

**FECAL COLIFORM BACTERIA TOTAL  
MAXIMUM DAILY LOAD EVALUATION FOR  
WEST STRAWBERRY CREEK, LAWRENCE  
COUNTY, SOUTH DAKOTA**

South Dakota Department of  
Environment and Natural Resources



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

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## Total Maximum Daily Load Summary Table

### West Strawberry Creek Total Maximum Daily Load

<b>Entity ID:</b>	SD-BF-R-W_Strawberry_01
<b>Location:</b>	HUC Code: 101202020207
<b>Size of Watershed:</b>	2,945 acres
<b>Water body Type:</b>	River/Stream
<b>303(d) Listing Parameter:</b>	Fecal Coliform Bacteria
<b>Initial Listing date:</b>	2008 IR
<b>TMDL Priority Ranking:</b>	2
<b>Listed Stream Miles:</b>	4.191 Km from headwaters to confluence with Whitewood Creek
<b>Designated Use of Concern:</b>	Limited Contact Recreation
<b>Analytical Approach:</b>	Load Duration Curve Framework
<b>Target:</b>	Meet applicable water quality standards 74:51:01:55
<b>Indicators:</b>	Fecal Coliform Bacteria Counts
<b>Threshold Value:</b>	< 1000 colonies/100 ml geometric mean concentration with maximum single sample concentrations of <2000 colonies/100 ml
<b>High Flow Zone LA:</b>	$9.12 \times 10^{11}$ Colonies/ Day
<b>High Flow Zone MOS:</b>	$1.42 \times 10^{11}$ Colonies/ Day
<b>High Flow Zone TMDL:</b>	$1.05 \times 10^{12}$ Colonies/ Day

## 1.0 Introduction

The intent of this document is to clearly identify the components of the TMDL submittal to support adequate public participation and facilitate the United States Environmental Protection Agency (EPA) review and approval. The TMDL was developed in accordance with Section 303(d) of the federal Clean Water Act and guidance developed by EPA. This TMDL document addresses the fecal coliform bacteria impairment of West Strawberry Creek from its headwaters to its confluence with Whitewood Creek near Deadwood, SD, SD-BF-R-W\_Strawberry\_01.

### 1.1 Watershed Characteristics

West Strawberry Creek is part of the Upper Whitewood Creek watershed, which drains approximately 44,756 acres of land in South Dakota's Black Hills. The Upper Whitewood Creek watershed is part of the Belle Fourche River basin which drains into the Cheyenne River. The 303(d) listed segment that this TMDL addresses drains approximately 2,945 acres of land in Lawrence County in western South Dakota (Figure 1).

The communities of Lead and Deadwood intersect the northern portion of the listed segments drainage. These communities do not discharge their waste into West Strawberry Creek; therefore there is no need for WLAs. There are approximately 39 residential homes in the watershed. Of the 39, 30 use city sewage and water. The remaining nine homes use septic systems for waste removal. Based on the 2010 census the average household contains 2.59 people, therefore, the watershed has an approximate population of 101 people. About 78 of the 101 people in the watershed are accounted for in the city sewage removal system. The remaining 23 people rely on septic systems for removal of their waste.

The watershed climate is characterized by summers ranging from warm to hot with temperatures occasionally reaching 100°F or greater and cold winters with temperatures dipping down below 0°F. Annual precipitation averages around 28.33 inches with 70% of it falling during the growing season, April through September. The average annual snowfall total is 106.8 inches (<http://www.hprcc.unl.edu/>).

The dominant soil associations located in the West Strawberry Creek drainage include the Buska-Rock outcrop complex, Vanocker-Citadel complex and the Grizzly-Virkula complex (<http://soildatamart.nrcs.usda.gov/>). Most areas in these associations have large populations of ponderosa pines. All of these soil associations pose severe limitations for building sites, sanitary facilities, septic tank absorption fields and roads due to shallow bedrock, steep grades and high shrink swell. The Buska-Virkula and Buska-Rock outcrop complexes also exist to a minor extent in the West Strawberry Creek drainage (<http://soildatamart.nrcs.usda.gov/>). These soil associations may not be dominant within the West Strawberry Creek drainage, however, they are the highest populated among the associations.

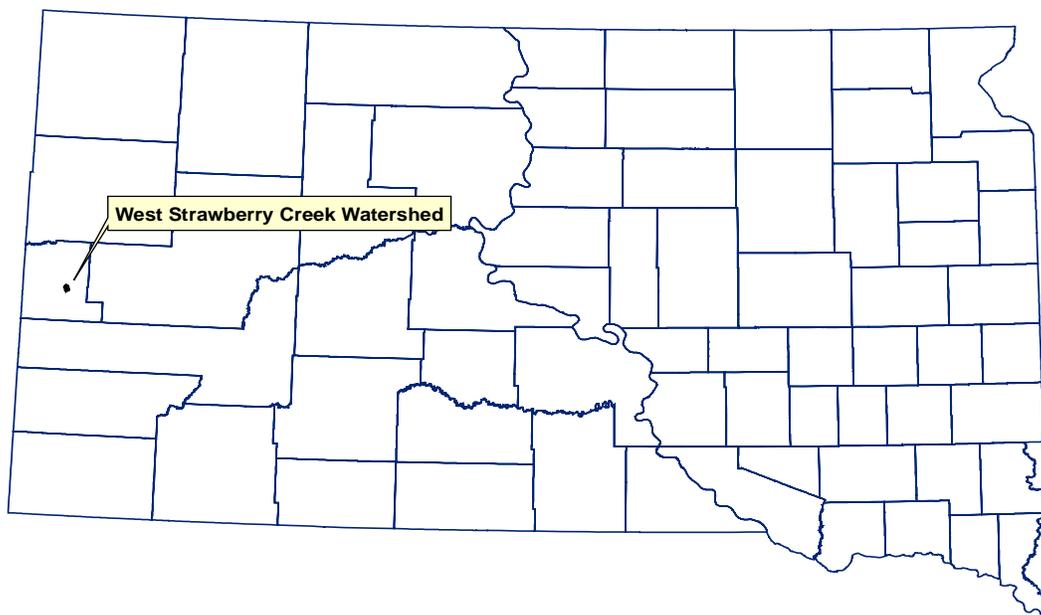
The soil associations: Buska-Rock outcrop complex (10-40% slopes), Grizzly Virkula complex (10-40% slopes), Buska-Rock outcrop complex (40-80% slopes) and the Vanocker-Citadel complex (20-60% slopes) all consistently show a very limited suitability to septic system absorption fields as well as dwellings without basements and roads. Whereas, the Buska-Virkula complex shows a somewhat limited suitability septic

system absorption fields as well as dwellings without basements and roads (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>).

Land use in the watershed is predominately forested in nature. Major land use categories are 75.1% forested, 16.8% herbaceous, 6.1% water, 1% urban, and 0.9% open space.

West Strawberry Creek is sampled quarterly at site 460675 (WQM75) as a part of the Ambient Surface Water Quality Monitoring project, which maintains an extensive surface water quality monitoring network throughout South Dakota. West Strawberry Creek was also sampled during the Belle Fourche Watershed Assessment (BELLEF01).

Segment SD-BF-R-W\_Strawberry\_01 was listed for temperature and fecal coliform in the 2008 Integrated Report (SDDENR, 2008). The 2010 Integrated Report removed the temperature listing from this segment requiring that a TMDL only be completed for bacteria. Any other future listings will be evaluated in separate TMDL document(s).



