FECAL COLIFORM AND *ESCHERICHIA coli* BACTERIA TOTAL MAXIMUM DAILY LOAD EVALUATIONS FOR DAWSON CREEK, HUTCHINSON AND BON HOMME COUNTIES, SOUTH DAKOTA

South Dakota Department of
Environment and Natural Resources

Protecting South Dakota's Tomorrow ... Today

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

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Total Maximum Daily Load Summary Table

Dawson Creek Total Maximum Daily Load

Entity ID:	SD-JA-R-DAWSON-01
Location:	HUC Code: 10160011
Size of Watershed:	44,768 acres
Water body Type:	River/Stream
303(d) Listing Parameter:	Fecal Coliform Bacteria
Initial Listing date:	2010 IR
TMDL Priority Ranking:	1
Listed Stream Miles:	Lake Henry (near Scotland) to James River
Designated Use of Concern:	Limited Contact Recreation
Analytical Approach:	Load Duration Curve Framework
Target:	Meet applicable water quality standards 74:51:01:55
Indicators:	Fecal Coliform Bacteria Counts
Threshold Value:	$\leq$ 1000 colonies/100 ml geometric mean concentration with maximum single sample concentrations of $\leq$2000 colonies/100 ml
High Flow Zone LA:	6.67×10^{12} Colonies/ Day
High Flow Zone WLA:	Scotland = 1.65×10^{11} Colonies/ Day
High Flow Zone MOS:	4.52×10^{11} Colonies/ Day
High Flow Zone TMDL:	7.28×10^{12} Colonies/ Day

Total Maximum Daily Load Summary Table

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Designated Use of Concern:	Limited Contact Recreation
Analytical Approach:	Load Duration Curve Framework
Target:	Meet applicable water quality standards 74:51:01:55
Indicators:	*E. coli* Bacteria Counts
Threshold Value:	$\leq$ 630 colonies/100 ml geometric mean concentration with maximum single sample concentrations of $\leq$ 1178 colonies/100 ml
High Flow Zone LA:	4.20×10^{12} Colonies/ Day
High Flow Zone WLA:	Scotland = 1.04×10^{11} Colonies/ Day
High Flow Zone MOS:	2.85×10^{11} Colonies/ Day
High Flow Zone TMDL:	4.59×10^{12} Colonies/ Day

1.0 Introduction

The intent of this document is to clearly identify the components of the TMDLs submitted to support adequate public participation and facilitate the United States Environmental Protection Agency (EPA) review and approval. These TMDLs were 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 and *Escherichia coli* bacteria impairment of Dawson Creek from Lake Henry near the town of Scotland to the James River. This impaired segment was identified as SD-JA-R-Dawson-01 in the 303(d) list of impaired waterbodies incorporated in South Dakota's 2010 Integrated Report (IR) for Surface Water Quality.

1.1 Watershed Characteristics

The entire Dawson Creek watershed drains 44,768 acres in South Dakota and discharges to the James River. The 303(d) listed segment that this TMDL addresses drains portions of Hutchinson and Bon Homme Counties in southeast South Dakota (Figure 1).

The communities of Tripp and Scotland reside upstream of the listed segments drainage. Over half of the population (1,500) within the watershed resides within these communities. The total population of the watershed is approximately 2,500. Approximately 36% of the population resides in rural agricultural areas of the watershed.

The watershed climate is characterized by hot summers with temperatures occasionally reaching 100^{o}F or greater and cold winters with temperatures dipping down below 0^{o}F. Annual precipitation averages around 22 inches with 75% of it falling during the growing season, April through September. The average annual snowfall total is 50 inches.

The most dominant soil association for the northern portion of the Dawson Creek drainage in Hutchinson County is the Clarno-Tetonka-Prosper association. The Tetonka-Prosper associations represent small wet depressions and narrow swales, respectively. The dominant soil associations for the rest of the Dawson Creek drainage located in Bon Homme County are Clarno-Bonilla, Clarno-Ethan-Bonilla and Ethan-Bon. The Clarno and Bonilla associations comprise over 80% cropland. The major crops in Bon Homme County are Alfalfa, corn, soybeans, oats and grain sorghum. About 75% of the Ethan-Bon association supports native grasses and is used for grazing (USDA, 1984).

Land use in the watershed is predominately agricultural. Major land use categories include; 64% row crops, 25% native rangelands, 6% urban or developed, 3% hay ground, 1% small grains, and just over 1% forest-shrub and water.

Dawson Creek was assessed as an individual portion of the larger Lower James River Watershed Assessment, which focused on individual streams such as Dawson Creek as well as the entire drainage basin and the cumulative effects of the individual waterbodies on the lower portion of the James River.

Segment SD-JA-R-DAWSON-01 was listed for fecal coliform and *E.coli* bacteria in the 2010 Integrated Report (SDDENR, 2010). This TMDL document addresses both the fecal coliform and *E. coli* impairments.

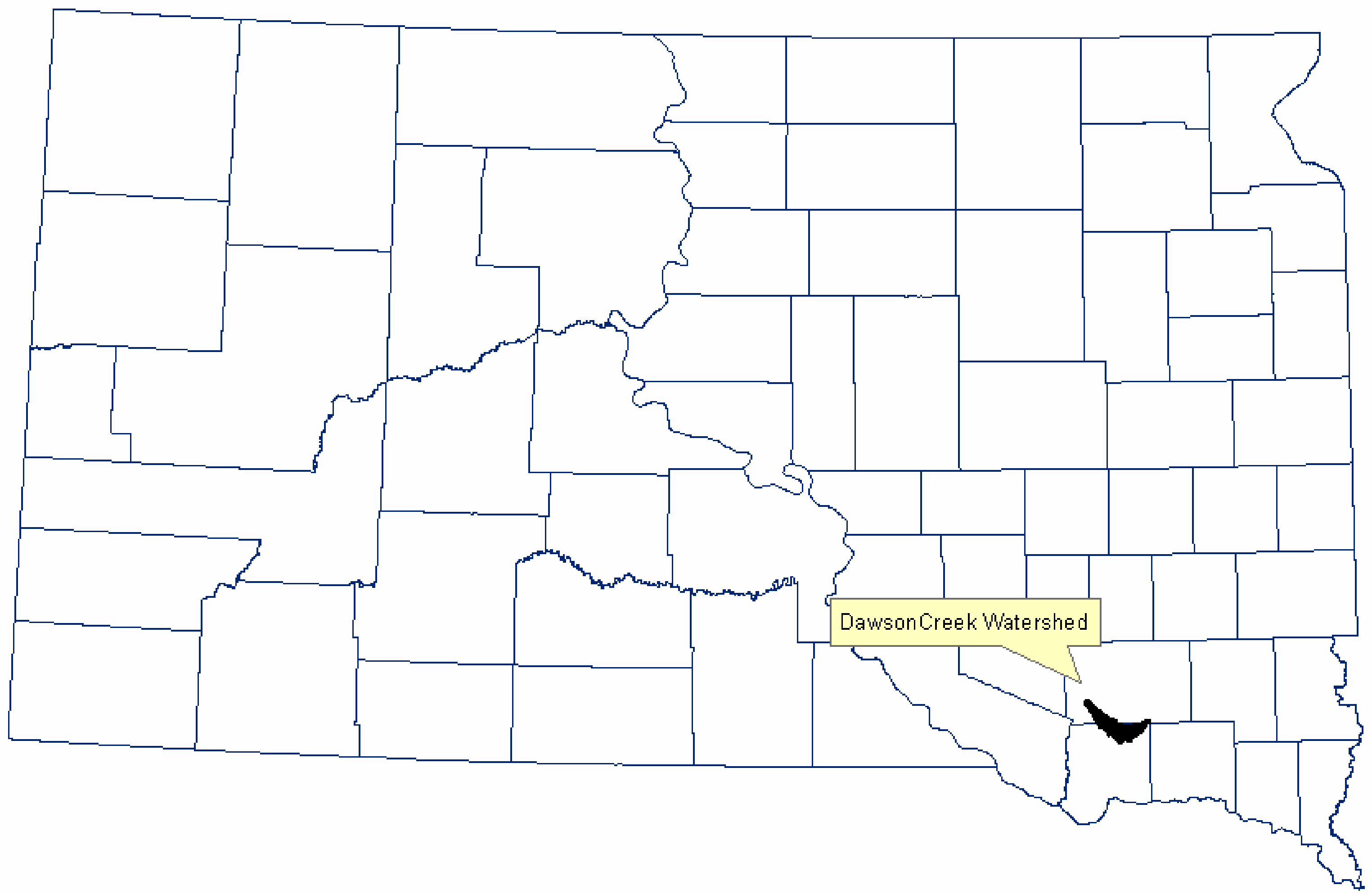

Figure 1. **Dawson Creek Watershed location in South Dakot**a

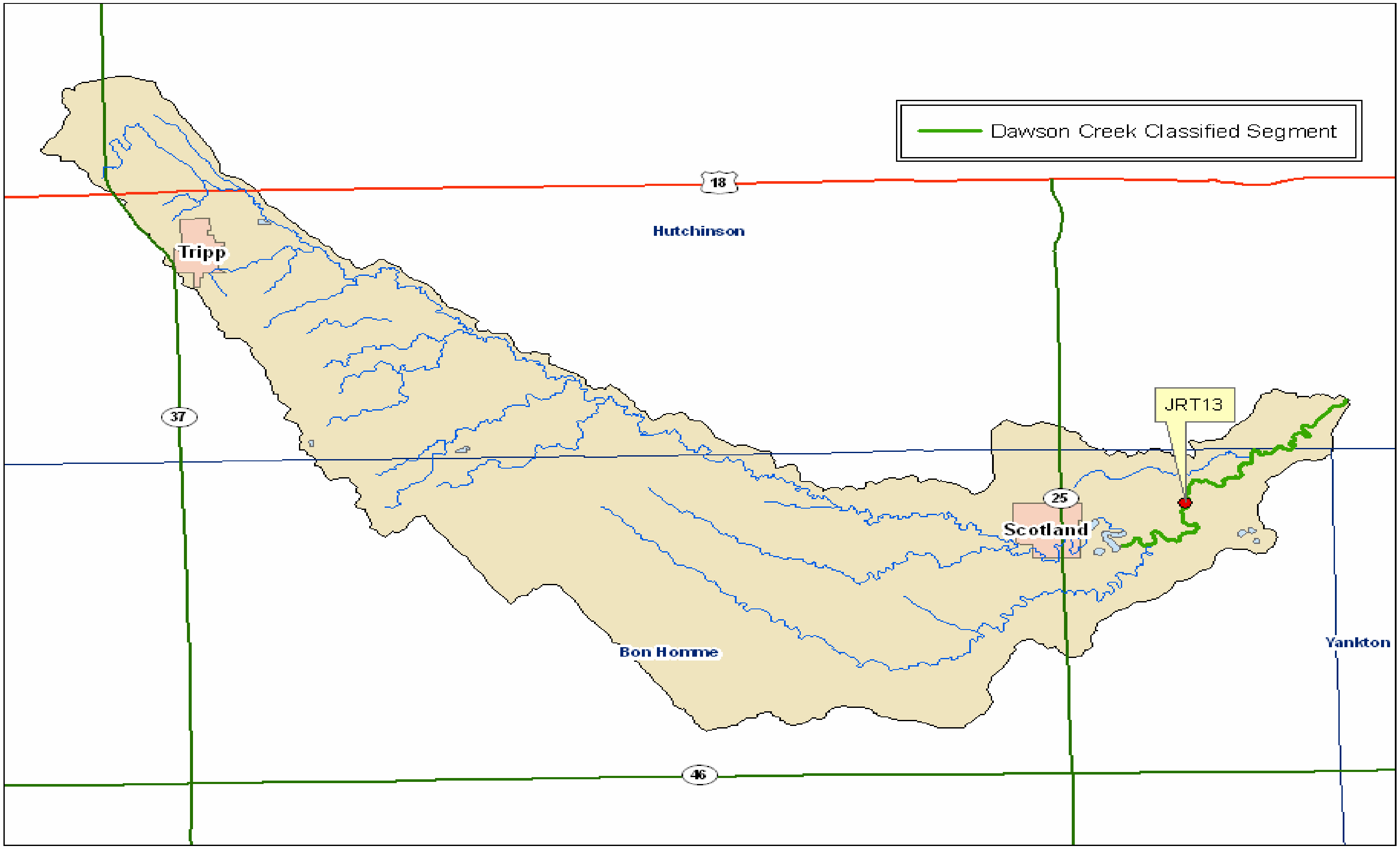

Figure 2. Dawson Creek Watershed

2.0 Water Quality Standards

Each waterbody within South Dakota is assigned beneficial uses. All waters (both lakes and streams) are designated the use of fish and wildlife propagation, recreation and stock watering. All streams are assigned the use of irrigation. Additional uses may be assigned by the state based on a use attainability 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 numeric criteria that provide physical and chemical benchmarks from which management decisions can be developed.

