the document.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. The recent water quality monitoring was conducted during spring and summer in 2006 and included 16 fecal coliform samples. The data set also includes the approximately 2 years of flow record on Pierre Creek that was use to develop a load duration curve for Pierre Creek.

**COMMENTS:** None.

## 4.2 Waste Load Allocations (WLA):

Waste Load Allocations represent point source pollutant loads to the waterbody. Point source loads are typically better understood and more easily monitored and quantified than nonpoint source loads. Whenever practical, each point source should be given a separate waste load allocation. All NPDES permitted dischargers that discharge the pollutant under analysis directly to the waterbody should be identified and given separate waste load allocations. The finalized WLAs are required to be incorporated into future NPDES permit renewals.

Minimum Submission Requirements:

☒ EPA regulations require that a TMDL include WLAs for all significant and/or NPDES permitted point sources of the pollutant. TMDLs must identify the portion of the loading capacity allocated to individual existing and/or

future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit. If no allocations are to be made to point sources, then the TMDL should include a value of zero for the WLA.

☒ All NPDES permitted dischargers given WLA as part of the TMDL should be identified in the TMDL, including the specific NPDES permit numbers, their geographical locations, and their associated waste load allocations.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek TMDL document says that there are no municipal or other point source discharges to Pierre Creek. The town of Alexandria is located within the watershed, and maintains a wastewater lagoon, but it is not allowed to discharge to surface water. Therefore, the WLA for this TMDL is zero. SD DENR conducted an inspection of Alexandria's wastewater treatment facility in May 2008 and found no evidence to suggest the city of Alexandria's wastewater treatment facility is impacting the ground water or surface water resources in this area.

**COMMENTS:** None.

## 4.3 Load Allocations (LA):

Load allocations include the nonpoint source, natural, and background loads. These types of loads are typically more difficult to quantify than point source loads, and may include a significant degree of uncertainty. Often it is necessary to group these loads into larger categories and estimate the loading rates based on limited monitoring data and/or modeling results. The background load represents a composite of all upstream pollutant loads into the waterbody. In addition to the upstream nonpoint and upstream natural load, the background load often includes upstream point source loads that are not given specific waste load allocations in this particular TMDL analysis. In instances where nonpoint source loading rates are particularly difficult to quantify, a performance-based allocation approach, in which a detailed monitoring plan and adaptive management strategy are employed for the application of BMPs, may be appropriate.

Minimum Submission Requirements:

☒ EPA regulations require that TMDL expressions include LAs which identify the portion of the loading capacity attributed to nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Load allocations may be included for both existing and future nonpoint source loads. Where possible, load allocations should be described separately for natural background and nonpoint sources.

☒ Load allocations assigned to natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g., measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified and given proper load or waste load allocations.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** To develop the fecal coliform bacteria load allocation (LA), the loading capacity (LC) was first determined. The LC for Pierre Creek was calculated by multiplying the chronic fecal coliform bacteria criterion in each flow zone by the mean daily average discharge in that flow zone and a unit conversion factor. The chronic or geometric mean criterion (1000 CFU/100ml) was used rather than the daily maximum (2000 CFU/100ml). If the chronic standard is targeted rather than the daily standard, it will ensure that both standards will be met.

**COMMENTS:** None.

## 4.4 Margin of Safety (MOS):

Natural systems are inherently complex. Any mathematical relationship used to quantify the stressor → response relationship between pollutant loading rates and the resultant water quality impacts, no matter how rigorous, will include some level of uncertainty and error. To compensate for this uncertainty and ensure water quality standards will be attained, a margin of safety is required as a component of each TMDL. The MOS may take the form of a explicit load allocation (e.g., 10 lbs/day), or may be implicitly built into the TMDL analysis through the use of conservative assumptions and values for the various factors that determine the TMDL pollutant load → water quality effect relationship. Whether explicit or implicit, the MOS should be supported by an appropriate level of discussion that addresses the level of uncertainty in the various components of the TMDL technical analysis, the assumptions used in that analysis, and the relative effect of those assumptions on the final TMDL. The discussion should demonstrate that the MOS used is sufficient to ensure that the water quality standards would be attained if the TMDL pollutant loading rates are met. In cases where there is substantial uncertainty regarding the linkage between the proposed allocations and achievement of water quality standards, it may be necessary to employ a phased or adaptive management approach (e.g., establish a monitoring plan to determine if the proposed allocations are, in fact, leading to the desired water quality improvements).