**Figure 1. Location of West Strawberry Creek Watershed**

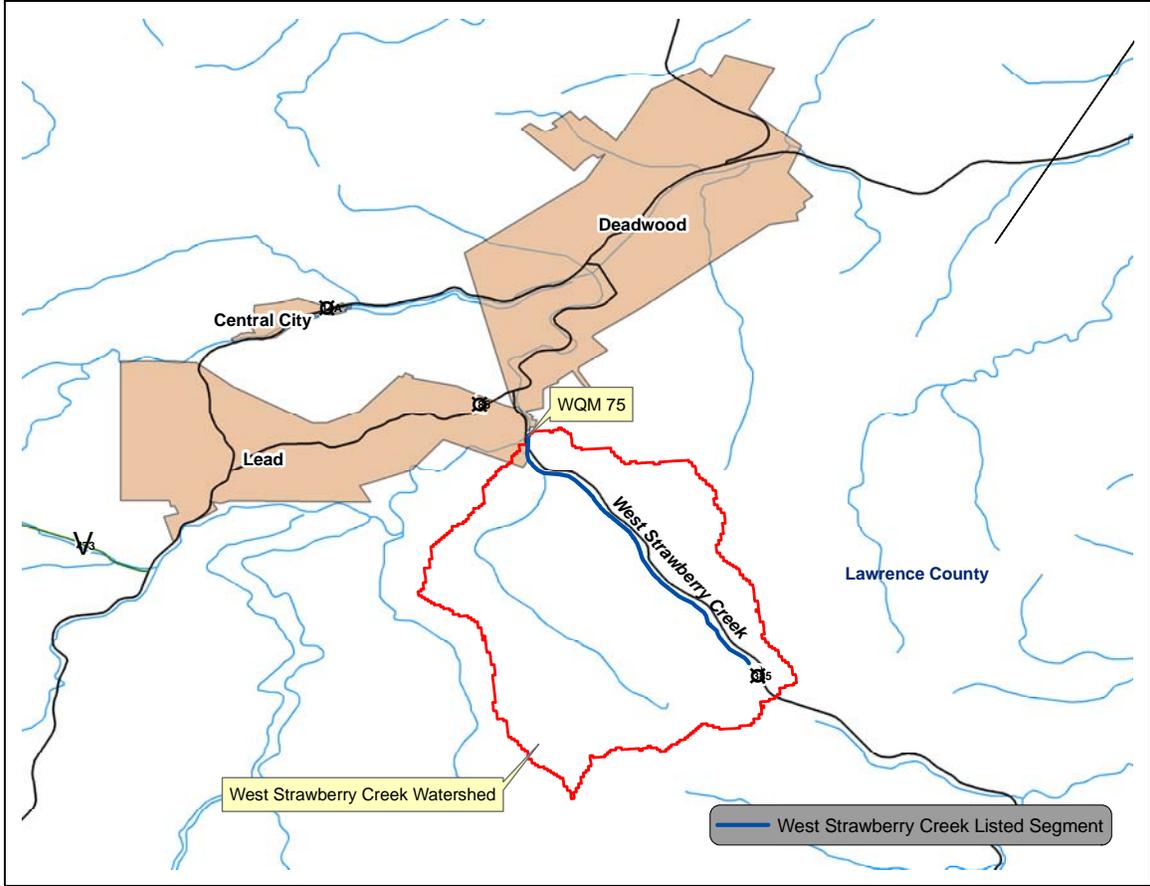


Figure 2. West Strawberry Creek Watershed

## 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 beneficial use analysis of each waterbody. Water quality standards have been defined in South Dakota state statutes in support of these uses. These standards consist of suites of 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 Water Quality Report (IR) 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; and 09”. These contain language that generally prohibits the presence of materials causing pollutants to form, visible pollutants, and nuisance aquatic life.

West Strawberry Creek from its headwaters downstream to its confluence with Whitewood Creek has been assigned the beneficial uses of: coldwater permanent fish life propagation; irrigation waters; limited contact recreation; and fish and wildlife propagation, recreation, and stock watering. Table 1 lists the criteria that must be met to support the specified beneficial uses. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

The numeric TMDL target established for West Strawberry Creek is 1000 cfu/100 ml, which is based on the chronic standard for fecal coliform. The fecal coliform criteria for the limited contact recreation beneficial use requires that 1) no sample exceeds 2000 cfu/100 ml and 2) during a 30-day period, the geometric mean of a minimum of 5 samples collected during separate 24-hour periods must not exceed 1000 cfu/100 ml. These criteria are applicable from May 1 through September 30.

South Dakota has recently adopted *Escherichia coli* criteria for the protection of the limited contact and immersion recreation uses. However, West Strawberry Creek does not require an *E. coli* TMDL because the parameter is not currently listed as a cause of impairment to this stream. Because the two indicators are closely related, the fecal coliform bacteria TMDL and associated implementation strategy described in this document are expected to address both the fecal coliform bacteria and possible future *E. coli* impairments. If a TMDL must be established for *E. coli* in the future, a separate TMDL document will be developed for this parameter.

Table 1. State Water Quality Standards for West Strawberry Creek

Parameters	Criteria	Unit of Measure	Beneficial Use Requiring this Standard
Total ammonia nitrogen as N	Equal to or less than the result from Equation 3 in Appendix A of Surface Water Quality Standards	mg/L	Coldwater Permanent Fish Propagation
		30 day average	
	Equal to or less than the result from Equation 1 in Appendix A of Surface Water Quality Standards	mg/L	
		daily maximum	
Chlorides	$\leq 100$	mg/L	Coldwater Permanent Fish Propagation
	$\leq 175$	mg/L	
Dissolved Oxygen	$> 6.5$	mg/L	Coldwater Permanent Fish Propagation
	$\geq 9.5$	mg/L	
	$\geq 5.0$	mg/L	
	$\geq 8.0$	mg/L	
Undissociated H <sub>2</sub> S	$\leq 0.002$	mg/L	Coldwater Permanent Fish Propagation
pH	$\geq 6.5 - \leq 9.0$	units	Coldwater Permanent Fish Propagation
Total Suspended Solids	$\leq 30$	mg/L	Coldwater Permanent Fish Propagation
	$< 53$	mg/L	
Temperature	$< 18.9$	$^{\circ}\text{C}$	Coldwater Permanent Fish Propagation
		maximum weekly average temperature	
	$< 23.9$	$^{\circ}\text{C}$	
		daily maximum	
Fecal Coliform Bacteria (May 1- Sept 30)	$\leq 1000$ (geometric mean) $\leq 2000$ (single sample)	count/100 mL	Limited Contact Recreation
<i>Escherichia coli</i> Bacteria (May 1- Sept 30)	$\leq 630$ (geometric mean) $\leq 1178$ (single sample)	count/100 mL	Limited Contact Recreation
Alkalinity (CaCO <sub>3</sub> )	$\leq 750$ (mean) $\leq 1,313$ (single sample)	mg/L	Fish and Wildlife Propagation and Stock Watering
Nitrogen, nitrate as N	$\leq 50$ (mean) $\leq 88$ (single sample)	mg/L	Fish and Wildlife Propagation and Stock Watering
Solids, total dissolved	$\leq 2,500$ (mean) $\leq 4,375$ (single sample)	mg/L	Fish and Wildlife Propagation and Stock Watering
Total Petroleum Hydrocarbon	$\leq 10$	mg/L	Fish and Wildlife Propagation and Stock Watering
Oil and Grease	$\leq 10$		
Conductivity	$\leq 2,500$ (mean) $\leq 4,375$ (single sample)	$\mu\text{mhos/cm}$	Irrigation Waters
		@ 25 $^{\circ}\text{C}$	
Sodium Adsorption Ratio	$< 10$	ratio	Irrigation Waters

## 3.0 Significant Sources

### 3.1 Point Sources

#### Wasteload Allocations (WLAs)

Homestake Mining Company has a “Minor Industrial Permit” (SD-0025933) that allows discharges to Grizzly Gulch, which flows into West Strawberry Creek. The permit does not include fecal coliform bacteria. Therefore, the “wasteload allocation” component of this TMDL is considered a zero value. The TMDLs are completely included within the “load allocation” component.

### 3.2 Nonpoint Sources

Nonpoint sources of fecal coliform bacteria in West Strawberry Creek come primarily from wildlife sources. Data from the 2009 National Agricultural Statistic Survey (NASS) and from the 2002 South Dakota Game Fish and Parks Department’s county wildlife assessments were utilized for livestock and wildlife densities, respectively. Animal density information was used to estimate relative source contributions of bacteria loads.

#### 3.2.1 Agriculture

Manure from livestock is a potential source of fecal coliform to the stream. However, there are no visible indications of livestock in the watershed according to aerial photographs and personnel in charge of monitoring the ambient water quality site. There are also no agricultural practices in the watershed.

#### 3.2.2 Human

The number of people in the watershed was an estimate based on the number of homes within the watershed multiplied by 2010 census mean number of people per household. When calculated there are approximately 101 people living in 39 homes within this watershed. However, 30 of these homes are within a housing development on the south east end of Lead, SD. These homes use the Lead wastewater and water systems therefore these homes should not be a source of fecal coliform within the watershed. The remaining 9 homes, which account for roughly 23 people, are located sporadically in the southern end of the watershed. It is assumed these homes use septic systems to remove wastewater.

Human fecal production may be estimated at  $1.95E+9$  (Yagow et al. 2001). When included as a total load in the table, the remaining population produced fecals accounting for nearly 43% 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. There have been no complaints registered with the SD DENR regarding septic systems during the years the violations occurred. However, septic systems in the black hills can be problematic due to the shallowness of the bedrock and the slow permeability of the soils.