Chronic standards, including geometric means and 30-day averages, are applied to a calendar month. While not explicitly described within the states water quality standards, this is the method used in the states Integrated Report (IR) for Surface Water Quality as well as in permit development.

Additional “narrative” standards that may apply can be found in the “Administrative rules of South Dakota: Articles 74:51:01:05; 06; 08, 09; and 12”. These standards contain language that generally prohibits the presence of materials causing pollutants to form, visible pollutants, nuisance aquatic life, and biological integrity.

Dawson Creek from Lake Henry near the town of Scotland downstream to the James River has been assigned the beneficial uses of: warmwater marginal fish life propagation, irrigation waters, limited contact recreation, and fish and wildlife propagation, recreation, and stock watering. Table 1 lists the water quality standard criteria used to determine support status of the specified beneficial uses. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

The acute bacterial criterion for waters designated the beneficial use of limited contact recreation requires that fecal coliform and *E. coli* samples not exceed 2000 cfu/100 ml and 1,178 cfu/100ml, respectively. The chronic criteria for fecal coliform and *E.coli* must not exceed 1000 cfu/100 ml and 630 cfu/100ml, respectively. The chronic standards are based on the geometric mean of a minimum of 5 samples collected during separate 24-hour periods over a 30-day period. The numeric TMDL target established for Dawson Creek is based on the chronic standards for both bacteria indicators, respectively. The bacterial criteria are exclusively applicable from May 1 through September 30.

Table 1. State Water Quality Standards for Dawson Creek (SD-JA-R-DAWSON-01).

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 Marginal 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 30	
	Equal to or less than the result from Equation 2 in Appendix A of Surface Water Quality Standards	mg/L Daily Maximum	
Dissolved Oxygen	≥5.0	mg/L	Limited Contact Recreation
Total Suspended Solids	≤90 (mean) ≤158 (single sample)	mg/L	Warmwater Marginal Fish Propagation
Temperature	≤32	°C	Warmwater Marginal Fish Propagation
Fecal Coliform Bacteria (May 1- Sept 30)	≤1000 (geometric mean) ≤2000 (single sample)	count/100 mL	Limited Contact Recreation
Escherichia coli Bacteria (May 1- Sept 30)	≤630 (geometric mean) ≤1178 (single sample)	count/100 mL	Limited Contact Recreation
Alkalinity ($CaCO_3$)	≤750 (mean) ≤1,313 (single sample)	mg/L	Wildlife Propagation and Stock Watering
Conductivity	≤2,500 (mean) ≤4,375 (single sample)	µmhos/cm @ 25° C	Irrigation Waters
Nitrogen, nitrate as N	≤50 (mean) ≤88 (single sample)	mg/L	Wildlife Propagation and Stock Watering
pH (standard units)	≥6.5 to ≤9.0	units	Warmwater Marginal Fish Propagation
Solids, total dissolved	≤2,500 (mean) ≤4,375 (single sample)	mg/L	Wildlife Propagation and Stock Watering
Total Petroleum Hydrocarbon Oil and Grease	≤10 ≤10	mg/L	Wildlife Propagation and Stock Watering
Sodium Adsorption Ratio	<10	ratio	Irrigation Waters

3.0 Significant Sources

3.1 Point Sources

The communities of Tripp and Scotland are the primary point source dischargers in the Dawson Creek watershed. Both communities utilize retention pond systems as a mechanism to treat municipal wastewater and are regulated by NPDES/Surface Water Discharge permits.

The City of Tripp's wastewater treatment facility produces periodic discharge to an unnamed tributary in the headwaters of the Dawson Creek drainage approximately 17 miles (27 kilometers) upstream of the 303(d) listed segment. The potential for impact to the downstream classified segment was considered during the development of Tripp's NPDES/Surface Water Discharge permit. SD DENR determined that Tripp's minor discharge would not impact the segment of Dawson Creek designated limited contact recreation due to sufficient distance. Therefore, a flow rate and corresponding WLA were not incorporated into the permit for fecal coliform bacteria or *E. coli*. The effluent limits could be set strictly on the standards assigned to the segment the facility discharges to. The City of Tripp's discharge to Dawson Creek is not causing water quality impacts in the downstream segment of Dawson Creek and will not be given a WLA for either fecal coliform or *E.coli* TMDL.

The remaining permitted facility is located at the City of Scotland just upstream of the listed segment above Lake Henry. The facility structure is comprised of a series of retention ponds that may periodically require a portion of the final pond to be discharged. Discharge from the Scotland facility bypasses Lake Henry and enters Dawson Creek just downstream of the outlet or start of the classified segment. Table 2 includes the basic system information and permit numbers for both facilities within the basin.

Table 2. Permitted Facilities within the Dawson Creek Drainage

Permit Number	Facility Name	System comments	Pond 1 (acres)	Pond 2 (acres)	Pond 3 (acres)
SD0022403	Tripp	Pond system-wetlands	11	8.9	
SD0022853	Scotland	Pond system-aeration basin	6.4	6.7	11.1

Table 3 includes the information used by SDDENR to calculate a maximum allowable discharge for the Scotland facility. The WLA calculation was based on the effluent limits included in the surface water discharge permit, multiplied by the 80th percentile maximum flow rate. The normal operation of this system would typically result in only a portion of the calculated daily amounts actually being discharged. It is important to note that all discharges are required to meet the chronic water quality thresholds for Dawson Creek.

Table 3. Waste Load Allocation for Facilities in the Dawson Creek Drainage

Facility Name	Flow (cfs) used in WLA	30-day Geometric Mean Fecal Coliform Bacteria (cfu/100ml) permit limit	Fecal Coliform WLA (cfu/day)
Tripp			
Scotland	6.73	1000	1.65×10^{11}

Including the WLA in the load duration curve required several factors be taken into account. The maximum fecal coliform waste load for the Scotland system is 1.65×10^{11} cfu/day. A flow of 6.73 cfs was associated with this waste load allocation. A flow of 6.73 cfs is met or exceeded in Dawson Creek only 16% of the time. Arbitrarily adding this load to the entire flow regime would be a misrepresentation of how this intermittent system functions, essentially suggesting a continuous discharge.

The Scotland facility only discharges twice per year, once in the spring (April or May) and again in the fall. The fall discharge events have consistently occurred in November which is outside the recreation season for which this TMDL applies. Furthermore, the majority of the spring discharge events, over the past 10 years, have occurred in April rather than May. The duration of a discharge event is estimated at one week. This suggests that the Scotland facility only discharges occasionally for one week during the recreation season. The Scotland facility is required to collect fecal coliform samples during discharge events as part of their NPDES permit. The maximum fecal coliform concentration reported by the Scotland facility over the past ten years was 20 cfu/100ml. This information suggests that the bacterial wasteload contributed by the Scotland facility is insignificant and not contributing to the impairment of the classified segment of Dawson Creek.

E.coli was recently added to the water quality standards and is not included in the current surface water discharge permit. The WLA for *E. coli* was calculated by multiplying the chronic standard (630 cfu/100ml) by the allowable flow rate (6.73 cfs) specified in the current WLA for fecal coliform. When the current permit expires, the fecal coliform WLA will be replaced with a WLA for *E. coli*. The new permit will likely provide an *E. coli* load of 1.04×10^{11} cfu/100ml assuming the same flow rate. This load is based on the chronic standard and was used as a reasonable WLA for the *E.coli* TMDL. The *E.coli* wasteload contributed by the Scotland facility is also insignificant and not contributing to the impairment of the classified segment of Dawson Creek.

Flow data used to develop the flow frequency curve includes daily flow data. The flow record provided over 25 years of daily flow data which included all waste water treatment facility discharges during that time period. The flow variability, as a result of the intermittent operation of these facilities, is fully accounted for in the flow frequency curve.

3.2 Nonpoint Sources

Nonpoint sources of fecal coliform and *E. coli* bacteria in the Dawson Creek watershed come primarily from agricultural sources. Data from the 2009 National Agricultural Statistic Survey (NASS) and the 2002 South Dakota Game Fish and Parks county wildlife assessment were utilized for livestock and wildlife densities, respectively. Animal density information was used to estimate relative source contributions of bacteria loads (Table 5).

3.2.1 Agriculture

Manure from livestock is a potential source of fecal coliform and *E. coli* bacteria to the stream. Livestock in the basin are predominantly beef cattle and hogs. Livestock can contribute bacteria directly to the stream by defecating while wading in the stream. They can also contribute by defecating while grazing on rangelands that get washed off during precipitation events. Table 4 allocates sources of bacteria production in the watershed into three primary categories. The summary is based on several assumptions. Feedlot numbers were calculated as the sum of all dairy, hog, and the NASS estimate of beef in feeding areas. All remaining livestock were assumed to be on grass.

Table 4. Fecal Source Allocation for Dawson Creek

Source	Percentage
Feedlots	62.2%
Livestock on Grass	37.4%
Wildlife	0.4%

The main source of fecal coliform and *E. coli* bacteria in the Dawson Creek watershed is livestock from a combination of feedlots and grazing. Bacteria migration from feedlots and upland grazing is most likely occurring during major run-off events. Direct use of the stream by livestock is the most likely source of bacteria at low flows. Evidence of this is available in the load duration curves which indicate that elevated counts of Fecal coliform and *E. coli* occur throughout different flow regimes. Beef cattle and hogs were found to contribute the most significant amount of bacteria to the Dawson Creek watershed (Table 5).

3.2.2 Human

Two communities are located in the Dawson Creek watershed, Tripp and Scotland. Their wastewater treatment systems account for about 1600 of the approximate 2500 people in the watershed. Septic systems are assumed to be the primary human source for the rural population in the watershed. When included in the total load, the remaining population produced fecals accounting for less than 0.5% of all fecal coliform produced in the watershed. Human fecal production may be estimated at 1.95E+9 (Yagow et al. 2001). These bacteria should all be delivered to a septic system, which if functioning correctly would result in no fecal coliform entering the creek. Septic system failure was not identified as a source of concern during the field investigation conducted in the Dawson Creek watershed.

