FECAL COLIFORM TOTAL MAXIMUM DAILY LOAD EVALUATION FOR KEYA PAHA RIVER, TRIPP COUNTY, SOUTH DAKOTA

South Dakota Department of Environment and Natural Resources

Protecting South Dakota's Tomorrow ... Today

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

OCTOBER, 2009

Keya Paha River Total Maximum Daily Load

Entity ID:	SD-NI-R-KEYA_PAHA_01
Location:	HUC Code: 10150006
Size of Watershed:	1,092,300 acres
Waterbody Type:	River/Stream
303(d) Listing Parameter:	FECAL COLIFORM BACTERIA
Initial Listing date:	***2***008 IR
TMDL Priority Ranking:	1
Listed Stream Miles:	60 miles from the Nebraska border upstream to the Tripp and Todd County Line
Designated Use of Concern:	Warmwater Semipermanent Fish Life Propagation
Analytical Approach:	Aquarius, EDNA, Load Duration Curve
Target:	Meet all applicable Water Quality Standards
Indicators:	Fecal Coliform Bacteria Counts
Threshold Value:	< 1000 colonies/100mL geometric mean concentration with maximum single sample concentrations of < 2000 colonies/ 100mL
Waste Load Allocation:	NA
High Flow Zone LA:	***1.34×10^{13} colonies/ day***
High Flow Zone MOS:	***2.25×10^{12} colonies/ day***
High Flow Zone TMDL:	***1.56×10^{13} colonies/ day***

Objective:
The intent of this document is to clearly identify the components of the TMDL submittal to support adequate public participation and facilitate the US Environmental Protection Agency (EPA) review and approval. The TMDL was developed in accordance with Section 303(d) of the federal Clean Water Act and guidance developed by EPA. This TMDL document addresses the fecal coliform bacteria impairment of the Keya Paha River from the Tripp and Todd County lines downstream to the Nebraska Border, SD-NI-R-KEYA_PAHA_01.

Introduction
The Keya Paha River drains over 1 million acres in South Central South Dakota and discharges to the Niobrara River in Nebraska. The river receives runoff from agricultural operations and experiences periods of degraded water quality due to fecal coliform bacteria concentrations. The land use in the watershed is predominately agricultural consisting of cropland (42%) and grazing (57%), with the remaining 1% of the watershed composed of water and wetlands, roads and housing, and forested lands. These percentages are considered representative of both the watershed as a whole, as well as the drainage area immediately surrounding the listed segment. The contributing drainage area is composed of 17% Nebraska Lands, 50% Tripp County Lands, and 33% Todd County Lands.

The Keya Paha River was assessed as an individual portion of the larger Lewis and Clark Watershed Assessment which included individual streams such as the Keya Paha as well as the entire drainage basin and the cumulative effects of the individual waterbodies.

Segment SD-NI-R-KEYA_PAHA_01 is listed for fecal coliform bacteria and total suspended solids. This TMDL will deal specifically with the fecal coliform bacteria listing; suspended solids were addressed in a separate TMDL document. The listed segment stretches across the boundary between Tripp County and the Rosebud Reservation. The majority of the segment is in Tripp County, and this TMDL will be limited to the portions of the reach that are located in Tripp County (see Figure 2).