### 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.

**Table 2. West Strawberry Nonpoint Sources**

Species	#/sq mile	#/acre	#/Watershed	FC/Animal/Day	Fecal Coliform	Percent
Humans <sub>7</sub>	2.73E+01	4.26E-02	23.00**	1.95E+09	4.49E+10	43%
Beef	0	0	0	3.90E+10	0	0%
Bison <sub>1</sub>	0	0	0	4.46E+10	0	0%
Sheep	0	0	0	1.96E+10	0	0%
Horse	0	0	0	5.15E+10	0	0%
All Wildlife	Sum of all Wildlife				5.84E+10	57%
Turkey (Wild) <sub>2</sub>	1.12E+01	1.76E-02	51.75	1.10E+08	5.69E+09	
Deer <sub>4</sub>	1.62E+01	2.54E-02	74.74	3.47E+08	2.59E+10	
Raccoon <sub>4</sub>	1.50E+00	2.34E-03	6.90	2.50E+08	1.72E+09	
Beaver <sub>4</sub>	7.50E-01	1.17E-03	3.45	2.00E+05	6.90E+05	
Ruffed Grouse <sub>3</sub>	1.62E+00	2.54E-03	7.47	1.40E+08	1.05E+09	
Sharptail grouse <sub>3</sub>	1.25E+00	1.95E-03	5.75	1.40E+08	8.05E+08	
Skunk <sub>6</sub>	2.50E+00	3.91E-03	11.50	2.50E+08	2.87E+09	
Coyote/Fox <sub>5</sub>	1.25E+00	1.95E-03	5.75	1.75E+09	1.01E+10	
Cottontail <sub>6</sub>	7.50E+00	1.17E-02	34.50	2.50E+08	8.62E+09	
Squirrel <sub>6</sub>	8.75E-01	1.37E-03	4.02	2.50E+08	1.01E+09	
Mink <sub>6</sub>	5.62E-01	8.79E-04	2.59	2.50E+08	6.47E+08	

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

7 Human fecal production may be estimated at 1.95E+9 (Yagow et al. 2001)

\*\* Estimated number of humans using septic systems in watershed

## 4.0 Technical Analysis

### 4.1 Data Collection Method

Data on West Strawberry Creek were collected during the Belle Fourche Watershed Assessment (BELLEF01) from one sampling point located approximately 200 meters from the mouth of West Strawberry Creek. This site was identified as site BELLESTRAW. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site 460675 (WQM 75) which was located at the mouth of West Strawberry Creek. There was no flow data for West Strawberry Creek, so it was supplemented with flow data taken from three United States Geological Survey (USGS) stations, Whitewood Creek at Deadwood, SD (06436170), Whitewood Creek above Whitewood, SD (06436180), and Whitetail Creek at Lead, SD (06436156).

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

Flow data for West Strawberry Creek was calculated through comparisons to Whitewood and Whitetail Creeks. Whitewood Creek is the receiving water for discharges from West Strawberry and Whitetail Creeks and has a long term gauge record maintained by the USGS (06436180). Whitetail Creek (06436156) is a small tributary to Whitewood Creek that is similar in geology, soils, size, and is located less than one mile from the West Strawberry Creek Watershed. Whitetail Creek is an appropriate surrogate for the West Strawberry Creek Watershed because of its similarities. The Whitetail Creek gauge record was shorter than desired for the generation of an accurate flow frequency curve. To lengthen the record, Whitewood and Whitetail Creeks were modeled with the Aquarius Modeling Tool creating a long term flow frequency with less than 10% error.

The final flow data set provided nearly 30 years of water quantity data (Figure 3). This data set provided the basis for a load duration curve that accurately represents the West Strawberry Creek flow frequencies. Water quality data from the Belle Fourche Watershed Assessment (BELLEF01) as well as SDDENR ambient water quality monitoring were utilized in the development of this TMDL. Sites BELLESTRAW and 460675 (WQM 75) were both located at the same point on the creek.

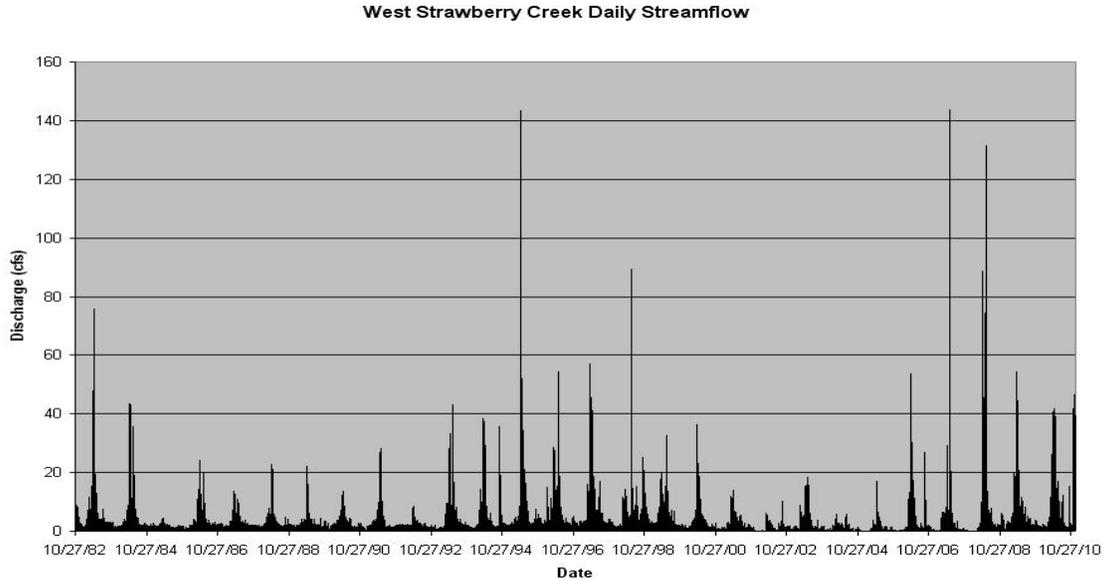


Figure 3. West Strawberry Creek Daily Streamflow

### 4.3 Sample Data

Sample data from the existing WQM project as well as the assessment project were utilized to evaluate the stream. A total of 44 samples were available for analysis. Comparing flow and concentration resulted in a very weak relationship that was inadequate for use in predicting daily loads. Four of the 44 samples exceeded the chronic standard. There were no waste load allocations in the load duration curve because no waste facilities are located within the watershed.

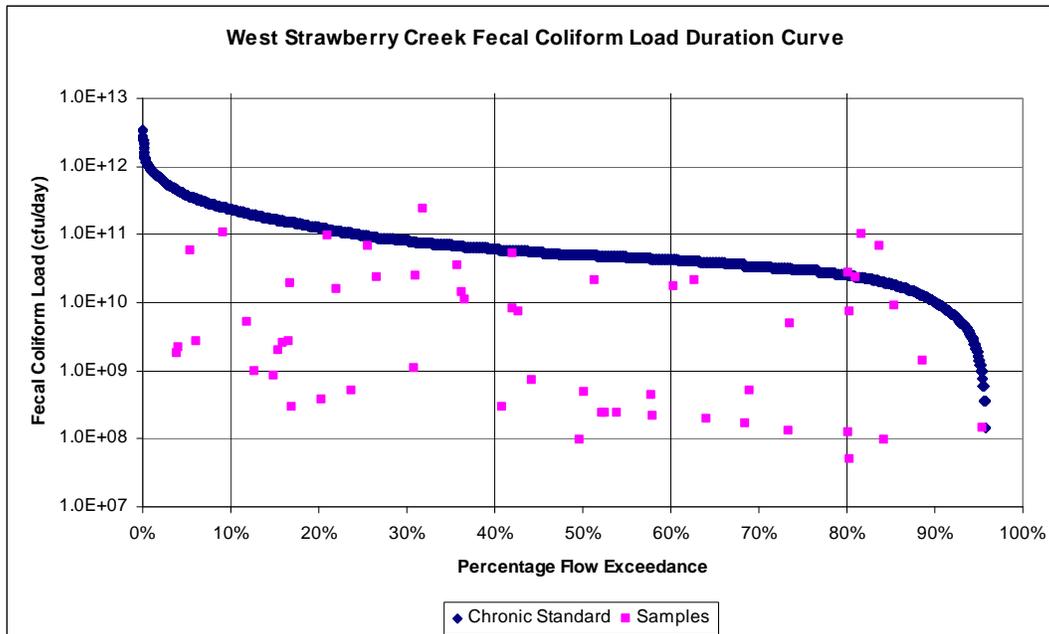


Figure 4. Fecal Coliform Load Duration Curve

**Table 3. West Strawberry Creek Fecal Coliform Bacteria Sample Data (Highlighted samples are in excess of the chronic standard)**