3.2.3 Natural background/wildlife

Wildlife within the watershed is a natural background source of fecal coliform bacteria. Wildlife population density estimates were obtained from the South Dakota Department of Game, Fish, and Parks (Huxoll, 2002). The contribution of bacteria from wildlife in the Dawson Creek watershed was insignificant (0.3%) in comparison to livestock sources.

Table 5. Dawson Creek Nonpoint Sources

Species	#/sq mile	#/acre	FC/Animal/Day	Fecal Coliform	Percent
Dairy cow	2.38	3.73E-03	4.46E+10	1.66E+08	2.2%
Beef	97.00	1.52E-01	3.90E+10	5.91E+09	77.8%
Bison[1]	0.16	2.46E-04	4.46E+10	1.10E+07	0.1%
Hog	78.10	1.22E-01	1.08E+10	1.32E+09	17.4%
Sheep	3.57	5.58E-03	1.96E+10	1.09E+08	1.4%
Horse	0.66	1.03E-03	5.15E+10	5.33E+07	0.7%
All Wildlife	Sum of all Wildlife			2.58E+07	0.3%
Turkey (Wild)[2]	1.0	1.50E-03	1.10E+08	1.65E+05	
Sharptail grouse and prairie chicken[3]	0.4	5.78E-04	1.40E+08	8.09E+04	
Deer[4]	2.2	3.48E-03	3.47E+08	1.21E+06	
Beaver[4]	2.0	3.10E-03	2.00E+05	6.2E+02	
Raccoon[4]	5.2	8.17E-03	2.50E+08	2.04E+06	
Coyote/Fox[5]	3.0	4.66E-03	1.75E+09	8.16E+06	
Muskrat[2]	3.8	5.94E-03	2.50E+07	1.49E+05	
Opossum[6]	2.0	3.08E-03	2.50E+08	7.69E+05	
Mink[6]	1.1	1.65E-03	2.50E+08	4.13E+05	
Skunk[6]	2.3	3.52E-03	2.50E+08	8.80E+05	
Badger[6]	1.4	2.15E-03	2.50E+08	5.38E+05	
Jackrabbit[6]	0.1	6.36E-03	2.50E+08	1.59E+06	
Cottontail[6]	15.2	2.37E-02	2.50E+08	5.93E+06	
Squirrel[6]	9.8	1.53E-02	2.50E+08	3.83E+06	

1 FC/Animal/Day copied from Dairy Cow to provide a more conservative estimate of background affects of wildlife

2 USEPA 2001

3 FC/Animal/Day copied from Chicken (USEPA 2001) to provide an estimate of background affects of wildlife

4 Bacteria Indicator Tool Worksheet

5 Best Professional Judgment based off of Dogs

6 FC/Animal/Day copied from Raccoon to provide a more conservative estimate of background affects of wildlife

The amount of *E. coli* produced per animal per day is assumed to be closely related to fecal coliform for individual livestock and wildlife species. Therefore, the overall contribution of *E.coli* bacteria from various sources in the Dawson Creek watershed is expected to be similar to that reported for fecal coliform.

4.0 Technical Analysis

4.1 Data Collection Method

Fecal coliform and *E. coli* bacteria samples were collected on Dawson Creek during the Lower James River Watershed Assessment. The primary sampling point LOWJIMJRT13 (JRT13) was located three miles upstream of the James River confluence, and one mile downstream of Lake Henry (Figure1). This site represented the impaired segment classified as limited contact recreation. Several additional fecal coliform and *E. coli* samples were collected above JRT13 in the three main branches of Dawson Creek to aid in locating potential source areas upstream of the classified reach. These data were exclusively used to focus implementation efforts as described in section 9.0. Long-term flow data for Dawson Creek was estimated from a series of hydrologic model exercises.

Unless otherwise noted, analysis was completed with modeling programs according to the most recent version of the Water Quality Modeling in South Dakota document (SDDENR, 2009).

4.2 Flow Analysis

Long term gauge data for Dawson Creek did not exist and a suitable surrogate gauge on neighboring streams was also unavailable for the development of a long term flow frequency curve. To develop a representative flow frequency curve, the AnnAGNPS model was utilized. Designed as a runoff model, it makes an appropriate model for a small stream such as Dawson Creek which was primarily influenced by runoff events and has a minimal amount of baseflow. Accurate weather data from the watershed was available for a period of 26 years from 1984 through 2009. The base model was run and comparisons were made to other available data. The predicted peak flow for a 25 year storm event for Dawson Creek is approximately 2000 cfs (Sando, 1998). The model included a single date that had an event that could be classified as a 25 year rain event. For this event, the model predicted a peak flow of 2034 cfs, suggesting that the peak flows were representative.

Total flow volume was compared to estimates produced by the Elevation Derivatives for National Applications (EDNA) model. The EDNA model suggests that the average annual stream flow for Dawson Creek could be expected to be 10.2 cfs. Based on comparisons to USGS stream gauges in the region, EDNA tends to slightly over predict average annual runoff by 10% to 20%. The AnnAGNPs model predicted an average annual flow of 6.3 cfs, approximately 38% of the predicted. Further analysis of the AnnAGNPs dataset provided some indications as to why the model had under predicted total flow volumes. The model predicted that the stream flows 59.6% of the time, an acceptable prediction for a small intermittent stream such as Dawson Creek. As primarily a runoff model, low flows at the end of storm event hydrographs were predicted to be lower than what would have been expected. When the model predicted flow rates of less than 1 cfs, the majority were between of 0.0001 to 0.01 cfs with a lack of intermediate values (0.1 to 0.9 cfs). These flows were incrementally increased to create a more realistic distribution of flows between 0 and 1 cfs. The resulting average daily flow volume increased to 6.6 cfs, about 30 % of the EDNA prediction.

As primarily a runoff model, more weight was given to the peak flow than the average daily flow in the calibration process. The apparent high degree of accuracy in the peak flow suggests that the dataset is representative of Dawson Creek and made a suitable flow frequency from which to develop the load duration curve for the stream.

South Dakota recently adopted *Escherichia coli* criteria for the protection of limited contact and immersion recreation uses. Dawson Creek requires an *E. coli* TMDL because the parameter was listed as a cause of impairment to this stream on the 303(d) list of impaired waterbodies in the 2010 IR. Because the two indicators are closely related, the fecal coliform bacteria sources and associated implementation strategy described in this document are expected to apply to both the fecal coliform bacteria and *E. coli* impairments. This TMDL document incorporates a TMDL for both parameters.

4.3 Sample Data

Fecal coliform and *E. coli* data collected at JRT 13 during the Lower James River Watershed Assessment project was utilized to evaluate the impaired reach of Dawson Creek. A total of twelve samples were available for both parameters (n=24) within the applicable timeframe (May 1 through September 30) for use in the TMDL analysis. Ten of the twelve fecal coliform samples were above the chronic standard while eight of those exceeded the acute standard. Ten of the twelve *E. coli* samples were above both the acute and chronic standard (Table 6).

Table 6. Dawson Creek Fecal Coliform and *E.coli* Data

Date	Station	Fecal Coliform Bacteria colonies /100ml	E. coli Bacteria Colonies/100ml	Flow (CFS)	Flow Zone
5/2/06	JRT13	100	144	0.05	3
5/10/06	JRT13	**2,000**	**2420**	0.45	3
5/16/06	JRT13	1,400	**2420**	1.14	2
5/23/06	JRT13	**11,000**	**2420**	0.13	3
5/31/06	JRT13	1,800	**2420**	0.26	3
6/6/06	JRT13	**5,800**	**2420**	0.13	3
7/26/06	JRT13	**2,700**	**1550**	0.13	3
9/28/06	JRT13	**5,500**	**2420**	1.7	2
5/7/07	JRT13	**9,800**	**4840**	520	1
5/21/07	JRT13	**2,900**	**4840**	4.3	2
5/31/07	JRT13	**130,000**	**2420**	3.22	2
6/25/07	JRT13	450	398	2.40	2

(Highlighted samples are in excess of the chronic standard and bolded samples are in excess of the acute standard.)

The State Health Laboratory only reported *E. coli* to 2,420 cfu/100ml and 4,840 cfu/100ml during the data collection period. Because the two bacterial indicators are closely related (*RESPEC*, 2010) an attempt was made to develop a regression equation to estimate *E. coli* based on available fecal coliform data. The linear relationship resulted in a regression coefficient (R^2) of 0.0032 suggesting that only 0.3% of the variability in *E. coli* is being explained by fecal coliform. This poor relationship was expected due to the small comparative dataset and majority of the *E. coli* data reported at the upper level of detection. The only two *E. coli* concentrations that fell well below the upper limit of detection are closely related to the fecal coliform concentrations collected on the same date (Table 6). This supports the assumption that *E. coli* and fecal coliform are closely related. Because the extent of *E. coli* loadings within each flow zone for the TMDL analysis was unknown the current load was underestimated. As a result, *E. coli* reductions were based on those calculated for fecal coliform for each of the respective flow zones.

The waste load allocation from the City of Scotland was not included in the load duration curve to prevent the misconception that the facility would provide a continuous discharge. They were included in the daily loads for each of the flow zones and are included as a part of the final TMDL calculations (Figure 4 and Table 7).