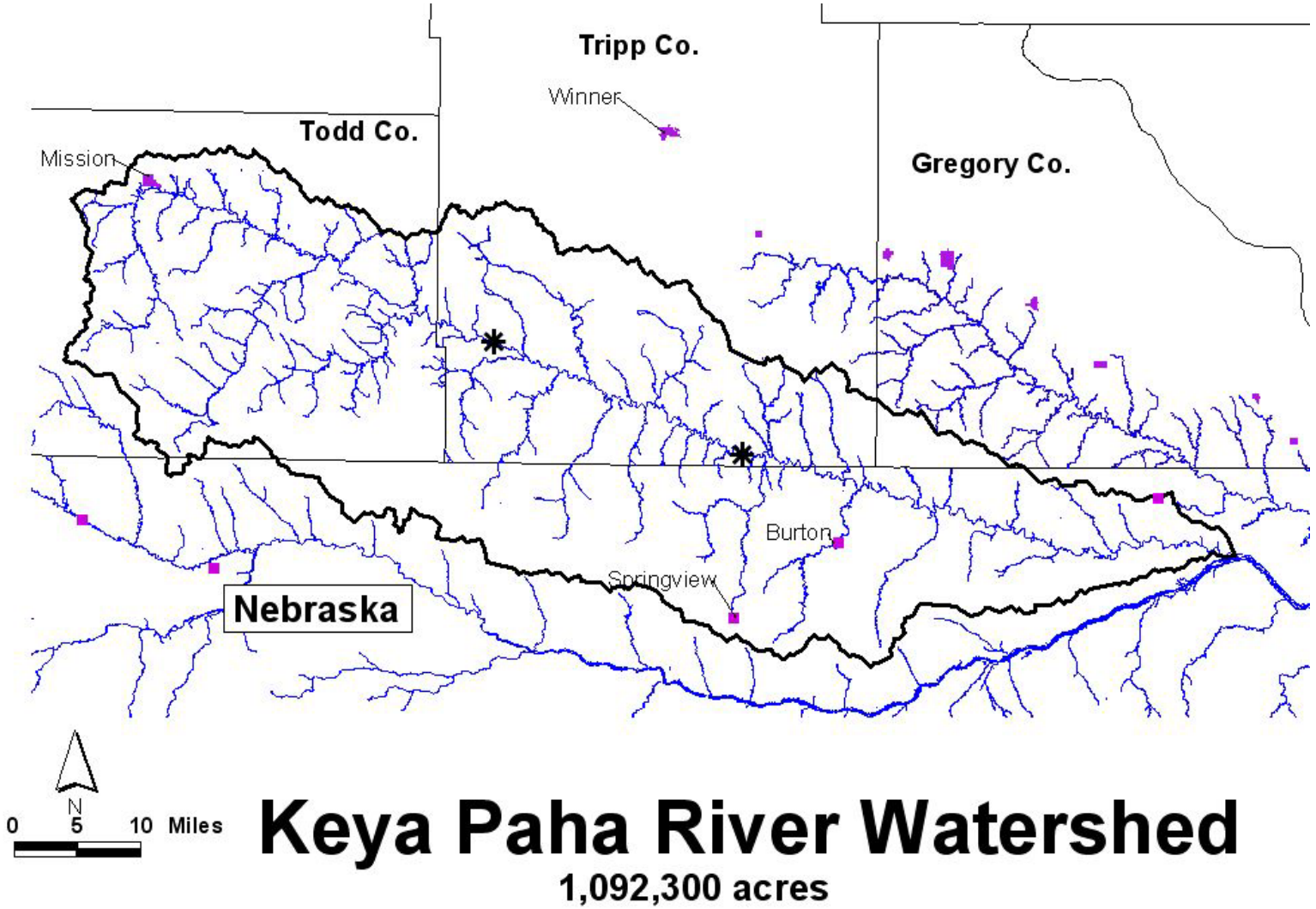

Figure 1. Keya Paha River Watershed

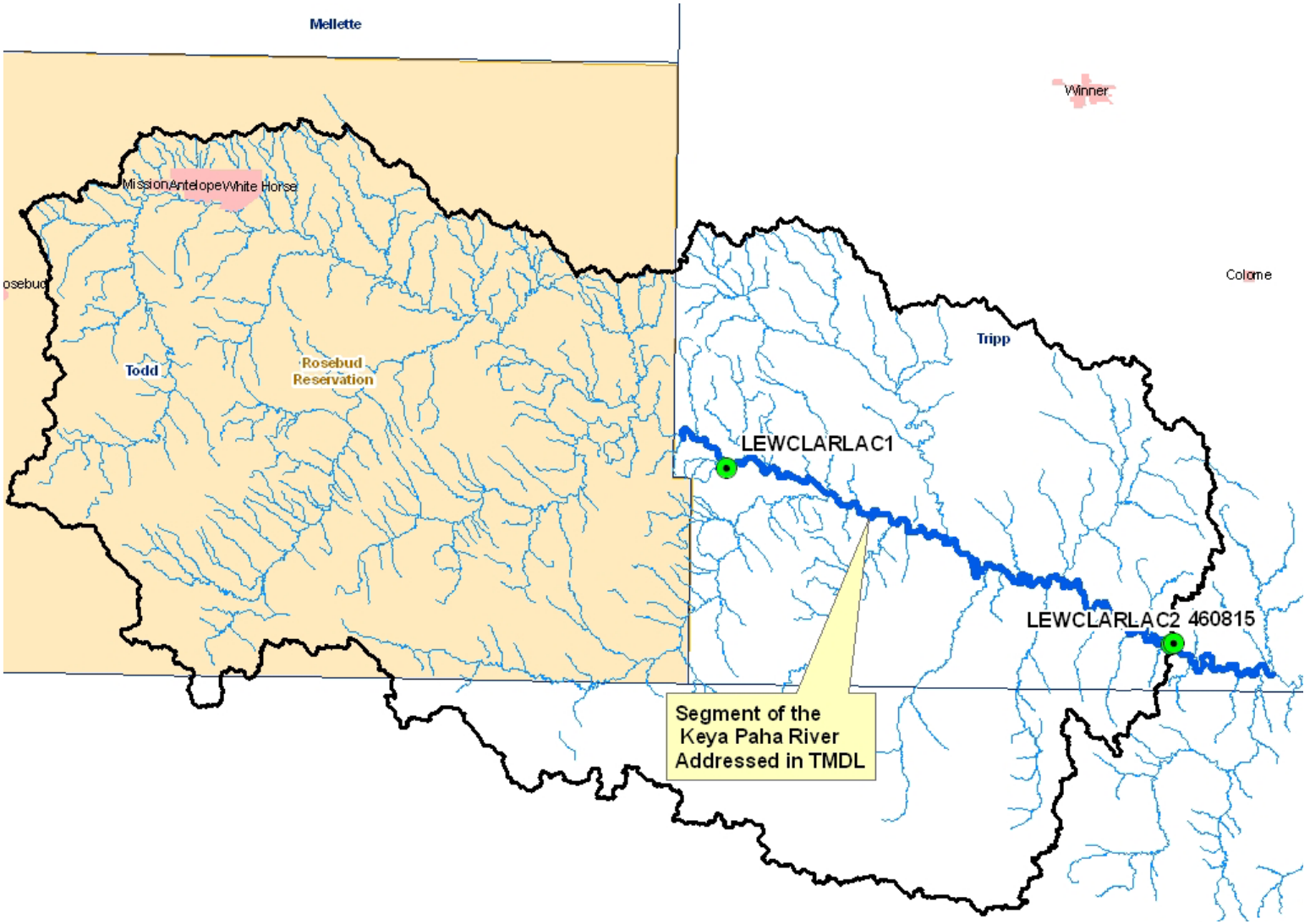

Figure 2. Segment of the TMDL Addressed in the TMDL

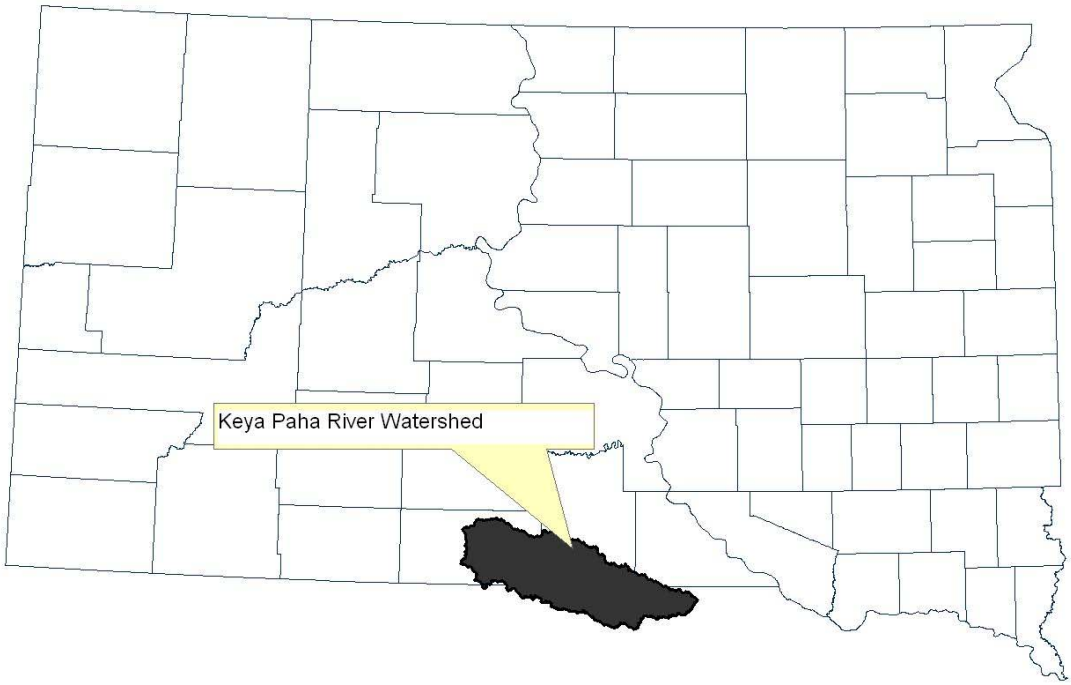

Figure 3 Keya Paha Watershed Location in South Dakota

Description of Applicable Water Quality Standards & Numeric Water Quality Targets

Each waterbody within South Dakota is assigned beneficial uses. All waters (both lakes and streams) are designated 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.

The Keya Paha River from its confluence with Antelope Creek to the Nebraska border has been assigned the beneficial uses of: domestic water supply, warmwater semi-permanent fish life propagation; irrigation waters, limited contact recreation; and fish and wildlife propagation, recreation, and stock watering. Table 1 lists the criteria that must be met to support the specified beneficial uses. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