Minimum Submission Requirements:

☒ TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ). EPA's 1991 TMDL Guidance explains that the MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as loadings set aside for the MOS).

- ☐ If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS should be identified and described. The document should discuss why the assumptions are considered conservative and the effect of the assumption on the final TMDL value determined.
- ☒ If the MOS is explicit, the loading set aside for the MOS should be identified. The document should discuss how the explicit MOS chosen is related to the uncertainty and/or potential error in the linkage analysis between the WQS, the TMDL target, and the TMDL loading rate.
- ☐ If, rather than an explicit or implicit MOS, the TMDL relies upon a phased approach to deal with large and/or unquantifiable uncertainties in the linkage analysis, the document should include a description of the planned phases for the TMDL as well as a monitoring plan and adaptive management strategy.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek TMDL includes an explicit MOS derived as the difference between the loading capacity at the mid-point of each flow zone and the loading capacity at the minimum flow in each zone.

**COMMENTS:** None.

## 4.5 Seasonality and variations in assimilative capacity:

The TMDL relationship is a factor of both the loading rate of the pollutant to the waterbody and the amount of pollutant the waterbody can assimilate and still attain water quality standards. Water quality standards often vary based on seasonal considerations. Therefore, it is appropriate that the TMDL analysis consider

seasonal variations, such as critical flow periods (high flow, low flow), when establishing TMDLs, targets, and allocations.

Minimum Submission Requirements:

☒ The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variability as a factor. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ).

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** By using the load duration curve approach to develop the TMDL allocations seasonal variability in fecal coliform loads is taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months. Also, the TMDL is seasonal since the fecal coliform criteria are in effect from May 1 to September 30, therefore the TMDL is only applicable during that period.

**COMMENTS:** None.

# 5. Public Participation

EPA regulations require that the establishment of TMDLs be conducted in a process open to the public, and that the public be afforded an opportunity to participate. To meaningfully participate in the TMDL process it is necessary that stakeholders, including members of the general public, be able to understand the problem and the proposed solution. TMDL documents should include language that explains the issues to the general public in understandable terms, as well as provides additional detailed technical information for the scientific community. Notifications or solicitations for comments regarding the TMDL should be made available to the general public, widely circulated, and clearly identify the product as a TMDL and the fact that it will be submitted to EPA for review. When the final TMDL is submitted to EPA for approval, a copy of the comments received by the state and the state responses to those comments should be included with the document.

Minimum Submission Requirements:
☒ The TMDL must include a description of the public participation process used during the development of the TMDL (40 C.F.R. §130.7(c)(1)(ii) ).

☒ TMDLs submitted to EPA for review and approval should include a summary of significant comments and the State's/Tribe's responses to those comments.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The State's submittal includes a summary of the public participation process that has occurred which describes the ways the public has been given an opportunity to be involved in the TMDL development process. In particular, the State has encouraged participation through public board meetings in the watershed. The draft TMDL was also available for a 30-day public notice period prior to finalization.

**COMMENTS:** None.

# 6. Monitoring Strategy

TMDLs may have significant uncertainty associated with the selection of appropriate numeric targets and estimates of source loadings and assimilative capacity. In these cases, a phased TMDL approach may be necessary. For Phased TMDLs, it is EPA's expectation that a monitoring plan will be included as a component of the TMDL document to articulate the means by which the TMDL will be evaluated in the field, and to provide for future supplemental data that will address any uncertainties that may exist when the document is prepared.

Minimum Submission Requirements:

☒ When a TMDL involves both NPDES permitted point source(s) and nonpoint source(s) allocations, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring.