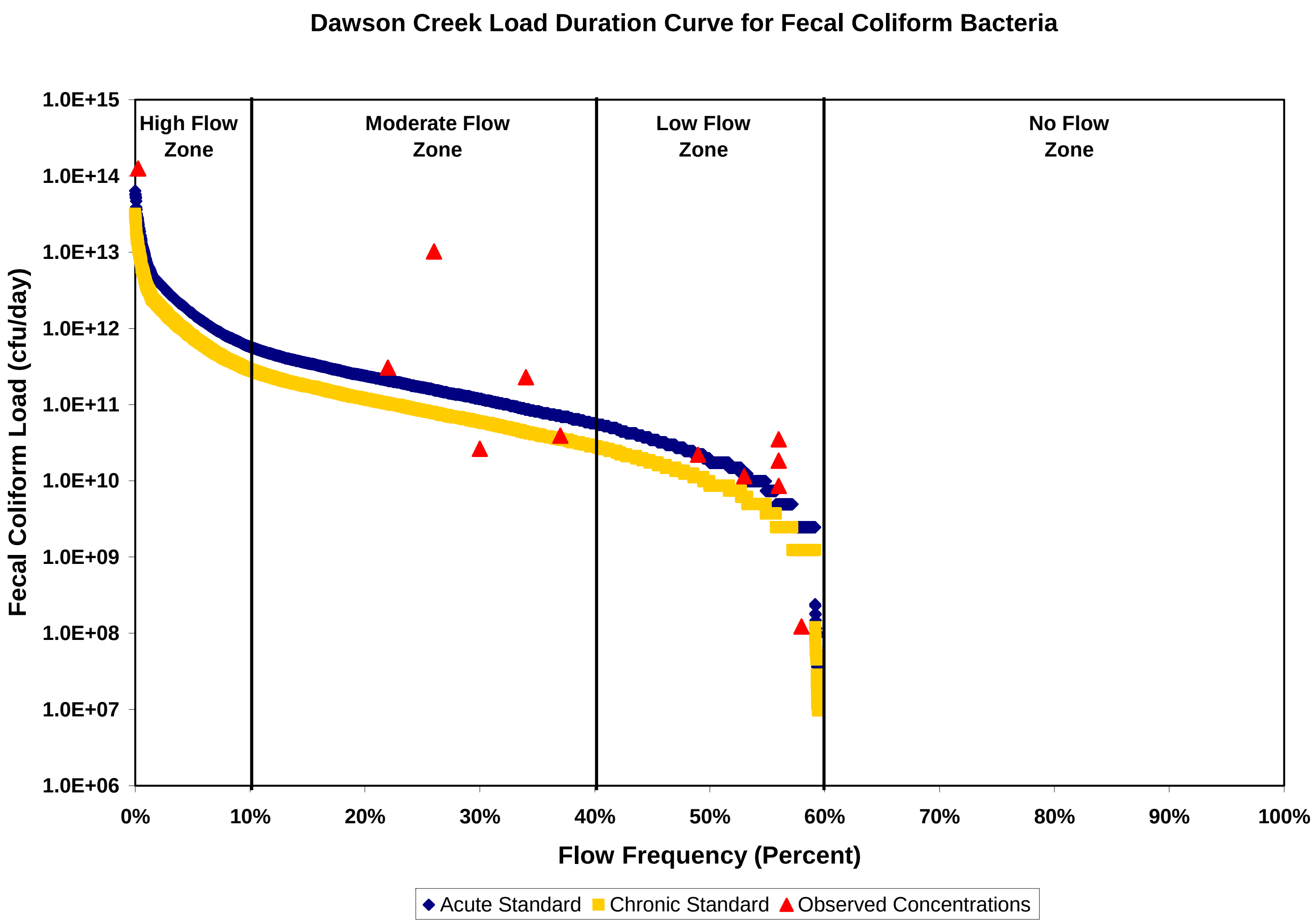

Figure 3. Fecal Coliform Load Duration Curve

5.0 TMDL and Allocations for Fecal Coliform

The flow frequency curve generated for Dawson Creek characterizes the system as intermittent with no flow occurring approximately 40% of the time (Figure 3). Flow zones were defined according to the flow regime structure and distribution of the observed data following guidance recommended by EPA (USEPA, 2001). Four distinct flow zones were established to facilitate interpretation of the hydrologic conditions and patterns associated with the impairment. The zones were segmented by high flows (0-10 percent), moderate flows (10-40 percent), low flows (40-60 percent) and no flow (60-100 percent).

Flows in the high zone are extremely variable ranging from a maximum of 1,300 cfs to a low of 11.1 cfs. Flows represented in this zone occur on an infrequent basis and are characteristic of significant run-off events. The single fecal coliform sample available for this flow zone (9,800 cfu/100ml) exceeded both the acute and chronic standard. The current load for the high flow zone was calculated based on this single sample concentration and the 95th percentile flow (298 cfs) for this zone. All components of the TMDL for the high flow zone including the current load and calculated reductions are presented in Table 7.

The moderate flow zone includes flows that range from 11.1 cfs to 1.1 cfs. Flows in this zone represent 50% of the entire flow occurrence across the flow regime. Flows in this zone are likely generated from moderate to small run-off events. The fecal coliform samples collected in this flow zone exhibit extreme variability ranging from a high concentration of 130,000 cfu/100ml to 450 cfu/100ml. Five samples were collected in the moderate zone of which 4 exceed the acute standard and 3 exceed the chronic standard. The 95th percentile flow (9.38 cfs) and fecal coliform concentration (105,100 cfu/100ml) was used to calculate the current load. All components of the TMDL for the moderate flow zone including the current load and calculated reductions are presented in Table 7.

The low flow zone includes flows that range from 1.1 cfs to those greater than zero cfs. Flows in this zone are base flows resulting from decreased surface run-off and groundwater inputs. The fecal coliform samples collected in this zone display moderate variability ranging from a high of 11,000 cfu/100ml to 100 cfu/100ml. Six samples were collected in the low zone of which 5 exceed the acute standard and 4 exceed the chronic standard. The 95th percentile flow (1.01 cfs) and fecal coliform concentration (9,700 cfu/100ml) was used to calculate the current load. All components of the TMDL for the low flow zone including the current load and calculated reductions are presented in Table 7.

The chronic standard ($\leq$ 1000 cfu/100ml) was used to develop the TMDLs for each distinct flow zone to be protective and provide assurance that neither water quality standard will be exceeded. The 95th percentile concentration was used to calculate current loadings and associated reductions for the moderate and low flow zones to allow for variability in the small datasets. The relatively high fecal coliform concentrations and associated exceedance rate of the acute and chronic standard across flow zones suggests that the source is continual. The most significant source of fecal coliform bacteria produced in the watershed is from beef livestock and hogs with over 60% residing in confinement operations. The WLA provides a relatively large portion of the allocation, however, it is based on permit levels that are highly inflated due to intermittent operation. The most likely source of fecal coliform contamination to Dawson Creek is run-off from feedlot operations especially in the high and moderate flow zones with livestock grazing in the lower end of the moderate and low flow zone.

Table 7. Dawson Creek Fecal Coliform TMDL components for defined flow zones.

	Fecal Coliform			
	Flow Zone expressed as CFU/Day			
	High	Moderate	Low	No Flow
TMDL Component	>11.1 cfs	11.1 to 1.1 cfs	1.1 to > 0 cfs	0 cfs
LA	6.67E+12	1.02E+10	7.41E+09	
WLA	1.65E+11	1.65E+11	7.40E+09	
MOS	4.52E+11	5.43E+10	9.86E+09	
TMDL	7.28E+12	2.29E+11	2.47E+10	
Current Load	7.14E+13	2.41E+13	2.39E+11	
Load Reduction	90%	99%	90%	

TMDL Component Descriptions

Load Allocation (LA): Remaining Load after deducting WLA and MOS from TMDL.

Waste Load Allocation (WLA): Based on a flow of 6.73 cfs and a fecal coliform concentration of 1000 cfu/100ml in accordance with the NPDES/Surface Water Discharge permit. The WLA for the low flow zone was adjusted to fit the flow range by splitting the flows proportionately between the LA and WLA taking into account the MOS resulting in a flow of 0.3 cfs and concentration of 1000 cfu/100ml.

Margin of Safety (MOS): Explicit (see section 7.1 for description).

Total Maximum Daily Load (TMDL): Chronic standard (1000 cfu/100ml) multiplied by the 95th percentile flow for zone.

Current Load: The 95th percentile of observed fecal coliform concentration multiplied by the 95th percentile flow for zone. The single sample maximum and 95th percentile flow was used to calculate the current load for the high flow zone.

Load Reduction: Reduction required to reduce the current load to the load at the standard or TMDL.

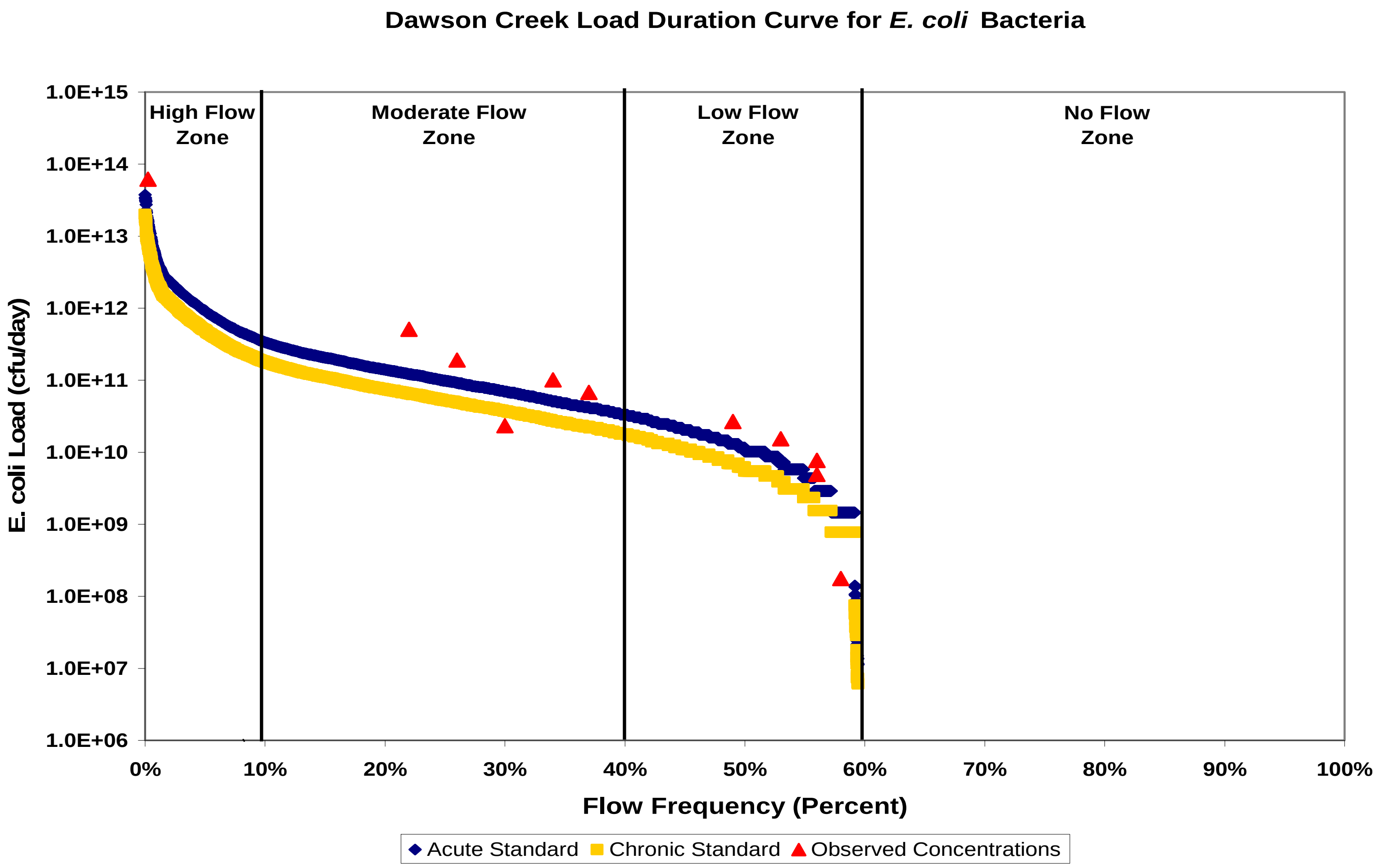

Figure 4. *E. coli* Load Duration Curve

6.0 TMDL and Allocations for *E. coli*

The flow frequency curve generated for Dawson Creek characterizes the system as intermittent with no flow occurring approximately 40% of the time (Figure 4). Flow zones were defined according to the flow regime structure and distribution of the observed data following guidance recommended by EPA (USEPA, 2001). Four distinct flow zones were established to facilitate interpretation of the hydrologic conditions and patterns associated with the impairment. The zones were segmented by high flows (0-10 percent), moderate flows (10-40 percent), low flows (40-60 percent) and no flow (60-100 percent).

The high flow zone is represented by flows that occur infrequently and are characteristic of significant run-off events. The single *E. coli* sample available for this flow zone was recorded at the upper level of detection (4,840 cfu/100ml) and exceeded both the acute and chronic standard. The current load for the high flow zone was calculated based on this single sample concentration and the 95th percentile flow (298 cfs) for this zone. All components of the TMDL for the high flow zone are presented in Table 7.

Flows in the moderate zone represent 50% of the entire flow occurrence across the flow regime. Flows in this zone are likely generated from moderate to small run-off events. Five *E. coli* samples were collected in the moderate flow zone of which four exceeded the acute standard and chronic standard. All four samples were above the upper level of detection (2,420 and 4,840 cfu/100ml). The 95th percentile flow (9.38 cfs) and the maximum upper level detection *E. coli* concentration (4,840) was used to calculate the current load. All components of the TMDL for the moderate flow zone are presented in Table 7.