The numeric TMDL target established for the Keya Paha River is 1000 cfu/100mL, which is based on the chronic standard for fecal coliform. Water quality criteria for the limited contact recreation beneficial use requires that 1) no sample exceeds 2000 colonies/ 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 colonies/ 100mL. These criteria are applicable from May 1 through September 30th.

Table 1. State Water Quality Standards for Keya Paha River.

Parameters	Criteria	Unit of Measure	Beneficial Use Requiring this Standard
Total ammonia nitrogen as N	Equal to or less than the result from Equation 3 in Appendix A of Surface Water Quality Standards	mg/L 30 average May 1 to October 31	Warmwater Semipermanent Fish Propagation
	Equal to or less than the result from Equation 4 in Appendix A of Surface Water Quality Standards	mg/L 30 average November 1 to April 31	
	Equal to or less than the result from Equation c in Appendix A of Surface Water Quality Standards	mg/L Daily Maximum	
Dissolved Oxygen	≥4.0	mg/L	Warmwater Semipermanent Fish Propagation
Total Suspended Solids	≤90 (mean) ≤158 (single sample)	mg/L	Warmwater Semipermanent Fish Propagation
Temperature	≤32	°C	Warmwater Semipermanent Fish Propagation
Fecal Coliform Bacteria (May 1- Sept 30)	≤1000 (geometric mean) ≤2000 (single sample)	count/100 mL	Limited Contact Recreation
Escherichia Coli Bacteria (May 1- Sept 30)	≤630 (geometric mean) ≤1178 (single sample)	count/100 mL	Limited Contact Recreation
Alkalinity ($CaCO_3$)	≤750 (mean) ≤1,313 (single sample)	mg/L	Wildlife Propagation and Stock Watering
Conductivity	≤2,500 (mean) ≤4,375 (single sample)	mhos/cm @ 25° C	Irrigation Waters
Nitrogen, nitrate as N	≤10	mg/L	Domestic Water Supply
pH (standard units)	≥6.5 to ≤9.0	units	Domestic Water Supply
Solids, total dissolved	≤1,000 (mean) ≤1,750 (single sample)	mg/L	Domestic Water Supply
Total Petroleum Hydrocarbon Oil and Grease	≤10 ≤10	mg/L	Wildlife Propagation and Stock Watering
Sodium Adsorption Ratio	<10	ratio	Irrigation Waters
Total Coliform	≤5,000 (mean) ≤20,000 (single sample)	count/100 mL	Domestic Water Supply
Barium	≤1.0	mg/L	Domestic Water Supply
Chloride	≤250	mg/L	Domestic Water Supply
Fluoride	≤4.0	mg/L	Domestic Water Supply
Sulfate	≤500 (mean) ≤875 (single sample)	mg/L	Domestic Water Supply
Total Petroleum Hydrocarbon	≤1.0	mg/L	Domestic Water Supply