Date	Station	Fecal Coliform Bacteria cfu/100mL	Flow	Flow Zone
08/01/83	460675	316	3.142	2
05/07/84	460675	4	18.346	1
08/06/84	460675	170	2.708	2
11/13/84	460675	10	1.752	3
02/05/85	460675	2	1.014	4
05/06/85	460675	2	2.013	3
08/10/87	460675	130	2.361	3
02/17/88	460675	10	2.013	3
05/24/88	460675	2	6.096	2
08/23/88	460675	15	1.405	3
11/07/88	460675	13	2.274	3
04/19/95	460675	3	5.054	2
07/18/95	460675	130	6.183	2
07/29/96	460675	520	2.795	2
07/21/97	460675	420	10.179	1
07/14/98	460675	800	4.88	2
07/20/99	460675	142	4.619	2
07/11/00	460675	710	3.924	2
07/18/01	460675	880	2.447	3
07/15/02	460675	250	0.024	5
06/11/03	BELLESTRAW	8	13.568	1
06/17/03	BELLESTRAW	26	8.355	2
06/20/03	BELLESTRAW	16	6.444	2
06/25/03	BELLESTRAW	18	6.27	2
07/02/03	BELLESTRAW	14	3.229	2
07/02/03	BELLESTRAW	24	3.229	2
07/08/03	460675	210	2.795	2
07/10/03	BELLESTRAW	140	2.447	3
07/16/03	BELLESTRAW	530	1.666	3
07/23/03	BELLESTRAW	300	1.023	4
07/30/03	BELLESTRAW	980	0.979	4
<b>08/06/03</b>	<b>BELLESTRAW</b>	<b>3200</b>	<b>0.849</b>	<b>5</b>
<b>08/12/03</b>	<b>BELLESTRAW</b>	<b>4300</b>	<b>0.971</b>	<b>5</b>
08/20/03	BELLESTRAW	410	1.752	3
<b>09/10/03</b>	<b>BELLESTRAW</b>	<b>3100</b>	<b>3.09</b>	<b>2</b>
<b>07/13/04</b>	<b>460675</b>	<b>1100</b>	<b>1.04</b>	<b>4</b>
07/11/05	460675	500	0.745	5
07/25/06	460675	110	0.528	5
07/11/07	460675	440	2.013	3
07/14/08	460675	260	3.751	2
06/22/09	460675	12	6.704	2
09/08/09	460675	4	1.318	3
06/14/10	460675	160	14.784	1
09/16/10	460675	150	1.318	3

## 5.0 TMDL and Allocations

### 5.0.1 High Flow (<10% exceedence)

The High Flow zone is composed of the highest 10% of flows that occurred in West Strawberry Creek. The 10<sup>th</sup> percentile equates to a flow of 9.6 cfs and is the division between the top two flow zones as defined in the EPA load duration curve guidance.

There were no samples in this zone which were above the chronic standard. However, it was used to calculate the current load from which reductions were calculated.

Table 4 depicts an example of a TMDL for a flow of 43.1 cfs within the the high flow regime. 43.1 cfs is the 95<sup>th</sup> percentile flow in this zone and is an example of the acceptable load at this particular flow. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

The concentration of 1000 cfu/100ml represents the chronic standard and may make an appropriate goal for this flow zone because flows in excess of 9.6 cfs typically only last for short periods of time (peak runoff events). Analysis of the flow frequency within this flow regime indicates that flows of this magnitude may persist roughly 10% of the time.

The chronic threshold of 1000 cfu/100ml was chosen for the TMDL. Chronic violations are not likely in this flow zone, but by using the 1000 cfu/100ml threshold assurance is provided that the water quality standard will not be exceeded.

**Table 4. High Flow Total Maximum Daily Load**

	Flow Zone (expressed as CFU/Day)	
	High Flow >9.571 cfs	
WLA	0	<i>There are no WLAs in the watershed</i>
LA	9.12E+11	<i>Remaining load after deducting WLA and MOS from TMDL</i>
MOS	1.42E+11	
TMDL @ 1000 cfu/100 ml	1.05E+12	<i>Standard multiplied by 95th % flow for zone</i>
Current Load**	3.88E+11	<i>95th Percentile of observed fecal coliform bacteria load for each zone</i>
Load Reduction	0%	<i>Reduction required to reduce the current load to the load at the standard</i>

### 5.0.2 Moist Conditions (10% to 40% exceedence)

Flows during moist conditions are characterized by above average moisture conditions in the watershed. Flows in this regime are generated by precipitation and snowmelt events. The upper bound of this flow regime is approximately 9.5 cfs while the lower end of this regime is roughly 2.5 cfs.

Table 5 depicts an example of a TMDL for a flow of 8 cfs within the moist condition regime. 8 cfs is the 95<sup>th</sup> percentile flow in this zone and is an example of the acceptable load at this particular flow. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

One of the eighteen samples (5%) collected within this flow zone was above the chronic threshold of 1000 cfu/100ml. Flows within this zone may be expected to persist for several weeks on a regular basis. As a result of insufficient data to accurately assess the chronic standard, reductions will be based on the chronic threshold of 1000 cfu/100 ml. By utilizing 1000 cfu/100ml as the reduction target for a single sample maximum, it insures that both the chronic and acute standards are fully supported. The 95<sup>th</sup> percentile of this flow regime was calculated to 915 cfu/100ml, which meets standards set in place. However, the maximum load of 3100 cfu/100ml was used in place of the 95<sup>th</sup> percentile. Therefore a 68% load reduction is recommended for this flow regime in order to meet TMDL standards.

**Table 5. Moist Conditions Total Maximum Daily Load**

	Flow Zone (expressed as CFU/Day)	
	Moist Conditions	
	9.571-2.534 cfs	
WLA	0	<i>There are no WLAs in the watershed</i>
LA	1.60E+11	<i>Remaining load after deducting WLA and MOS from TMDL</i>
MOS	3.61E+10	
<b>TMDL @ 1000 cfu/100 ml</b>	<b>1.96E+11</b>	<i>Standard multiplied by 95th % flow for zone</i>
<b>Current Load**</b>	<b>6.07E+11</b>	<i>95th Percentile of observed fecal coliform bacteria load for each zone</i>
<b>Load Reduction</b>	<b>68%</b>	<i>Reduction required to reduce the current load to the load at the standard</i>

### 5.0.3 Midrange Flows (40% to 60% exceedence)

Midrange flows extend from approximately 2.5 cfs down to 1.8 cfs. Of the thirteen samples collected from this flow regime, none exceeded the chronic standard. The 95<sup>th</sup> percentile of this flow regime was calculated to 547 cfu/100 ml, slightly over the chronic standard. No load reduction will be needed to fully support designated beneficial uses to the chronic water quality standard.

Table 6 depicts an example of a TMDL for a flow of 2.45 cfs within the midrange flow regime. 2.45 cfs is the 95<sup>th</sup> percentile flow in this zone and is an example of the acceptable load at this particular flow. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

**Table 6. Midrange Flows Total Maximum Daily Load**

	Flow Zone (expressed as CFU/Day)	
	Midrange Flows	
	2.534-1.752 cfs	
WLA	0	<i>There are no WLAs in the watershed</i>
LA	5.35E+10	<i>Remaining load after deducting WLA and MOS from TMDL</i>
MOS	6.38E+09	
<b>TMDL @ 1000 cfu/100 ml</b>	<b>5.98E+10</b>	<i>Standard multiplied by 95th % flow for zone</i>
<b>Current Load**</b>	<b>3.28E+10</b>	<i>95th Percentile of observed fecal coliform bacteria load for each zone</i>
<b>Load Reduction</b>	<b>0%</b>	<i>Reduction required to reduce the current load to the load at the standard</i>

### 5.0.4 Dry Conditions (60% to 80% exceedence)

Flows during dry conditions extend from approximately 1.75 cfs down to 1 cfs. One of the three samples (33%) collected within this flow zone were above the chronic threshold of 1000 cfu/100ml. The 95<sup>th</sup> percentile of this flow regime was calculated to 980 cfu/100ml, which meets standards set in place. However, the maximum load of 1100 cfu/100ml was used in place of the 95<sup>th</sup> percentile to calculate a current load of 4.48E+10. Therefore a 9% load reduction is recommended for this flow regime to meet TMDL standards.

Table 7 depicts an example of a TMDL for a flow of 1.67 cfs within dry condition regime. 1.67 cfs is the 95<sup>th</sup> percentile flow in this zone and is an example of the acceptable load at this particular flow. Higher and lower flows within this zone may acceptably carry higher or lower loads as long as the concentration does not exceed the state standard.

**Table 7. Dry Conditions Total Maximum Daily Load**

	<b>Flow Zone (expressed as CFU/Day)</b>	
	<b>Dry Conditions 1.752-1.049 cfs</b>	
<b>WLA</b>	<b>0</b>	<i>There are no WLAs in the watershed</i>
<b>LA</b>	<b>3.20E+10</b>	<i>Remaining load after deducting WLA and MOS from TMDL</i>
<b>MOS</b>	<b>8.70E+09</b>	
<b>TMDL @ 1000 cfu/100 ml</b>	<b>4.07E+10</b>	<i>Standard multiplied by 95th % flow for zone</i>
<b>Current Load**</b>	<b>4.48E+10</b>	<i>95th Percentile of observed fecal coliform bacteria load for each zone</i>
<b>Load Reduction</b>	<b>9%</b>	<i>Reduction required to reduce the current load to the load at the standard</i>

### 5.0.5 Low Flows (80% to 100% exceedence)

The low flow regime extends from approximately 1 cfs down to no flow. Two of the six samples collected in this regime exceeded the chronic standard. The 95<sup>th</sup> percentile of this flow regime was calculated to 3970 cfu/100 ml. Sources of bacteria in this flow zone can be expected to be in direct contact with the stream. This flow regime contained two of the highest fecal coliform concentrations recorded during the study. Various types of wildlife in direct contact with the stream are probably the main source of fecal coliform bacteria in this flow zone. Low flow violations may also be indicative of septic tanks leaking. At higher runoff rates the waste may be diluted to an amount below the chronic standard.