The low flow zone includes flows that range from 1.1 cfs to those greater than zero cfs. Flows in this zone are base flows resulting from decreased surface run-off and groundwater inputs. Six *E. coli* samples were collected in the low flow zone of which 5 exceed the acute standard and chronic standard. The 95th percentile flow (1.01 cfs) and maximum upper level detection *E. coli* concentration (2,420 cfu/100ml) was used to calculate the current load. All components of the TMDL for the low flow zone are presented in Table 7.

The chronic standard ($\leq$ 630 cfu/100ml) was used to develop the TMDLs for each distinct flow zone to be protective and provide assurance that neither water quality standard will be exceeded. The majority of *E. coli* samples were reported at the upper level of detection. This resulted in a high exceedance rate of both the acute and chronic standard across flow zones suggesting the source is continual. The most significant source of fecal coliform produced in the watershed is from beef livestock and hogs with over 60% residing in confinement operations. The WLA provides a relatively large portion of the allocation, however, it is based on permit levels that are highly inflated due to intermittent operation. The most likely source of *E. coli* contamination to Dawson Creek is run-off from feedlot operations especially in the high and moderate flow zones with livestock grazing in the lower end of the moderate and low flow zones.

Table 8. Dawson Creek *E. coli* TMDL components for defined flow zones

	E.coli			
	Flow Zone expressed as CFU/Day			
	High	Moderate	Low	No Flow
TMDL Component	>11.1 cfs	11.1 to 1.1 cfs	1.1 to > 0 cfs	0 cfs
LA	4.20E+12	6.35E+09	1.93E+09	
WLA	1.04E+11	1.04E+11	7.40E+09	
MOS	2.85E+11	3.42E+10	6.21E+09	
TMDL	4.59E+12	1.45E+11	1.55E+10	
Current Load	3.53E+13	1.11E+12	5.97E+10	
Load Reduction	90%	99%	90%	

TMDL Component Descriptions

Load Allocation (LA): Remaining Load after deducting WLA and MOS from TMDL.

Waste Load Allocation (WLA): Based on a flow of 6.73 cfs and an *E. coli* concentration of 630 cfu/100ml (chronic standard) to remain consistent with the NPDES/Surface Water Discharge permit for fecal coliform. The WLA for the low flow zone was adjusted to fit the flow range by splitting the flows proportionately between the LA and WLA taking into account the MOS. The resulting flow (0.3 cfs) was multiplied by the chronic standard.

Margin of Safety (MOS): Explicit (see section 7.1 for description).

Total Maximum Daily Load (TMDL): Chronic standard (630 cfu/100ml) multiplied by the 95^{th} percentile flow for zone.

Current Load: The upper level detection concentrations were multiplied by the 95^{th} percentile flow for each zone to calculate the current load.

Load Reduction: Reduction required to reduce the current load to the load at the standard or TMDL. Uncertainties exist with regards to the current load in all flow zones due to restraints associated with concentrations only being reported to the upper level of detection. The reductions were based on those calculated for fecal coliform loads.

6.1 Load Allocations (LAs)

Approximately 90% of the landuse in the watershed is agricultural. A portion of the TMDL load has been allocated to these nonpoint source loads in the following load allocations. Reductions are based on the single sample maximum chronic standard for both bacteria indicators to assure that the limited contact recreation use will be attained for the classified segment of Dawson Creek. A 90% reduction in fecal coliform and *E*.coli bacteria is required from anthropogenic sources (livestock) in the high flow zone to achieve water quality standards. A 95% reduction in fecal coliform and *E. coli* bacteria is required in the moderate flow zone to achieve water quality standards. A 90% reduction in fecal coliform and *E. coli* bacteria is required in the low flow zone to achieve water quality standards. Reducing the highest samples below the chronic standard provides assurance that both acute and chronic standards will be met. Bacteria contributions from the Scotland facility are negligible as described in section 6.2. To achieve the specified reductions primary focus should be placed on reducing bacteria inputs from feedlots and livestock grazing.

6.2 Wasteload Allocations (WLAs)

There are two point sources of pollutants in the Dawson Creek watershed. The WLA for the city of Tripp was not included in the TMDL analysis due the facilities distance (17 miles) from the impaired segment. The City of Scotland's wastewater treatment system is comprised of retention ponds that periodically require a portion of the final pond to be discharged. Discharge from the final pond bypasses Lake Henry and enters below the spillway near the upstream end of the classified reach. The wasteload allocation was set equal to the discharge of the final pond in the system according to the NPDES permit.

The Scotland facility rarely discharges to Dawson Creek during the recreation season as described in Section 3.1. Nonetheless, a wasteload allocation was incorporated into both TMDLs due to the brief discharge (7 day) that can occur during the recreation season. The WLA is rather insignificant in the high flow zone only accounting for approximately 2% of the load capacity for both the fecal coliform and *E. coli* TMDLs. When the hydrology of Dawson Creek is characteristic of the high flow regime and discharge is absent from the Scotland facility, the WLA can be considered solely included as LA in the overall load capacity for both bacteria TMDLs.

The WLA in the moderate flow zone accounts for approximately 72% of the load capacity in both the fecal coliform and *E. coli* TMDLs. The WLA makes up 60% of the flow in the moderate zone. Therefore, if discharge from the Scotland facility were to occur at the permitted flow rate (6.73 cfs) the moderate flow zone would be strongly effluent dominated. Bacteria concentrations from the effluent are likely to be an order of magnitude less than the permit limit allowing for additional NPS load allocation in the overall load capacity. In addition, when flow contribution from the watershed exceeds 4.37 cfs, the hydrology of the stream would shift to the high flow regime portion of the TMDL. When flow in the moderate zone is not effluent driven the WLA can be considered solely included as LA in the overall load capacity for both bacteria TMDLs.

The Scotland facility pond structure provides a mechanism to reduce fecal coliform and *E. coli* bacteria. Bacteria in the ponds are not likely viable for long periods due to extended retention time and resultant exposure to the suns ultraviolet light. This is evident in the bacteria data collected as part of the permit requirements. The max fecal coliform bacteria concentration was 20 fcu/100ml based on discharge events for the most recent ten year period. The relative assumption is that fecal coliform and *E. coli* bacteria contributions from the Scotland facility are minor and not contributing to the impaired segment of Dawson Creek. Emphasis should be placed on reducing bacteria inputs from livestock sources (feedlots and grazing) to bring the recreational use of the classified segment of Dawson Creek into compliance.

7.0 Margin of Safety (MOS) and Seasonality

7.1 Margin of Safety

An explicit MOS 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.

7.2 Seasonality

These TMDLs exclusively address the recreational season which is defined as May 1 through September 30. Eighteen additional bacteria (fecal coliform and *E.coli*) samples were collected outside the recreation season upstream of the classified segment at various locations throughout the three main branches of Dawson Creek. The majority of the samples were collected in March and April. Only one fecal coliform and *E. coli* sample set exceeded the standards. This indicates that Dawson Creek is most vulnerable to elevated bacteria counts during the recreation season. During this time period the creek is most likely to experience higher temperatures (encouraging livestock use of the stream) and peak recreational use of the waters.

8.0 Public Participation

STATE AGENCIES
South Dakota Department of Environment and Natural Resources (SD DENR) was the primary state agency involved in completion of this assessment. SD DENR provided technical support and equipment throughout the course of the project.

FEDERAL AGENCIES
Environmental Protection Agency (EPA) provided the primary source of funds for the completion of the Lower James River Assessment project.

LOCAL GOVERNMENT, INDUSTRY, ENVIRONMENTAL, AND OTHER GROUPS, AND PUBLIC AT LARGE
The primary local sponsor for this project was the James River Water Development District. The district held bi-monthly board meetings in which, short updates on the progress of the assessment project were presented. The updates were followed by a question and answer session for board members and public attendees. TMDL activities in the district were presented and discussed at nearly every meeting since project planning began in 2005.

During the summer sampling seasons, project personnel frequently met with landowners in the field. These meetings were most often initiated by landowners stopping to ask questions while coordinators were engaged in data collection. Although informal in nature, these meetings provide an important medium for obtaining local landowner views and opinions.

This TMDL document was placed on public notice during February 2011 in both the Yankton Daily Press as well as the Scotland Journal. The document was made available on the DENR website and advertised on its home page during the same time period. The only comments received during the notice were from EPA.

9.0 Monitoring Strategy

The Department may adjust the load and/or wasteload allocations in these TMDLs to account for new information or circumstances that are developed or come to light during the implementation of the TMDLs and a review of the new information or circumstances indicate that such adjustments are appropriate. Adjustment of the load and waste load allocations will only be made following an opportunity for public participation. New information generated during 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 these TMDLs within 30 days of their adoption.

An implementation project began in 2009 for the greater Lower James River Watershed which includes the Dawson Creek watershed. This implementation effort will address the fecal coliform and *E. coli* TMDLs for this waterbody. Bacteria sampling will be incorporated into the implementation plan to monitor the effectiveness of BMPs and determine compliance of the classified segment of Dawson Creek following implementation.

10.0 Restoration Strategy

The WLA component of both bacterial TMDLs accounts for a relatively large portion of the overall load capacity, especially in the moderate flow zones. This is a function of the daily allowable wasteload defined in the Scotland facilities NPDES permit. The actual daily pathogen wasteload produced by the Scotland facility is assumed to be orders of magnitude less as described in section 6.2. The majority of the bacterial load capacity for Dawson Creek is expected to be the NPS load allocation.

A digital feedlot layer and bacteria sample data are being used as tools to identify potential sources of bacteria to the classified segment of Dawson Creek. Sample data collected during the project indicated the southern branch of the mainstem and southern most branch to Dawson Creek contribute the highest concentrations of fecal coliform and *E. coli* loading to the downstream impaired segment. Several feedlots suspected to contribute significant bacterial loads were identified in the aforementioned upstream branches of Dawson Creek. At this time, the implementation coordinator has identified three animal feeding operations that are expected to contribute significant bacteria loading to Dawson Creek. The respective landowners have agreed to apply Best Management Practices and all are in varying phases of implementation.

Livestock grazing in the riparian zone was identified as the main source of bacterial loading to the mainstem of Dawson Creek. The implementation coordinator is encouraging select landowners throughout the watershed to enroll in the Conservation Reserve and Enhancement Program (CREP) to protect riparian areas and exclude livestock access to the stream. Placing primary emphasis on reducing bacterial loading from livestock sources (feedlots and grazing) should achieve the reductions required to meet the TMDLs and bring the classified segment of Dawson Creek into compliance.

11.0 Literature Cited

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SDDENR (South Dakota Department of Environment and Natural Resources). 2010. The 2010 South Dakota Integrated Report for Surface Water Quality Assessment Pierre, SD.

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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.01-2006. St. Joseph, Mich.

APPENDIX A

EPA REGION VIII TMDL REVIEW COMMENTS AND DENR RESPONSE TO COMMENTS

EPA REGION VIII TMDL REVIEW

TMDL Document Info:

Document Name:	**Fecal Coliform and *Escherichia* coli Bacteria Total Maximum Daily Load Evaluation for Dawson Creek, Hutchinson and Bon Homme Counties, South Dakota**
Submitted by:	**Cheryl Saunders, SD DENR**
Date Received:	**January 25, 2011**
Review Date:	**February 22, 2011**
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 Dawson Creek fecal coliform and E. coli TMDLs were submitted to EPA for review via an email from Cheryl Saunders, SD DENR on January 25, 2011. The email included the draft TMDL document and a request to review and comment on the TMDL.