Data Collection Method

Data on the Keya Paha River were collected during the Lewis and Clark Watershed Assessment. Data were collected from two sampling points, one near the Todd and Tripp County lines and the second located near the Nebraska border. The data collected during the assessment were used to supplement existing ambient monitoring data from SD DENR ambient water quality monitoring site 460815 which was co-located at site LAC2. Flow data for the Keya Paha River was retrieved from the United States Geological Survey (USGS). Figure 3 represents both the listed segment as well as the sample site locations.

Figure 4. Listed Segment of the Keya Paha River

Analysis will focus on the downstream location, nearest the Nebraska border. Both USGS data as well as ambient water quality data for that location were far more extensive than the upstream site, and better represent the waterbody.

Analysis was completed with modeling programs according to the most recent version of the Water Quality Modeling in South Dakota document (SDDENR, 2009). Elevation Derivatives for National Applications (EDNA) was used to calculate the mean daily flow for the Keya Paha River. Mean daily fecal coliform loadings were calculated using the mean total fecal coliform concentration and the mean daily flow.

Data from the 2006 National Agricultural Statistic Survey and from the 2002 South Dakota Game Fish and Parks county wildlife assessment were utilized for livestock and wildlife densities, respectively. Animal density information was used to estimate relative source contributions of bacteria loads.

Technical Analysis (Linkage Analysis)

Table 2 is a summary of all available data collected from both sites LAC1 and LAC2 during the project in addition to all of the WQM data that has been collected at this site since 1968. The table also indicates the average daily flow from the date that each of the samples was collected from.

Analytical results from fecal coliform bacteria sampling exceeded the acute standard (2000 colonies/ 100mL) on nine of the 123 samples or 7% of the time. The violations do not appear to be storm event driven. Elevated and excessive concentrations were measured at a variety of flows. Similarly, when the data were examined for seasonal patterns, elevated concentrations were found throughout the growing season. Twenty of the 123 samples or 16% of the samples were above the chronic standard of 1000 colonies/ 100mL. It is important to note that the stream did not violate the chronic standard 16% of the time (samples were not collected within 30 days of each other); the waterbody was at risk of exceeding the chronic standard 16% of the time.

Flow data (Figure 5) were obtained from a nearby USGS gauging station (Station number 06464500, Keya Paha River at Wewela, SD). The extended gauge record available at this site provided sufficient data for the development of a load duration curve, located in the TMDL and Allocations for Fecal Coliform Bacteria section of this report.

South Dakota has recently adopted *Escherichia coli* criteria for the protection of the limited contact and immersion recreation uses. However, the Keya Paha River 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 2. Fecal Coliform Samples (Highlighted samples are in excess of the chronic standard and bolded samples are in excess of the acute standard)