Table 8 depicts an example of a TMDL for a flow of 0.971 cfs within the low flow regime. 0.971 cfs is the 95<sup>th</sup> percentile flow in this zone and is an example of the acceptable load at this particular flow. Higher and lower flows within this zone may carry higher or lower loads as long as the concentration does not exceed the state standard.

**Table 8. Low Flows Total Maximum Daily Load**

	Flow Zone (expressed as CFU/Day)	
	Low Flows	
	<1.049	
WLA	0	<i>There are no WLAs in the watershed</i>
LA	1.40E+10	<i>Remaining load after deducting WLA and MOS from TMDL</i>
MOS	9.78E+09	
TMDL @ 1000 cfu/100 ml	2.37E+10	<i>Standard multiplied by 95th % flow for zone</i>
Current Load**	9.43E+10	<i>95th Percentile of observed fecal coliform bacteria load for each zone</i>
Load Reduction	75%	<i>Reduction required to reduce the current load to the load at the standard</i>

### 5.1 Load Allocations (LAs)

Approximately 93% of the landuse in the watershed is either forested or herbaceous. The majority of the TMDL load has been allocated to these nonpoint source loads in the following load allocations. A 68% load reduction in fecal coliform bacteria is required in the moist conditions flow zone to fully attain current water quality standards. A 9% reduction in fecal coliform bacteria is required in dry conditions flow zone to fully attain current water quality standards. A 75% reduction in fecal coliform bacteria is required in loz flow zone to fully attain current water quality standards. The remaining flow regimes do not require reductions to maintain support of the standards. Reducing the highest samples below the chronic standard provides assurance that both acute and chronic standards will be met.

## 6.0 Margin of Safety (MOS) and Seasonality

### 6.1 Margin of Safety

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

### 6.2 Seasonality

Different seasons of the year can yield differences in water quality due to changes in precipitation. The fecal coliform standard only applies to streams from May 1 through September 30, which is the season that the TMDL addresses. The majority of the data collected comes from within the recreation season. Elevated counts did not appear to be linked to a particular month or portion of the growing season.

## **7.0 Public Participation**

South Dakota Department of Environment and Natural Resources (SD DENR) was the primary state agency involved in completion of this assessment. The SD DENR Surface Water Quality Program and the SD DENR Water Resources Assistance Program provided samples from ambient water quality monitoring sites and the Belle Fourche Watershed Assessment.

The South Dakota School of Mines and Technology also provided assistance with collection of samples from West Strawberry Creek during the Belle Fourche Watershed Assessment.

The TMDL was noticed for a 30 day period in both the Black Hills Pioneer and the Rapid City Journal in which the public at large had an opportunity to comment. Comments received during this period and DENR responses are included in Appendix A.

## **8.0 Monitoring Strategy**

Future monitoring of this stream segment will continue as a part of the states ambient stream monitoring program. If bacterial impairments persist beyond completion of restoration activities, it may be beneficial to add a secondary site upstream of the residential section to help better define the background contributions from wildlife.

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

## **9.0 Restoration Strategy**

The Belle Fourche Implementation Project covers a large section of the Cheyenne River drainage including the West Strawberry Creek watershed. This project has been approached about addressing this impairment in future phases. Emphasis should be placed on hooking up septic wastewater systems to the city wastewater system in order to stop leaks of fecal coliform and other bacteria into the stream.

## 10.0 Literature Cited

- High Plains Regional Climate Center. "High Plains Regional Climate Center." 2011. University of Nebraska Lincoln. 4 March 2011. <<http://www.hprcc.unl.edu/>>.
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- Natural Resources Conservation Service (NRCS). "Soil Data Mart." 4 March 2011. <<http://soildatamart.nrcs.usda.gov/>>.
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- SDDENR (South Dakota Department of Environment and Natural Resources). 2008. The 2008 South Dakota Integrated Report for Surface Water Quality Assessment Pierre, SD.
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- USEPA. 2001. Protocol for Developing Pathogen TMDLs. EPA 841-R-00-002. Office of Water (4503F0, United States Environmental Protection Agency, Washington D.C. 132 pp.
- Yagow, G., Dillaha, T., Mostaghimi, S., Brannan, K., Heatwole, C., and Wolfe, M.L. 2001. *TMDL modeling of fecal coliform bacteria with HSPF*. ASAE meeting paper No.01-2006. St. Joseph, Mich.

**Appendix A****File Code:** 2500**Date:** February 24, 2011

STEVEN PIRNER  
SECRETARY  
SOUTH DAKOTA DEPARTMENT OF  
ENVIRONMENT AND NATURAL RESOURCES  
WATER RESOURCES ASSISTANCE PROGRAM  
523 EAST CAPITOL AVE., JOE FOSS BUILDING  
PIERRE, SD 57501-3181

Dear Mr. Pirner:

This letter is in response to the electronic notice of availability of the Draft West Strawberry Creek Fecal Coliform Total Maximum Daily Load (TMDL) Assessment ([http://denr.sd.gov/dfta/wp/tmdl/tmdl\\_weststrawberrycreekfecal.pdf](http://denr.sd.gov/dfta/wp/tmdl/tmdl_weststrawberrycreekfecal.pdf)) inviting review and comment. As identified in the Memorandum of Understanding between the United States Forest Service, Rocky Mountain and Northern Regions and the South Dakota Department of Environment and Natural Resources (SD DENR), the Black Hills National Forest continues to be interested in working with the State on understanding water quality issues and improving water quality on National Forest System lands. While there is a very limited amount of Forest Service administered lands within the watershed, the watershed is of interest and Forest staff offer the following comments regarding the draft TMDL assessment:

**Section 1.1 Watershed Characteristics****Page 3**

Paragraph 1: There is a suggestion to change location information for Lawrence County. The county should be listed as occurring in western SD rather than in eastern SD as currently identified.

*DENR Response: This mistake was corrected.*

Paragraph 2: It is stated that a number of the residential facilities currently use city sewage and water. Could there be a potential that some old septic tanks may have been left on site prior connecting to city facilities and that those could be contributing to the issue? If so, a suggestion is that this could be added to the discussion within this section.

*DENR Response: The cool temperatures that would be expected in an abandoned subsurface tank would not be conducive to the long term survival or reproduction of bacteria and were not considered a possible source.*

## Pages 3-4

Multiple paragraphs: It was noticed that the soils information (1979 Soil Survey of Lawrence County, South Dakota) referenced in the report is no longer the official soils data for the county. The Lawrence County Soil Survey was updated with new soils information in 2007. The official soils data is located on USDA-Natural Resources Conservation Service's Web Soil Services websites: Soil Data Mart (<http://soildatamart.nrcs.usda.gov/>); and Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>).

A few examples of issues with the soils section includes that one of the soil associations (soil map units) identified in the assessment is no longer mapped in the county; another is of minor extent in the West Strawberry Creek Watershed (per discussion with NRCS).

A recommendation by personal communication with cooperating NRCS staff is that SD DENR GIS staff could download the recent SSURGO data from the Soil Data Mart into an ArcGIS system. Various soil reports are available in Soil Data Mart as well. If you need assistance in downloading the data or generating reports, please contact Barb Hall, NRCS, at 605-352-1256.

Once the soil map units/soil map information for the assessment has been updated, NRCS has indicated that they can effectively comment on their properties.

From within the same section the precipitation climate data is referenced from 1979. A suggestion is to use much more current data available online from the High Plains Climate Center (<http://www.hprcc.unl.edu/>).

*DENR Response: The soils and climate data were updated to reflect the more recent publications cited.*

## Page 4

Last paragraph: The 2008 SD DENR Integrated Report was referenced for the listing. Suggest identifying any changes or similarities with the more recent 2010 SD DENR Integrated Report and referencing the newer document.

*DENR Response: This section was updated to include the 2010 IR.*

## Section 2.0 Water Quality Standards

## Page 5

First paragraph: For aid in locating the watershed beneficial use analysis that is being referred to in this section interest was expressed that a reference or a web address be included within the document.

*DENR Response: A beneficial use analysis has not been completed on West Strawberry Creek. The statement in question is meant to convey that additional uses "May" be*

assigned to a waterbody and if they are, they will be assigned as a result of a beneficial use analysis.

#### Page 6

Last paragraph: While discussion indicated that West Strawberry Creek does not require a TMDL at this time for *E. coli* because it is not currently listed as an impairment feature for this system, is there current sampling that is occurring at this location since the two are closely related? If so, has recent sampling indicated impairment and can a reference be provided where this information can be located?