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: Dawson Creek is a stream located in Bon Homme and Hutchinson Counties, South Dakota and is part of the larger James River watershed in the Lower James sub-basin (HUC

10160011). The listed segment has a drainage area of approximately 44,768 acres in south eastern South Dakota, and includes approximately 7.3 miles of stream from Lake Henry (near Scotland, SD) to its confluence with the James River (SD-JA-R-DAWSON_01). It is listed as a high priority for TMDL development.

The designated uses for Dawson Creek include warmwater marginal fish life propagation waters, limited-contract recreation waters, irrigation, fish and wildlife propagation, recreation, and stock watering. The segment was listed on the 2010 303(d) list for fecal coliform and E. coli which are impairing the recreational use. The TMDL document and this review, address the both the fecal coliform and E. coli impairments.

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: Dawson Creek is listed as impaired based on fecal coliform and E. coli concentrations that are impairing the limited contact recreation beneficial uses. South Dakota has applicable numeric standards for fecal coliform and E. coli that may be applied to this stream. The fecal coliform numeric standards being implemented in this TMDL are: a single sample maximum value of < 2000 cfu/100 mL and a 30-day geometric mean of < 1000 cfu/100 mL, and the E. coli standards are: 1178 cfu/100 mL in any one sample, and a maximum geometric mean of 630 cfu/100 mL during a 30-day period. Discussion of additional applicable water quality standards for Dawson Creek can be found on pages 8 and 9 of the TMDL.

COMMENTS: Page 8 of the TMDL document mentions the acute fecal coliform and E. coli criteria as: “2000 cfu/100 ml and 630 cfu/100ml, respectively” and the chronic criteria as “1000 cfu/100 ml and 1178 cfu/100ml, respectively.” The TMDL should be revised so that the E. coli acute value is 1178 and the chronic value is 630.

DENR Response to Comment: This statement was revised on page 8 of the TMDL document to indicate that the acute value for *E. coli* is 1,178 and the chronic value is 630.

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 these TMDLs are based on the numeric water quality standards for fecal coliform and E. coli established to protect the limited contact recreation beneficial uses for Dawson Creek. The targets for Dawson Creek included in the TMDL document are the fecal coliform and E. coli standards expressed as the 30-day geometric mean of 1000 cfu/100 mL and 630 cfu/100 mL respectively. The fecal coliform and *E. coli* standards are applicable from May 1 to September 30. While the standards are intended to be expressed as the 30-day geometric mean, the targets were used to compare to values from single grab samples. This ensures that the reductions necessary to achieve the targets will be protective of both the acute (single sample value) and chronic (geometric mean of 5 samples) standards.

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 row crops and small grains (65%), grassland / rangeland (25%), developed (6%), hayland (3%) and water/wetlands or forest land (1%).

The communities of Tripp and Scotland are the primary point source dischargers in the Dawson Creek watershed. Both communities utilize retention pond systems as a mechanism to treat municipal wastewater and are regulated by NPDES discharge permits.

The City of Tripp's wastewater treatment facility produces periodic discharge to an unnamed tributary in the headwaters of the Dawson Creek drainage approximately 17 miles (27 kilometers) upstream of the 303(d) listed segment. SD DENR determined that Tripp's minor discharge would not impact Dawson Creek due to the distance of the discharge from the listed segment. Therefore, Tripp's discharge was not given a WLA for either fecal coliform or E. coli in the Dawson Creek TMDLs.

The City of Scotland's wastewater treatment facility is located just upstream of the listed segment above Lake Henry. The WLA calculation was based on the effluent limits included in the surface water discharge permit, multiplied by the expected flow rate from the facility. The normal operation of this system would typically result in only a portion of the calculated daily amounts actually being discharged, and the discharge flows through Lake Henry prior to entering the impaired segment of Dawson Creek.

E. coli was recently added to SD's water quality standards and is not included in the current surface water discharge permit for Scotland. The WLA for E. coli was calculated by multiplying the chronic standard (630 cfu/100ml) by the allowable flow rate (6.73 cfs) specified in the current WLA for fecal coliform. When the current permit expires, the fecal coliform WLA will be replaced with a WLA for E. coli. The new permit will likely provide an E. coli load of 1.04E+11 cfu/day, which assumes the same flow rate. This load is based on the chronic standard and was used as a reasonable WLA for the E. coli TMDL.

Nonpoint sources of fecal coliform and E. coli bacteria in Dawson Creek come primarily from agricultural sources. Data from the 2009 National Agricultural Statistic Survey (NASS) and from the 2002 South Dakota Game Fish and Parks county wildlife assessment were utilized for livestock and wildlife densities, respectively. Animal density information was used to estimate relative source contributions of bacteria loads as summarized in Table 5 of the TMDL document.

Livestock in the basin are predominantly beef cattle and hogs. Livestock can contribute fecal coliform bacteria directly to the stream by defecating while wading in the stream. They may also contribute by defecating while grazing on rangelands, which then get washed off during precipitation events. Table 4, excerpted from the TMDL document below, allocates the sources for bacteria production in the watershed into three primary categories. Feedlot numbers were calculated as the sum of all dairy, hog, and the NASS estimate of beef in feeding areas. All remaining livestock were assumed to be on grass. The main source of fecal coliform bacteria is likely overland runoff from livestock feedlots or livestock grazing in pastures.

Table 4. Fecal Source Allocation for Dawson Creek

Source	Percentage
Feedlots	62.2%
Livestock on Grass	37.4%
Wildlife	0.4%

The main source of fecal coliform and E. coli bacteria in the Dawson Creek watershed is livestock from a combination of feedlots and grazing. Bacteria migration from feedlots and upland grazing is most likely occurring during major run-off events. Direct use of the stream by livestock is the most likely source of bacteria at low flows.

The wastewater facilities for Tripp and Scotland account for about 1600 of the approximate 2500 people in the watershed. Septic systems are assumed to be the primary human source for the rural population in the watershed. When included in the total load, the remaining population produced fecals accounting for less than 0.5% of all fecal coliform produced in the watershed. These bacteria should all be delivered to a septic system, which if functioning correctly would result in no fecal coliform entering the creek.

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 Dawson Creek TMDL describes how the fecal coliform and E. coli loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segment.

Data on Dawson Creek was collected during the Lower James River watershed assessment. The primary sampling point LOWJIMJRT13 (JRT13) was located three miles upstream of the James River confluence, and one mile downstream of Lake Henry. Several additional fecal coliform and E. coli samples were collected above JRT13 in the three main branches of Dawson Creek to aid in locating potential source areas upstream of the classified reach. This data was used to focus implementation efforts as described in the TMDL document.

Long term gauge data for Dawson Creek did not exist and a suitable surrogate gauge on neighboring streams was also unavailable for the development of a long term flow frequency curve. To develop a representative flow frequency curve, the AnnAGNPS model was utilized. Designed as a runoff model, it makes an appropriate model for a small stream such as Dawson Creek which was primarily influenced by runoff events and has a minimal amount of baseflow.

South Dakota recently adopted E. coli criteria for the protection of recreational uses. Dawson Creek requires an E. coli TMDL because the parameter was listed as a cause of impairment to this stream on the 303(d) list of impaired waterbodies in the 2010 IR. Because the two indicators are closely related, the fecal coliform bacteria TMDL and associated implementation strategy described in the TMDL document is expected to address both the fecal coliform bacteria and E. coli impairments.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDCs were divided into 3 distinct flow regimes – high flow (≥ 11.1 cfs), moderate flow (between 11.1 cfs and 1.1 cfs), and dry flow (< 1.1 cfs). The results are flow-variable TMDL targets across the flow regimes shown in Figures 3 and 4 of the TMDL document. The LDCs are dynamic expressions of the allowable load for any given daily flow. Loading capacities were derived from this approach at the 95^{th} percentile of the observed fecal coliform bacteria load for each flow regime: high flow = 7.28E+12 CFU/day; moderate flow = 2.29E+11 CFU/day; and dry flow = 2.39E+10 CFU/day. For E. coli the loading capacity loads for each flow regime are: high flow = 4.59E+12 CFU/day; moderate flow = 1.45E+11 CFU/day; and dry flow = 1.55E+10 CFU/day.

COMMENTS: See the comment related to reasonable assurance in the Restoration Strategy section below.

DENR Response: Reasonable assurance was addressed in the Restoration Strategy section below.

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 Dawson Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. Data on Dawson Creek was collected during the Lower James River watershed assessment. The primary sampling point LOWJIMJRT13 (JRT13) was located three miles upstream of the James River confluence, and one mile downstream of Lake Henry. A total of twelve samples were available for both fecal coliform and E. coli, from May 1 through September 30, for use in the TMDL analysis. Ten of the twelve fecal coliform samples were above the chronic standard while eight of those exceeded the acute standard. Ten of the twelve E. coli samples were above both the acute and chronic standard.

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: Scotland, South Dakota (permit number SD0022853) is the only municipality within the watershed with a potential to impact the listed segment of Dawson Creek. The City of Scotland's wastewater treatment facility is located above Lake Henry. The outlet of Lake Henry is where the listed segment of Dawson Creek begins. Scotland's wastewater facility is comprised of a series of retention ponds that may periodically require a portion of the final pond to be discharged. Table 3 below includes the information used by SD DENR to calculate a wasteload allocation for the discharge from Scotland's facility. The WLA calculation was based on the effluent limits included in the surface water discharge permit, multiplied by the expected flow rate from the facility. The normal operation of this system would typically result in only a portion of the calculated daily amounts actually being discharged, and the discharge flows through Lake Henry prior to entering the impaired segment of Dawson Creek.

Table 3. Waste Load Allocation for Facilities in the Dawson Creek Drainage

Facility Name	Flow (cfs) used in WLA	30-day Geometric Mean Fecal Coliform Bacteria (cfu/100ml) permit limit	Fecal Coliform WLA (cfu/day)
Tripp			
Scotland	6.73	1000	1.65×10^{11}

Including the WLA in the load duration curve required several factors be taken into account. The maximum fecal coliform waste load for the Scotland system is 1.65E+11 cfu/day. A flow of 6.73 cfs was associated with this waste load allocation. A flow of 6.73 cfs is met or exceeded in Dawson Creek only 16% of the time. Adding this load to the entire flow regime would be a misrepresentation of how this intermittent system functions, essentially suggesting a continuous discharge.

COMMENTS: The WLA for both fecal coliform and E. coli is approximately 72% of the loading capacity at the moderate flow regime as shown in Tables 7 and 8 of the TMDL. This gives the impression that the discharge from the Scotland WWTF is a significant source of pathogen loading to the impaired segment and raises significant issues related to reasonable assurance. We assume that one of the functions of Lake Henry is for flood control, and that the lake has an outlet control structure. Therefore, the flow into the lake may not be the same as the flow out of the lake during times of the year. Further, pathogen concentrations entering the lake may differ significantly from those exiting the lake due to die-off as well as changing air and water temperatures and retention rates in the reservoir. We realize that DENR used the worst case scenario and conservative assumptions to derive the WLA for Scotland's discharge, but the resulting load is likely to be an extreme overestimation. Is there any pathogen data where Dawson Creek enters and exits Lake Henry? Is there any in-lake pathogen data or reported pathogen problems in Lake Henry? Are there alternate default assumptions that could be included in the WLA calculations that could help to present a more realistic estimate of the potential impact of the discharge on the impairment downstream of Lake Henry?