☒ Under certain circumstances, a phased TMDL approach may be utilized when limited existing data are relied upon to develop a TMDL, and the State believes that the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation and merit development of a second phase TMDL. EPA recommends that a phased TMDL document or its implementation plan include a monitoring plan and a scheduled timeframe for revision of the TMDL. These elements would not be an intrinsic part of the TMDL and would not be approved by EPA, but may be necessary to support a rationale for approving the TMDL. http://www.epa.gov/owow/tmdl/tmdl_clarification_letter.pdf

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** Pierre Creek should continue to be monitored as part of the Lower James River implementation project. Post-implementation monitoring will be necessary to assure the TMDL has been reached and maintenance of the beneficial use occurs.

**COMMENTS:** The limited amount of data currently available for Pierre Creek suggests that this would be a good candidate for an adaptive management approach to implementation, or even a phased TMDL. Collecting additional data during and after implementation would be a necessary part of any implementation and follow-up scenario.

# 7. Restoration Strategy

The overall purpose of the TMDL analysis is to determine what actions are necessary to ensure that the pollutant load in a waterbody does not result in water quality impairment. Adding additional detail regarding the proposed approach for the restoration of water quality is not currently a regulatory requirement, but is considered a value added component of a TMDL document. During the TMDL analytical process, information is often gained that may serve to point restoration efforts in the right direction and help ensure that resources are spent in the most efficient manner possible. For example, watershed models used to analyze the linkage between the pollutant loading rates and resultant water quality impacts might also be used to conduct "what if" scenarios to help direct BMP installations to locations that provide the greatest pollutant reductions. Once a TMDL has been written and approved, it is often the responsibility of other water quality programs to see that it is implemented. The level of quality and detail provided in the restoration strategy will greatly influence the future success in achieving the needed pollutant load reductions.

Minimum Submission Requirements:

☒ EPA is not required to and does not approve TMDL implementation plans. However, in cases where a WLA is dependent upon the achievement of a LA, "reasonable assurance" is required to demonstrate the necessary LA called for in the document is practicable). A discussion of the BMPs (or other load reduction measures) that are to be relied upon to achieve the LA(s), and programs and funding sources that will be relied upon to implement the load reductions called for in the document, may be included in the implementation/restoration section of the TMDL document to support a demonstration of "reasonable assurance".

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Implementation Plan section of the TMDL document says that implementation activities for Pierre Creek were incorporated into the Lower James River Implementation Project. Since there are no point source discharges to Pierre Creek, there is no need to include a discussion of reasonable assurance in this TMDL document.

**COMMENTS:** None.

# 8. Daily Loading Expression

The goal of a TMDL analysis is to determine what actions are necessary to attain and maintain WQS. The appropriate averaging period that corresponds to this goal will vary depending on the pollutant and the nature of the waterbody under analysis. When selecting an appropriate averaging period for a TMDL analysis, primary concern should be given to the nature of the pollutant in question and the achievement of the underlying WQS. However, recent federal appeals court decisions have pointed out that the title TMDL implies a "daily" loading rate. While the most appropriate averaging period to be used for developing a TMDL analysis may vary according to the pollutant, a daily loading rate can provide a more practical indication of whether or not the overall needed load reductions are being achieved. When limited monitoring resources are available, a daily loading target that takes into account the natural variability of the system can serve as a useful indicator for whether or not the overall load reductions are likely to be met. Therefore, a daily expression of the required pollutant loading rate is a required element in all TMDLs, in addition to any other load averaging periods that may have been used to conduct the TMDL analysis. The level of effort spent to develop the daily load indicator should be based on the overall utility it can provide as an indicator for the total load reductions needed.

Minimum Submission Requirements:

☒ The document should include an expression of the TMDL in terms of a daily load. However, the TMDL may also be expressed in temporal terms other than daily (e.g., an annual or monthly load). If the document expresses the TMDL in additional "non-daily" terms the document should explain why it is appropriate or advantageous to express the TMDL in the additional unit of measurement chosen.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Pierre Creek fecal coliform TMDL includes daily loads expressed as colonies per day. The daily TMDL loads are included in TMDL and Allocations section of the TMDL document.

**COMMENTS:** None.