*DENR Response: South Dakota is currently undergoing a five year transition that will replace the Fecal Coliform Standard with an E Coli Standard. As mentioned, the two are often closely related and all sampling efforts by SDDENR are shifting their focus from Fecal Coliform to E. Coli. Due to the close relationship between the two, it is important to mention that at this point, the E. Coli data collected does not show an impairment. As data collection continues, if an impairment were to become evident, then a separate TMDL addressing the E. Coli impairment would be developed. The 2010 IR included all available data for the West Strawberry Creek and did not indicate impairment as a result of E. Coli. The stream will be evaluated as a part of the 2012 IR as well, however, data is available from DENR upon request.*

#### Section 3.2 Non-point Sources

#### Page 8

First paragraph within the section: The county wide assessment for wildlife densities seems somewhat misleading for this small watershed that is at one of highest elevations within the county. There are three species listed that may occur at a greater density at the lower elevations within the county, but may not be much more than incidental at the elevations that the West Strawberry Creek watershed occurs and with the various site characteristics (such as soils with significant levels of rock fragments). There are questions that this could affect the model used for estimating the amount of bacteria attributed to humans versus wildlife.

*DENR Response: Per personal conversation with the Forest Service, 3 species of wildlife were removed from the table, muskrat, badger, and jackrabbit. Each of these species is found in small enough numbers county wide that there was no measurable change in the allocation tables. Data is unavailable to further refine any of the estimates to specific species contributions.*

### Section 3.2.2 Human

#### Page 8

Last paragraph: Since bedrock is identified as an issue for septic systems within this section, a suggestion would be to discuss geology within the earlier Watershed Characteristics section of the document, similar to where the soils are discussed. The recent Geologic Map of the Deadwood South Quadrangle, South Dakota is available online through a link system on the SDDENR webpage at [http://www.sdgs.usd.edu/pubs/pdf/GQ24K-13\\_20100820.pdf](http://www.sdgs.usd.edu/pubs/pdf/GQ24K-13_20100820.pdf).

*DENR Response: A great deal of data discussing the regions bedrock including maps could have been included. The focus for the introduction was intended to present critical background knowledge to understand the TMDL. The soils description adequately explains that individual sanitary waste water disposal systems in this watershed would be severely limited due to the presence of shallow bedrock formations.*

### Section 3.2.3 Natural Background/Wildlife

#### Page 9

Table 2: Similar to an earlier comment. There are some questions as to why wildlife species are included in this table that are associated with lower elevations of the county that likely only occur incidentally, if at all, within this watershed (based on elevation, level of rock fragments, canopy cover density, etc.). Questions also arose that since these species were used for estimating natural background bacteria that inclusion of the species may have altered the level amounts attributed to human sources.

*DENR Response: These species were removed and resulted in no change in the allocations. The densities of the three species were too small to result in a measurable change in the allocations.*

### Section 6.2

#### Page 16

Last Paragraph: This paragraph mentions water quality changes due to agriculture practices. Earlier discussions within the document did not identify or attribute bacterial issues with agriculture within the watershed and was not clear why it was being addressed in this section.

*DENR Response: The reference to agricultural practices was removed.*

### Section 8.0 Monitoring Strategy

A suggestion would be to define BMP within this section.

*DENR Response: Best Management Practices (BMP) were defined.*

### Section 9.0 Restoration Strategy

The discussion in this section seems to be very general regarding implementation activities and how West Strawberry Creek watershed restoration was associated with the Belle Fourche Implementation Project. It is recommended that the specific activities that were incorporated in the Belle Fourche Implementation Project to address the West Strawberry Creek bacteria issues be included here. It would be helpful if the website where the Implementation Project can be accessed and potentially a page number of a document be provided to aid in locating the discussion on those implementation activities. Could there be some discussion included here on the feasibility that the septic systems could be hooked up to the city wastewater system?

*DENR Response: As a result of an internal miscommunication, the original document incorrectly stated that the impairments were currently being addressed by the Belle Fourche Implementation. The project had taken the initial steps to include this watershed as a portion of its implementation activities, but no changes or additions to its mission or work plan were complete.*

The opportunity to comment on this document was located by accessing the SDDENR website. The Forest would like to be placed on a notification list for any further opportunities to comment on TMDL assessments located within the Black Hills ecoregion.

*DENR Response: As a standard practice, DENR typically contacts agencies (with land holdings or other significant stakes within the watershed) prior to the public notice period as a courtesy to that agency. The omission of the Forest Service for this TMDL was an oversight.*

Please contact Deanna Reyher, Forest Watershed Coordinator, with questions that you may have. Deanna can be contacted at (605) 673-9348 or [dreyher@fs.fed.us](mailto:dreyher@fs.fed.us). Thank you for the opportunity to review and comment on this assessment.

Sincerely,

*/s/ Craig Bobzien*  
CRAIG BOBZIEN  
Forest Supervisor

cc: Joan Y Carlson  
Melissa Dempsey

### EPA Region VIII TMDL Review

TMDL Document Info:

<b>Document Name:</b>	<b>Fecal Coliform Bacteria Total Maximum Daily Load Evaluation for West Strawberry Creek, Lawrence County, South Dakota</b>
<b>Submitted by:</b>	<b>Cheryl Saunders, SD DENR</b>
<b>Date Received:</b>	<b>January 25, 2011</b>
<b>Review Date:</b>	<b>February 15, 2011</b>
<b>Reviewer:</b>	<b>Vern Berry, EPA</b>
<b>Rough Draft / Public Notice / Final?</b>	<b>Public Notice Draft</b>
<b>Notes:</b>	

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 West Strawberry Creek fecal coliform TMDL was 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:** West Strawberry Creek is a stream located in Lawrence County, South Dakota and is part of the larger Belle Fourche River watershed in the Lower Belle Fourche sub-basin (HUC 10120202). The Creek has a total drainage area of approximately 2,945 acres in western South Dakota. The 303(d) listed segment of West Strawberry Creek includes approximately 4.2 miles of the Creek from its headwaters to the confluence with Whitewood Creek (SD-BF-R-W\_STRAWBERRY\_01). It is listed as medium priority for TMDL development.

The designated uses for West Strawberry Creek include coldwater permanent 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 which is impairing the recreational use.

**COMMENTS:** Page 3 of the TMDL document mentions that West Strawberry creek is located in *eastern* South Dakota. We believe it should say “western.” Also, on page 4 it mentions that West Strawberry Creek was listed for temperature on the 2008 303(d) list, however the 2010 list removed the temperature listing. The TMDL document should be revised to reflect the most current listing information from the 2010 303(d) list.

*DENR Response: The changes were made as requested.*

### 1.3 Water Quality Standards

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

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

Minimum Submission Requirements:

- The TMDL must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the anti-degradation policy. (40 C.F.R. §130.7(c)(1)).
- The purpose of a TMDL analysis is to determine the assimilative capacity of the waterbody that corresponds to the existing water quality standards for that waterbody, and to allocate that assimilative capacity between the significant sources. Therefore, all TMDL documents must be written to meet the existing water quality standards for that waterbody (CWA §303(d)(1)(C)).

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

- The TMDL document should describe the relationship between the pollutant of concern and the water quality standard the pollutant load is intended to meet. This information is necessary for EPA to evaluate whether or not attainment of the prescribed pollutant loadings will result in attainment of the water quality standard in question.
- If a standard includes multiple criteria for the pollutant of concern, the document should demonstrate that the TMDL value will result in attainment of all related criteria for the pollutant. For example, both acute and chronic values (if present in the WQS) should be addressed in the document, including consideration of magnitude, frequency and duration requirements.

Recommendation:

Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The West Strawberry Creek segment addressed by this TMDL is impaired based on fecal coliform concentrations for limited contact recreation. South Dakota has applicable numeric standards for fecal coliform that may be applied to this Creek segment. The fecal coliform numeric standards being implemented in this TMDL are: a single sample maximum value of  $\leq 2000$  cfu/100 mL, and a 30-day geometric mean of  $\leq 1000$  cfu/ 100 mL. Discussion of additional applicable water quality standards for West Strawberry Creek can be found on pages 5 - 7 of the TMDL.

South Dakota has recently adopted *Escherichia coli* criteria for the protection of the limited contact and immersion recreation uses. However, West Strawberry Creek does not require an *E. coli* TMDL because the parameter is not currently listed as a cause of impairment to this stream. Because the two indicators are closely related, the fecal coliform bacteria TMDL and associated implementation strategy described in the TMDL document are expected to address both the fecal coliform bacteria and possible future *E. coli* impairments. If a TMDL must be established for *E. coli* in the future, a separate TMDL document will be developed for this parameter.

**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 target for this TMDL is based on the numeric water quality standards for fecal coliform to achieve the limited contact recreation beneficial use for West Strawberry Creek. The target for the West Strawberry Creek segment included in the TMDL document is the fecal coliform standard expressed as the 30-day geometric mean of 1000 CFU/100 mL during the recreation season from May 1 to September 30. While the standard is intended to be expressed as the 30-day geometric mean, the target was used to compare to values from single grab samples. This ensures that the reductions necessary to achieve the target will be protective of both the acute (single sample value) and chronic (geometric mean of 5 samples) standard.