DENR Response to Comment: A descriptive approach was used to explain the actual significance of the Scotland facilities potential wasteload contribution as it relates to the impaired segment and reasonable assurance. Language was added to Section 3.1 to better describe the flow characteristics and bacteria concentrations associated with the Scotland facility. Discharge from the Scotland facility has consistently occurred outside the recreation season for which this TMDL applies. However, a WLA was included in the TMDL for the Scotland facility because discharge can occur in May for an estimated one week period. The maximum fecal coliform concentration reported by the Scotland facility over the past ten years was 20 cfu/100ml.

The WLAs assigned to the moderate flow zone of both bacterial TMDLs were conservatively derived from the allowable loading defined in the Scotland facilities NPDES permit. Nonetheless, low bacterial concentrations as a function of the pond system and intermittent flow characteristics imply that the actual wasteload contributions are expected to be significantly less than the daily end of pipe load defined by the permit. If discharge from the Scotland facility were to occur at the permitted flow rate (6.73 cfs) the moderate flow zone would be effluent dominated. Bacteria concentrations from the effluent are likely to be an order of magnitude less than the permit limit allowing for additional NPS load allocation in the overall load capacity. In addition, when flow contribution from the watershed exceeds 4.37 cfs, the hydrology of the stream would shift to the high flow regime portion of the TMDL. When flow in the moderate zone is not effluent driven (no discharge from WWTF) the WLA can be considered solely included as LA in the overall load capacity for both bacteria TMDLs.

Additional language was added to Sections 6.1 (LAs) and 6.2 (WLAs) to provide a more realistic assessment of the potential impact posed by the Scotland facility on the impaired segment of Dawson Creek. The relative assumption is that fecal coliform and *E.coli* bacteria contributions from the Scotland facility are minor and not contributing to the impairment of the classified segment of Dawson Creek. Emphasis should be placed on reducing bacteria inputs from livestock sources (feedlots and grazing) to bring the recreational use of the classified segment of Dawson Creek into compliance.

Lake Henry is expected to decrease bacterial loading from the mainstem and southern branch of the upper portion of Dawson Creek before it enters the downstream classified segment based on the mechanisms described by EPA. The exception would be high flow events that decrease retention time. However, the final pond in the Scotland facility does not discharge to Lake Henry. Rather, flow is routed or piped downstream of the lake near the upper portion of the classified segment. A sentence was added to the paragraph above Table 2 in Section 3.1 to provide this clarification. As described above, the potential bacterial load at the end of pipe discharge is considered minor and not contributing to the impairment of the classified segment of Dawson Creek.

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 Watershed Characteristics section of the TMDL explains that the landuse in the watershed as predominately agricultural consisting of row crops and small grains (65%), grassland / rangeland (25%), developed (6%), hayland (3%) and water/wetlands or forest land (1%). Nonpoint sources of fecal coliform bacteria in Dawson Creek come primarily from agricultural sources. Livestock in the basin are predominantly beef cattle and hogs. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Tables 7 and 8 include the load allocations for fecal coliform and E. coli for each of the 3 flow regimes shown in the load duration curves.

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 Dawson Creek TMDL includes an explicit MOS derived by calculating the difference between the loading capacity at the mid-point of each of the three flow zones and the loading capacity at the minimum flow in each zone. The explicit MOS values are included in Tables 7 and 8 of the TMDL.

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 and E. coli loads are taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months.

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 general summary agencies involved in development of the TMDL.

COMMENTS: The Public Participation section mentions the parties involved in data collection and TMDL development, but little mention is made of opportunities the general public has had to provide input to the TMDL. Regular public board meetings is mentioned, however more detail regarding the number of meetings, as well as reference to newspaper publication of the public notice, posting on the State’s website and 30-day public comment period should be included in the Public Notice section of the TMDL document.

DENR Response to Comment: Additional language was added to the Public Participation section regarding the public notice period. It was difficult to determine an exact number of meetings that this particular information presented. There have been approximately 30 board meetings held throughout the basin. Nearly every meeting included an update on the TMDL activities in the basin, however some updates did not include information specific to the bacteria TMDL for Dawson Creek. Perhaps the most important, although difficult to quantify, is the public interaction that occurs in the field during the data collection process. Project coordinators visit with local landowners about varying aspects of the project on a daily basis, with many of their concerns and accounts taken into consideration during development of the TMDL.

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 no

npoint 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: The Monitoring Strategy section makes no mention of future monitoring efforts.

Post-implementation monitoring will be necessary to assure the TMDL has been reached and maintenance of the beneficial use occurs.

COMMENTS: We recommend adding a brief description to the TMDL of future monitoring efforts planned for Dawson Creek, perhaps monitoring planned in the watershed as part of the Lower James River implementation project.

DENR Response to Comment: A paragraph was added to the Monitoring Strategy section (9.0) to describe future bacteria monitoring that will be conducted as part of the implementation effort on Dawson Creek. Monitoring data will be used to determine BMP effectiveness and overall compliance of the classified segment of Dawson Creek following implementation. The entire effort will be conducted as part of the greater Lower James River implementation project.

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 Restoration Strategy section of the TMDL document mentions an implementation project that began in 2009 for the greater Lower James River watershed, which includes the Dawson Creek watershed. This implementation effort will address the fecal coliform and E. coli TMDLs for this waterbody. A digital feedlot layer and bacteria sample data are being used as tools to identify potential sources of bacteria to the classified segment of Dawson Creek. The implementation coordinator has identified three animal feeding operations that are expected to contribute significant bacteria loading to Dawson Creek, and the landowners have agreed to apply best management practices. The implementation coordinator is also encouraging select landowners in the watershed to enroll in the Conservation Reserve and Enhancement Program (CREP) to protect riparian areas and exclude livestock access to the stream.

COMMENTS: We recommend including a brief discussion of reasonable assurance in all TMDLs that involve both point and nonpoint sources. In this case the WLA for Scotland's discharge seems to be a significant contribution of the loading during most flow conditions. If the permit includes end of pipe limits equal to the chronic water quality standard, and if the WLA is an insignificant portion of the loading capacity, then those facts can be added to the reasonable assurance discussion. Also, the pathogen implementation project that is underway should be explained in the context of reasonable assurance in the TMDL.

DENR Response to Comment: Language was added to section 10.0 (Restoration Strategy) to describe that the assigned WLAs were based on permit limits and that the actual daily wasteload from the Scotland facility is minor in comparison. The majority of the load capacity for the fecal coliform and *E.coli* TMDL is expected to be NPS load allocation. Language was also added to describe the assessments role in identifying upstream NPS bacterial loading to the impaired segment of Dawson Creek. It was also indicated that the implementation strategy is tailored towards reducing NPS bacterial loading associated with livestock activities (feedlot and grazing), which provides reasonable assurance the TMDL can be achieved.

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 Dawson Creek fecal coliform TMDL includes daily loads expressed as cfu/day. The daily TMDL loads are included in TMDL and Allocations section of the TMDL document.

COMMENTS: None.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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RECEIVED
JUN 7 2011
DEPT. OF ENVIRONMENT AND NATURAL RESOURCES, SECRETARY'S OFFICE

Ref: 8EPR-EP

JUN 2 2011

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

Re: TMDL Approvals
Dawson Creek; Fecal Coliform, E. coli;
SD-JA-R-DAWSON_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

Fecal Coliform and Escherichia Coli Bacteria Total Maximum Daily Load Evaluations for Dawson Creek, Hutchinson and Bon Homme Counties, South Dakota (SD DENR, January 2011)

Submitted: 4/27/2011

2	Pollutant TMDLs completed.
2	Causes addressed from the 2010 303(d) list.
0	Determinations that no pollutant TMDL needed.

Segment: Dawson Creek from James River confluence to Lake Henry

303(d) ID: SD-JA-R-DAWSON_01

Parameter/Pollutant (303(d) list cause): E. COLI - 227

Water Quality Targets: <= 630 cfu/100 mL geometric mean concentration; <= 1178 cfu/100 mL single sample maximum

Allocation*	Value	Units	Permits
WLA	1.04E+11	CFU/DAY	SD0022853
TMDL	1.45E+11	CFU/DAY	
MOS	3.42E+10	CFU/DAY	
LA	6.35E+09	CFU/DAY	

Notes: The loads shown represent the loads during the moderate flow regime as defined by the load duration curve for Dawson Creek (see Figure 4 of the TMDL). The moderate range flows are when significant differences occur between the existing loads and the target loads, and represent the flow regime that is most likely to be targeted for BMP implementation.

Parameter/Pollutant (303(d) list cause): FECAL COLIFORM - 259

Water Quality Targets: <= 1000 cfu/100 mL geometric mean concentration; <= 2000 cfu/100 mL single sample maximum

Allocation*	Value	Units	Permits
LA	1.02E+10	CFU/DAY	
WLA	1.65E+11	CFU/DAY	SD0022853
TMDL	2.29E+11	CFU/DAY	
MOS	5.43E+10	CFU/DAY	

Notes: The loads shown represent the loads during the moderate flow regime as defined by the load duration curve for Dawson Creek (see Figure 3 of the TMDL). The moderate range flows are when significant differences occur between the existing loads and the target loads, and represent the flow regime that is most likely to be targeted for BMP implementation.

* LA = Load Allocation, WLA = Wasteload Allocation, MOS = Margin of Safety, TMDL = sum(WLAs) + sum(LAs) + MOS

ENCLOSURE 2

EPA REGION VIII TMDL REVIEW

TMDL Document Info:

Document Name:	**Fecal Coliform and *Escherichia* coli Bacteria Total Maximum Daily Load Evaluation for Dawson Creek, Hutchinson and Bon Homme Counties, South Dakota**
Submitted by:	**Cheryl Saunders, SD DENR**
Date Received:	**April 27, 2011**
Review Date:	**May 31, 2011**
Reviewer:	**Vern Berry, EPA**
Rough Draft / Public Notice / Final?	**Final**
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 Dawson Creek fecal coliform and E. coli TMDLs were submitted to EPA for review and approval via an email from Cheryl Saunders, SD DENR on April 27, 2011. The email included the final TMDL document and a letter requesting approval of the TMDL.

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: Dawson Creek is a stream located in Bon Homme and Hutchinson Counties, South Dakota and is part of the larger James River watershed in the Lower James sub-basin (HUC 10160011). The listed segment has a drainage area of approximately 44,768 acres in south eastern South Dakota, and includes approximately 7.3 miles of stream from Lake Henry (near Scotland, SD) to its confluence with the James River (SD-JA-R-DAWSON_01). It is listed as a high priority for TMDL development.

The designated uses for Dawson Creek include warmwater marginal fish life propagation waters, limited-contact recreation waters, irrigation, fish and wildlife propagation, recreation, and stock watering. The segment was listed on the 2010 303(d) list for fecal coliform and E. coli which are impairing the recreational use. The TMDL document and this review, address the both the fecal coliform and E. coli impairments.

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, <u>all TMDL documents must be written to meet the existing water quality standards</u> 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: Dawson Creek is listed as impaired based on fecal coliform and E. coli concentrations that are impairing the limited contact recreation beneficial uses. South Dakota has applicable numeric standards for fecal coliform and E. coli that may be applied to this stream. The fecal coliform numeric standards being implemented in this TMDL are: a single sample maximum value of < 2000 cfu/100 mL and a 30-day geometric mean of < 1000 cfu/100 mL, and the E. coli standards are: 1178 cfu/100 mL in any one sample, and a maximum geometric mean of 630 cfu/100 mL during a 30-day period. Discussion of additional applicable water quality standards for Dawson Creek can be found on pages 8 and 9 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 these TMDLs are based on the numeric water quality standards for fecal coliform and E. coli established to protect the limited contact recreation beneficial uses for Dawson Creek. The targets for Dawson Creek included in the TMDL document are the fecal coliform and E. coli standards expressed as the 30-day geometric mean of 1000 cfu/100 mL and 630 cfu/100 mL respectively. The fecal coliform and *E. coli* standards are applicable from May 1 to September 30. While the standards are intended to be expressed as the 30-day geometric mean, the targets were used to compare to values from single grab samples. This ensures that the reductions necessary to achieve the targets will be protective of both the acute (single sample value) and chronic (geometric mean of 5 samples) standards.