**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 forest consisting of forested land (75%), herbaceous cover (17%), water (6%) and developed or open space land (2%).

Nonpoint sources of fecal coliform bacteria in West Strawberry Creek are likely to come primarily from wildlife within the watershed. 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. Based on this data there are no known livestock operations within the drainage area of West Strawberry Creek. There are estimated to be 9 homes in the watershed that are on septic systems. There have been no complaints registered with the SD DENR regarding septic systems during the years the fecal coliform data was collected in the watershed. However, septic systems in the Black Hills can be problematic due to the shallowness of the bedrock and the slow permeability of the soils.

The cities Lead and Deadwood are located Whitewood Creek drainage and do not discharge to West Strawberry Creek so no wasteload allocation for those sources are included in this TMDL document. Homestake Mining Company has an industrial discharge to Grizzly Gulch, which flows to West Strawberry Creek. The permit does not include limits for fecal coliform (i.e., no domestic waste is allowed), therefore the WLA is zero.

**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., stream 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 West Strawberry Creek TMDL describes how the fecal coliform loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segment.

Data on West Strawberry Creek were collected during the Belle Fourche watershed assessment from one sampling point located approximately 200 meters from the mouth of West Strawberry Creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site 460675 (WQM 75) which was located at the mouth of West Strawberry Creek. There was no flow data for West Strawberry Creek, so it was supplemented with flow data taken from three United States Geological Survey (USGS) stations.

Flow data for West Strawberry Creek was calculated through comparisons to Whitewood and Whitetail Creeks. Whitewood Creek is the receiving water for discharges from West Strawberry and Whitetail Creeks and has a long term gauge record maintained by the USGS (06436180). Whitetail Creek (06436156) is a small tributary to Whitewood Creek that is similar in geology, soils, size, and is located less than one mile from the West Strawberry Creek Watershed. Whitetail Creek is an appropriate surrogate for the West Strawberry Creek Watershed because of its similarities. The Whitetail Creek gauge record was shorter than desired for the generation of an accurate flow frequency curve. To lengthen the record, Whitewood and Whitetail Creeks were modeled with the Aquarius Modeling Tool creating a long term flow frequency with less than 10% error. The final flow data set provided nearly 30 years of water quantity data. This data set provided the basis for a load duration curve that accurately represents the West Strawberry Creek flow frequencies.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDC was divided into 5 distinct flow regimes – high flow ( $\geq 9.6$  cfs), moist flow (between 9.6 cfs and 2.5 cfs), midrange flow (between 2.5 cfs and 1.8 cfs), dry flow (between 1.8 cfs and 1 cfs), and low flow ( $< 1$  cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 4 of the TMDL document. The LDC is a dynamic expression of the allowable load for any given daily flow. Loading capacities were derived from this approach at the 95<sup>th</sup> percentile of the observed fecal coliform bacteria load for each flow regime: high flow =  $1.05E+12$  CFU/day; moist flow =  $1.96E+11$  CFU/day; midrange flow =  $5.98E+10$  CFU/day; dry flow =  $4.07E+10$  CFU/day; and low flow =  $2.37E+10$  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 West Strawberry Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. Data on West Strawberry Creek were collected during the Belle Fourche watershed assessment from one sampling point located approximately 200 meters from the mouth of West Strawberry Creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site 460675 (WQM 75) which was located at the mouth of West Strawberry Creek. There was no flow data for West Strawberry Creek, so it was supplemented with flow data taken from three United States Geological Survey (USGS) stations, Whitewood Creek at Deadwood, SD (06436170), Whitewood Creek above Whitewood, SD (06436180), and Whitetail Creek at Lead, SD (06436156).

**Comments: None.**

## 4.2 Waste Load Allocations (WLA):

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

## Minimum Submission Requirements:

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

## Recommendation:

- Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The cities Lead and Deadwood are located in the Whitewood Creek drainage and do not discharge to West Strawberry Creek so no wasteload allocation for those sources are included in this TMDL document. Homestake Mining Company has an industrial discharge to Grizzly

Gulch, which flows to West Strawberry Creek. The permit does not include limits for fecal coliform (i.e., no domestic waste is allowed), therefore the WLA is zero.

**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 is predominately forest consisting of forested land (75%), herbaceous cover (17%), water (6%) and developed or open space land (2%). Nonpoint sources of fecal coliform bacteria in West Strawberry Creek are likely to come primarily from wildlife within the watershed. There are no known livestock operations within the drainage area of West Strawberry Creek. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Tables 4 - 8 include the load allocations at each of the flow regimes – 9.12E+11 CFU/day at high flows; 1.60E+11 CFU/day during moist flows; 5.35E+10 CFU/day at midrange flows; 3.20E+10 CFU/day during dry conditions; and 1.40E+10 CFU/day at low flows.

**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 an 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 West Strawberry Creek TMDL includes an explicit MOS derived by calculating the difference between the loading capacity at the mid-point of each of the five flow zones and the loading capacity at the minimum flow in each zone. The explicit MOS values are included in Tables 4 - 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 TSS loads are taken into account. Highest stream 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 summary of the public participation process that has occurred which involves making the TMDL document available for a 30-day public notice period prior to finalization.

**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 aside from the 30 comment period. If meetings with landowner groups or watershed groups took place during development of the TMDL it should be mentioned in the Public Notice section of the TMDL document.

*DENR Response: No additional meetings were held within this watershed prior to, or during the development of this 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 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](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. With a SD DENR ambient monitoring station (WQM 75) located at the mouth of the West Strawberry Creek, we assume that monitoring will continue in this drainage. We recommend adding a brief description of future monitoring efforts in the TMDL document.

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

**Comments: None.**

*DENR Response: The presence of the ambient monitoring station WQM 75 ensures the stream will be monitored during and after any implementation in the watershed. Additional sites can be added as necessary.*

## 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 says that an implementation activities were included as part of the Belle Fourche implementation project. Since there are no significant point sources in the West Strawberry Creek watershed there is no need to include a discussion of reasonable assurance in this TMDL document.

**Comments: None.**

## 8. Daily Loading Expression

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

Minimum Submission Requirements:

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

Recommendation:

Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The West Strawberry 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  
REGION 8

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DEPT. OF ENVIRONMENT AND  
NATURAL RESOURCES,  
SECRETARY'S OFFICE

APR 6 2011

Ref: 8EPR-EP

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

Re: TMDL Approvals  
*West Strawberry Creek; Fecal Coliform; SD-BF-R-  
W\_STRAWBERRY\_01*

*Steve*

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



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ENCLOSURE 1: APPROVED TMDLs

**Fecal Coliform Bacteria Total Maximum Daily Load  
Evaluation for West Strawberry Creek, Lawrence County,  
South Dakota (SD DENR, January 2011)**

Submitted: 3/16/2011

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

Segment: West Strawberry Creek from headwaters to confluence with Whitewood Creek

303(d) ID: SD-BF-R-W STRAWBERRY 01

Parameter/Pollutant (303(d) list cause):	FECAL COLIFORM - 259	Water Quality <= 1000 cfu/100 mL geometric mean concentration; <= 2000 cfu/100 mL single Targets: sample maximum		Permits
Allocation*	Value	Units		
WLA	0	CFU/DAY		
LA	1.60E+11	CFU/DAY		
TMDL	1.96E+11	CFU/DAY		
MOS	3.61E+10	CFU/DAY		

**Notes:** The loads shown represent the loads during the moist flow regime as defined by the load duration curve for West Strawberry Creek (see Figure 4 of the TMDL). The moist 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

## EPA REGION VIII TMDL REVIEW

## TMDL Document Info:

<b>Document Name:</b>	<b>Fecal Coliform Bacteria Total Maximum Daily Load Evaluation for West Strawberry Creek, Lawrence County, South Dakota</b>
<b>Submitted by:</b>	<b>Cheryl Saunders, SD DENR</b>
<b>Date Received:</b>	<b>March 16, 2011</b>
<b>Review Date:</b>	<b>March 25, 2011</b>
<b>Reviewer:</b>	<b>Vern Berry, EPA</b>
<b>Rough Draft / Public Notice / Final?</b>	<b>Final</b>
<b>Notes:</b>	

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 West Strawberry Creek fecal coliform TMDL was submitted to EPA for review and approval via an email from Cheryl Saunders, SD DENR on March 16, 2011. The email included the final TMDL document and a letter requesting final review and approval.

**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:** West Strawberry Creek is a stream located in Lawrence County, South Dakota and is part of the larger Belle Fourche River watershed in the Lower Belle Fourche sub-basin (HUC 10120202). The Creek has a total drainage area of approximately 2,945 acres in western South Dakota. The 303(d) listed segment of West Strawberry Creek includes approximately 4.2 miles of the Creek from its headwaters to the confluence with Whitewood Creek (SD-BF-R-W\_STRAWBERRY\_01). It is listed as medium priority for TMDL development.

The designated uses for West Strawberry Creek include coldwater permanent 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 which is impairing the recreational use.