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 row crops and small grains (65%), grassland / rangeland (25%), developed (6%), hayland (3%) and water/wetlands or forest land (1%).

The communities of Tripp and Scotland are the primary point source dischargers in the Dawson Creek watershed. Both communities utilize retention pond systems as a mechanism to treat municipal wastewater and are regulated by NPDES discharge permits.

The City of Tripp's wastewater treatment facility produces periodic discharge to an unnamed tributary in the headwaters of the Dawson Creek drainage approximately 17 miles (27 kilometers) upstream of the 303(d) listed segment. SD DENR determined that Tripp's minor discharge would not impact Dawson Creek due to the distance of the discharge from the listed segment. Therefore, Tripp's discharge was not given a WLA for either fecal coliform or E. coli in the Dawson Creek TMDLs.

The City of Scotland's wastewater treatment facility is located just upstream of the listed segment above Lake Henry. The WLA calculation was based on the effluent limits included in the surface water discharge permit, multiplied by the expected flow rate from the facility. The normal operation of this system would typically result in only a portion of the calculated daily amounts actually being discharged.

E. coli was recently added to SD's water quality standards and is not included in the current surface water discharge permit for Scotland. The WLA for E. coli was calculated by multiplying the chronic standard (630 cfu/100ml) by the allowable flow rate (6.73 cfs) specified in the current WLA for fecal coliform. When the current permit expires, the fecal coliform WLA will be replaced with a WLA for E. coli. The new permit will likely provide an E. coli load of 1.04E+11 cfu/day, which assumes the same flow rate. This load is based on the chronic standard and was used as a reasonable WLA for the E. coli TMDL.

Nonpoint sources of fecal coliform and E. coli bacteria in Dawson Creek come primarily from agricultural sources. Data from the 2009 National Agricultural Statistic Survey (NASS) and from the 2002 South Dakota Game Fish and Parks county wildlife assessment were utilized for livestock and wildlife densities, respectively. Animal density information was used to estimate relative source contributions of bacteria loads as summarized in Table 5 of the TMDL document.

Livestock in the basin are predominantly beef cattle and hogs. Livestock can contribute fecal coliform bacteria directly to the stream by defecating while wading in the stream. They may also contribute by defecating while grazing on rangelands, which then get washed off during precipitation events. Table 4, excerpted from the TMDL document below, allocates the sources for bacteria production in the watershed into three primary categories. Feedlot numbers were calculated as the sum of all dairy, hog, and the NASS estimate of beef in feeding areas. All remaining livestock were assumed to be on grass. The main source of fecal coliform bacteria is likely overland runoff from livestock feedlots or livestock grazing in pastures.

Table 4. Fecal Source Allocation for Dawson Creek

Source	Percentage
Feedlots	62.2%
Livestock on Grass	37.4%
Wildlife	0.4%

The main source of fecal coliform and E. coli bacteria in the Dawson Creek watershed is livestock from a combination of feedlots and grazing. Bacteria migration from feedlots and upland grazing is most likely occurring during major run-off events. Direct use of the stream by livestock is the most likely source of bacteria at low flows.

The wastewater facilities for Tripp and Scotland account for about 1600 of the approximate 2500 people in the watershed. Septic systems are assumed to be the primary human source for the rural population in the watershed. When included in the total load, the remaining population produced fecals accounting for less than 0.5% of all fecal coliform produced in the watershed. These bacteria should all be delivered to a septic system, which if functioning correctly would result in no fecal coliform entering the creek.

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 Dawson Creek TMDL describes how the fecal coliform and E. coli loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segment.

Data on Dawson Creek was collected during the Lower James River watershed assessment. The primary sampling point LOWJIMJRT13 (JRT13) was located three miles upstream of the James River confluence, and one mile downstream of Lake Henry. Several additional fecal coliform and E. coli samples were collected above JRT13 in the three main branches of Dawson Creek to aid in locating potential source areas upstream of the classified reach. This data was used to focus implementation efforts as described in the TMDL document.

Long term gauge data for Dawson Creek did not exist and a suitable surrogate gauge on neighboring streams was also unavailable for the development of a long term flow frequency curve. To develop a representative flow frequency curve, the AnnAGNPS model was utilized. Designed as a runoff model, it makes an appropriate model for a small stream such as Dawson Creek which was primarily influenced by runoff events and has a minimal amount of baseflow.

South Dakota recently adopted E. coli criteria for the protection of recreational uses. Dawson Creek requires an E. coli TMDL because the parameter was listed as a cause of impairment to this stream on the 303(d) list of impaired waterbodies in the 2010 IR. Because the two indicators are closely related, the fecal coliform bacteria TMDL and associated implementation strategy described in the TMDL document is expected to address both the fecal coliform bacteria and E. coli impairments.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDCs were divided into 3 distinct flow regimes – high flow ($\geq$ 11.1 cfs), moderate flow (between 11.1 cfs and 1.1 cfs), and dry flow (< 1.1 cfs). The results are flow-variable TMDL targets across the flow regimes shown in Figures 3 and 4 of the TMDL document. The LDCs are dynamic expressions of the allowable load for any given daily flow. Loading capacities were derived from this approach at the 95th percentile of the observed fecal coliform bacteria load for each flow regime: high flow = 7.28E+12 CFU/day; moderate flow

= 2.29E+11 CFU/day; and dry flow = 2.39E+10 CFU/day. For E. coli the loading capacity loads for each flow regime are: high flow = 4.59E+12 CFU/day; moderate flow = 1.45E+11 CFU/day; and dry flow = 1.55E+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 Dawson Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. Data on Dawson Creek was collected during the Lower James River watershed assessment. The primary sampling point LOWJIMJRT13 (JRT13) was located three miles upstream of the James River confluence, and one mile downstream of Lake Henry. A total of twelve samples were available for both fecal coliform and E. coli, from May 1 through September 30, for use in the TMDL analysis. Ten of the twelve fecal coliform samples were above the chronic standard while eight of those exceeded the acute standard. Ten of the twelve E. coli samples were above both the acute and chronic standard.

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: Scotland, South Dakota (permit number SD0022853) is the only municipality within the watershed with a potential to impact the listed segment of Dawson Creek. The City of Scotland's wastewater treatment facility is located above Lake Henry. The facility structure is comprised of a series of retention ponds that may periodically require a portion of the final pond to be discharged. Discharge from the Scotland facility bypasses Lake Henry and enters Dawson Creek just downstream of the outlet or start of the classified segment. Table 3 below includes the information used by SD DENR to calculate a wasteload allocation for the discharge from Scotland's facility. The WLA calculation was based on the effluent limits included in the surface water discharge permit, multiplied by the expected flow rate from the facility. The normal operation of this system would typically result in only a portion of the calculated daily amounts actually being discharged. All discharges are required to meet the chronic water quality thresholds for Dawson Creek

Table 3. Waste Load Allocation for Facilities in the Dawson Creek Drainage

Facility Name	Flow (cfs) used in WLA	30-day Geometric Mean Fecal Coliform Bacteria (cfu/100ml) permit limit	Fecal Coliform WLA (cfu/day)
Tripp			
Scotland	6.73	1000	1.65×10^{11}

The Scotland facility only discharges twice per year, once in the spring (April or May) and again in the fall. The fall discharge events have consistently occurred in November which is outside the recreation season for which this TMDL applies. Furthermore, the majority of the spring discharge events, over the past 10 years, have occurred in April rather than May. The duration of a discharge event is estimated at one week. This suggests that the Scotland facility only discharges occasionally for one week during the recreation season. The Scotland facility is required to collect fecal coliform samples during discharge events as part of their NPDES permit. The maximum fecal coliform concentration reported by the Scotland facility over the past ten years was 20 cfu/100ml. This information suggests that the bacterial wasteload contributed by the Scotland facility is insignificant and not contributing to the impairment of the classified segment of Dawson Creek. *E.coli* was recently added to the water quality standards and is not included in the current surface water discharge permit. When the current permit expires, the fecal coliform WLA will be replaced with a WLA for *E. coli*.

Including the WLA in the load duration curve required several factors be taken into account. The maximum fecal coliform waste load for the Scotland system is 1.65E+11 cfu/day. A flow of 6.73 cfs was associated with this waste load allocation. A flow of 6.73 cfs is met or exceeded in Dawson Creek only 16% of the time. Adding this load to the entire flow regime would be a misrepresentation of how this intermittent system functions, essentially suggesting a continuous discharge.

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: The Watershed Characteristics section of the TMDL explains that the landuse in the watershed as predominately agricultural consisting of row crops and small grains (65%), grassland / rangeland (25%), developed (6%), hayland (3%) and water/wetlands or forest land (1%). Nonpoint sources of fecal coliform bacteria in Dawson Creek come primarily from agricultural sources. Livestock in the basin are predominantly beef cattle and hogs. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Tables 7 and 8 include the load allocations for fecal coliform and E. coli for each of the 3 flow regimes shown in the load duration curves.

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 Dawson Creek TMDL includes an explicit MOS derived by calculating the difference between the loading capacity at the mid-point of each of the three flow zones and the loading capacity at the minimum flow in each zone. The explicit MOS values are included in Tables 7 and 8 of the TMDL.

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 and E. coli loads are taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months.

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 Public Participation section of the TMDL document describes the public participation process that has occurred during the development of the TMDL. In particular, the State has encouraged participation through public meetings in the watershed, and a website was developed and maintained throughout the project. The TMDL was 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: The Monitoring Strategy section mentions that an implementation project began in 2009 for the greater lower James River watershed which includes the Dawson Creek watershed. Bacteria sampling will be incorporated into the implementation plan to monitor the effectiveness of BMPs and determine compliance of the classified segment of Dawson Creek following implementation.

Post-implementation monitoring will be necessary to assure the TMDL has been reached and maintenance of the beneficial use occurs.

COMMENTS: None.

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 Restoration Strategy section of the TMDL document mentions an implementation project that began in 2009 for the greater Lower James River watershed, which includes the Dawson Creek watershed. This implementation effort will address the fecal coliform and E. coli TMDLs for this waterbody. A digital feedlot layer and bacteria sample data are being used as tools to identify potential sources of bacteria to the classified segment of Dawson Creek. The implementation coordinator has identified three animal feeding operations that are expected to contribute significant bacteria loading to Dawson Creek, and the landowners have agreed to apply best management practices. The implementation coordinator is also encouraging select landowners in the watershed to enroll in the Conservation Reserve and Enhancement Program (CREP) to protect riparian areas and exclude livestock access to the stream. These nonpoint source implementation efforts combined with the detailed explanation of the point source controls and estimated wasteload contribution included in Sections 3.1 and 6.2 provide the necessary assurances that the TMDL loads will be met.

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 Dawson Creek fecal coliform TMDL includes daily loads expressed as cfu/day. The daily TMDL loads are included in TMDL and Allocations section of the TMDL document.

COMMENTS: None.