COMMENTS: None.

### 1.3 Water Quality Standards

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

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

Minimum Submission Requirements:

- The TMDL must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the anti-degradation policy. (40 C.F.R. §130.7(c)(1)).
- The purpose of a TMDL analysis is to determine the assimilative capacity of the waterbody that corresponds to the existing water quality standards for that waterbody, and to allocate that assimilative capacity between the significant sources. Therefore, all TMDL documents must be written to meet the existing water quality standards for that waterbody (CWA §303(d)(1)(C)).

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

- The TMDL document should describe the relationship between the pollutant of concern and the water quality standard the pollutant load is intended to meet. This information is necessary for EPA to evaluate whether or not attainment of the prescribed pollutant loadings will result in attainment of the water quality standard in question.
- If a standard includes multiple criteria for the pollutant of concern, the document should demonstrate that the TMDL value will result in attainment of all related criteria for the pollutant. For example, both acute and chronic values (if present in the WQS) should be addressed in the document, including consideration of magnitude, frequency and duration requirements.

Recommendation:

- Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The West Strawberry Creek segment addressed by this TMDL is impaired based on fecal coliform concentrations for limited contact recreation. South Dakota has applicable numeric standards for fecal coliform that may be applied to this Creek segment. The fecal coliform numeric standards being implemented in this TMDL are: a single sample maximum value of  $\leq 2000$  cfu/100 mL, and a 30-day

geometric mean of  $\leq 1000$  cfu/ 100 mL. Discussion of additional applicable water quality standards for West Strawberry Creek can be found on pages 6 - 7 of the TMDL.

South Dakota has recently adopted *Escherichia coli* criteria for the protection of the limited contact and immersion recreation uses. However, West Strawberry Creek does not require an *E. coli* TMDL because the parameter is not currently listed as a cause of impairment to this stream. Because the two indicators are closely related, the fecal coliform bacteria TMDL and associated implementation strategy described in the TMDL document are expected to address both the fecal coliform bacteria and possible future *E. coli* impairments. If a TMDL must be established for *E. coli* in the future, a separate TMDL document will be developed for this parameter.

**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 target for this TMDL is based on the numeric water quality standards for fecal coliform to achieve the limited contact recreation beneficial use for West Strawberry Creek. The target for the West Strawberry Creek segment included in the TMDL document is the fecal coliform standard expressed as the 30-day geometric mean of 1000 CFU/100 mL during the recreation season from May 1 to September 30. While the standard is intended to be expressed as the 30-day geometric mean, the target was

used to compare to values from single grab samples. This ensures that the reductions necessary to achieve the target will be protective of both the acute (single sample value) and chronic (geometric mean of 5 samples) standard.

**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 forest consisting of forested land (75%), herbaceous cover (17%), water (6%) and developed or open space land (2%).

Nonpoint sources of fecal coliform bacteria in West Strawberry Creek are likely to come primarily from wildlife within the watershed. 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. Based on this data there are no known livestock operations within the drainage area of West Strawberry Creek. There are estimated to be 9 homes in the watershed that are on septic systems. There have been no complaints registered with the SD DENR regarding septic systems

during the years the fecal coliform data was collected in the watershed. However, septic systems in the Black Hills can be problematic due to the shallowness of the bedrock and the slow permeability of the soils.

The cities Lead and Deadwood are located Whitewood Creek drainage and do not discharge to West Strawberry Creek so no wasteload allocation for those sources are included in this TMDL document. Homestake Mining Company has an industrial discharge to Grizzly Gulch, which flows to West Strawberry Creek. The permit does not include limits for fecal coliform (i.e., no domestic waste is allowed), therefore the WLA is zero.

**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., stream 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 West Strawberry Creek TMDL describes how the fecal coliform loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segment.

Data on West Strawberry Creek were collected during the Belle Fourche watershed assessment from one sampling point located approximately 200 meters from the mouth of West Strawberry Creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site 460675 (WQM 75) which was located at the mouth of West Strawberry Creek. There was no

flow data for West Strawberry Creek, so it was supplemented with flow data taken from three United States Geological Survey (USGS) stations.

Flow data for West Strawberry Creek was calculated through comparisons to Whitewood and Whitetail Creeks. Whitewood Creek is the receiving water for discharges from West Strawberry and Whitetail Creeks and has a long term gauge record maintained by the USGS (06436180). Whitetail Creek (06436156) is a small tributary to Whitewood Creek that is similar in geology, soils, size, and is located less than one mile from the West Strawberry Creek Watershed. Whitetail Creek is an appropriate surrogate for the West Strawberry Creek Watershed because of its similarities. The Whitetail Creek gauge record was shorter than desired for the generation of an accurate flow frequency curve. To lengthen the record, Whitewood and Whitetail Creeks were modeled with the Aquarius Modeling Tool creating a long term flow frequency with less than 10% error. The final flow data set provided nearly 30 years of water quantity data. This data set provided the basis for a load duration curve that accurately represents the West Strawberry Creek flow frequencies.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDC was divided into 5 distinct flow regimes – high flow ( $\geq 9.6$  cfs), moist flow (between 9.6 cfs and 2.5 cfs), midrange flow (between 2.5 cfs and 1.8 cfs), dry flow (between 1.8 cfs and 1 cfs), and low flow ( $< 1$  cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 4 of the TMDL document. The LDC is a dynamic expression of the allowable load for any given daily flow. Loading capacities were derived from this approach at the 95<sup>th</sup> percentile of the observed fecal coliform bacteria load for each flow regime: high flow =  $1.05E+12$  CFU/day; moist flow =  $1.96E+11$  CFU/day; midrange flow =  $5.98E+10$  CFU/day; dry flow =  $4.07E+10$  CFU/day; and low flow =  $2.37E+10$  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 West Strawberry Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. Data on West Strawberry Creek were collected during the Belle

Fourche watershed assessment from one sampling point located approximately 200 meters from the mouth of West Strawberry Creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site 460675 (WQM 75) which was located at the mouth of West Strawberry Creek. There was no flow data for West Strawberry Creek, so it was supplemented with flow data taken from three United States Geological Survey (USGS) stations, Whitewood Creek at Deadwood, SD (06436170), Whitewood Creek above Whitewood, SD (06436180), and Whitetail Creek at Lead, SD (06436156).

**COMMENTS:** None.

#### **4.2 Waste Load Allocations (WLA):**

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

Minimum Submission Requirements:

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

Recommendation:

- Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The cities Lead and Deadwood are located in the Whitewood Creek drainage and do not discharge to West Strawberry Creek so no wasteload allocation for those sources are included in this TMDL document. Homestake Mining Company has an industrial discharge to Grizzly Gulch, which flows to West Strawberry Creek. The permit does not include limits for fecal coliform (i.e., no domestic waste is allowed), therefore the WLA is zero.

**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 is predominately forest consisting of forested land (75%), herbaceous cover (17%), water (6%) and developed or open space land (2%). Nonpoint sources of fecal coliform bacteria in West Strawberry Creek are likely to come primarily from wildlife within the watershed. There are no known livestock operations within the drainage area of West Strawberry Creek. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Tables 4 - 8 include the load allocations at each of the flow regimes – 9.12E+11 CFU/day at high flows; 1.60E+11 CFU/day during moist flows; 5.35E+10 CFU/day at midrange flows; 3.20E+10 CFU/day during dry conditions; and 1.40E+10 CFU/day at low flows.

**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 West Strawberry Creek TMDL includes an explicit MOS derived by calculating the difference between the loading capacity at the mid-point of each of the five flow zones and the loading capacity at the minimum flow in each zone. The explicit MOS values are included in Tables 4 - 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 TSS loads are taken into account. Highest stream 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 summary of the public participation process that has occurred which involves making the TMDL document available for a 30-day public notice period prior to finalization. The public notice was published in the Black Hills Pioneer and the Rapid City Journal. Comments were received and included in Appendix A of the final TMDL document.

**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](http://www.epa.gov/owow/tmdl/tmdl_clarification_letter.pdf)

Recommendation:

Approve  Partial Approval  Disapprove  Insufficient Information

**SUMMARY:** The Monitoring Strategy section mentions that future monitoring of this stream segment will continue as a part of the states ambient stream monitoring program. If bacterial impairments persist beyond completion of restoration activities, it may be beneficial to add a secondary site upstream of the residential section to help better define the background contributions from wildlife.

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 says that the Belle Fourche Implementation Project covers a large section of the Cheyenne River drainage including the West Strawberry Creek watershed. This project has been approached about addressing the West Strawberry Creek fecal coliform impairment in future phases. Emphasis should be placed on hooking up septic wastewater systems to the city wastewater system in order to stop leaks of fecal coliform and other bacteria into the stream. Since there are no significant point sources in the West Strawberry Creek watershed there is no need to include a discussion of reasonable assurance in this TMDL document.

**COMMENTS:** None.

## 8. Daily Loading Expression

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

### Minimum Submission Requirements:

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

### Recommendation:

- Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The West Strawberry 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.