Date	Station	Fecal Count	Flow	Date	Station	Fecal Count	Flow	Date	Station	Fecal Count	Flow
05/22/1968	460815	85	72	09/20/1977	460815	140	26	04/16/1985	460815	80	94
03/27/1969	460815	0	450	10/18/1977	460815	60	40	07/16/1985	460815	870	17
12/13/1972	460815	20	18	11/23/1977	460815	5	50	10/22/1985	460815	40	38
10/30/1973	460815	10	46	01/18/1978	460815	7	19	01/22/1986	460815	30	40
03/21/1974	460815	5	54	02/27/1978	460815	23	19	07/14/1986	460815	150	46
04/23/1974	460815	40	77	03/29/1978	460815	10	249	10/21/1986	460815	70	67
06/04/1974	460815	30	31	04/19/1978	460815	1700	595	01/19/1987	460815	5	52
07/23/1974	460815	600	6	05/16/1978	460815	17	111	04/13/1987	460815	300	387
08/27/1974	460815	73	5.9	06/20/1978	460815	140	57	07/13/1987	460815	1400	185
09/23/1974	460815	13	14	07/19/1978	460815	150	40	10/19/1987	460815	50	46
10/29/1974	460815	90	22	08/29/1978	460815	80	24	07/20/1993	460815	430	51
11/19/1974	460815	3	26	09/19/1978	460815	750	23	07/18/1995	460815	250	75
12/17/1974	460815	5	17	10/18/1978	460815	100	26	07/10/1996	460815	200	63
01/27/1975	460815	23	17	11/29/1978	460815	40	26	**07/22/1997**	**460815**	**4900**	**79**
02/25/1975	460815	13	16	12/19/1978	460815	33	24	07/20/1998	460815	1400	65
03/18/1975	460815	3	65	01/17/1979	460815	17	3.5	07/21/1999	460815	300	78
07/23/1975	**460815**	**24000**	**74**	02/14/1979	460815	5	5	07/19/2000	460815	360	75
08/19/1975	460815	210	7.4	03/28/1979	460815	30	199	07/09/2001	460815	370	144
09/22/1975	460815	430	13	04/12/1979	460815	190	188	07/15/2002	460815	30	22
10/15/1975	460815	37	15	05/15/1979	460815	120	105	07/15/2003	460815	90	26
11/25/1975	460815	90	3	06/19/1979	460815	1700	197	**05/12/2004**	**LEWCLART1**	**10000**	**38**
12/16/1975	460815	33	6	07/05/1979	460815	670	75	**05/12/2004**	**LEWCLART1**	**10000**	**38**
01/08/1976	460815	6	10	08/22/1979	460815	320	29	05/12/2004	LEWCLART2	5	38
02/12/1976	460815	5	70	09/19/1979	460815	400	19	05/12/2004	LEWCLART2	320	38
03/23/1976	460815	5	49	10/12/1979	460815	250	25	**05/13/2004**	**LEWCLART1**	**5700**	**71**
04/21/1976	460815	43	34	01/28/1980	460815	3	40	05/13/2004	LEWCLART2	1700	71
05/25/1976	460815	1200	54	04/15/1980	460815	17	84	06/09/2004	LEWCLART1	5	49
06/24/1976	460815	990	11	**10/16/1980**	**460815**	**8000**	**23**	06/09/2004	LEWCLART1	1700	49
07/22/1976	460815	300	1.2	01/13/1981	460815	5	19	06/09/2004	LEWCLART2	130	49
09/16/1976	**460815**	**2100**	**11**	04/23/1981	460815	90	33	07/13/2004	460815	180	28
10/21/1976	460815	220	11	04/20/1982	460815	6	70	04/13/2005	LEWCLART1	590	114
11/04/1976	460815	30	14	05/06/1982	460815	8	47	04/13/2005	LEWCLART2	750	114
12/22/1976	460815	110	8	10/19/1982	460815	130	90	04/26/2005	LEWCLART1	1000	330
01/19/1977	460815	30	3	01/18/1983	460815	5	100	04/26/2005	LEWCLART2	5	330
02/24/1977	460815	5	18	04/26/1983	460815	30	89	04/26/2005	LEWCLART2	900	330
03/31/1977	460815	110	239	07/19/1983	460815	1000	620	06/15/2005	LEWCLART1	1100	606
04/21/1977	**460815**	**9200**	**605**	10/18/1983	460815	240	42	06/15/2005	LEWCLART2	690	606
05/19/1977	460815	90	124	01/17/1984	460815	60	35	07/12/2005	460815	230	41
06/23/1977	460815	80	97	04/17/1984	460815	30	481	07/12/2005	460815	360	41
07/21/1977	460815	1000	43	07/17/1984	460815	160	51	07/18/2007	460815	580	28
08/18/1977	**460815**	**2000**	**36**	10/17/1984	460815	200	42	07/23/2008	460815	150	#N/A

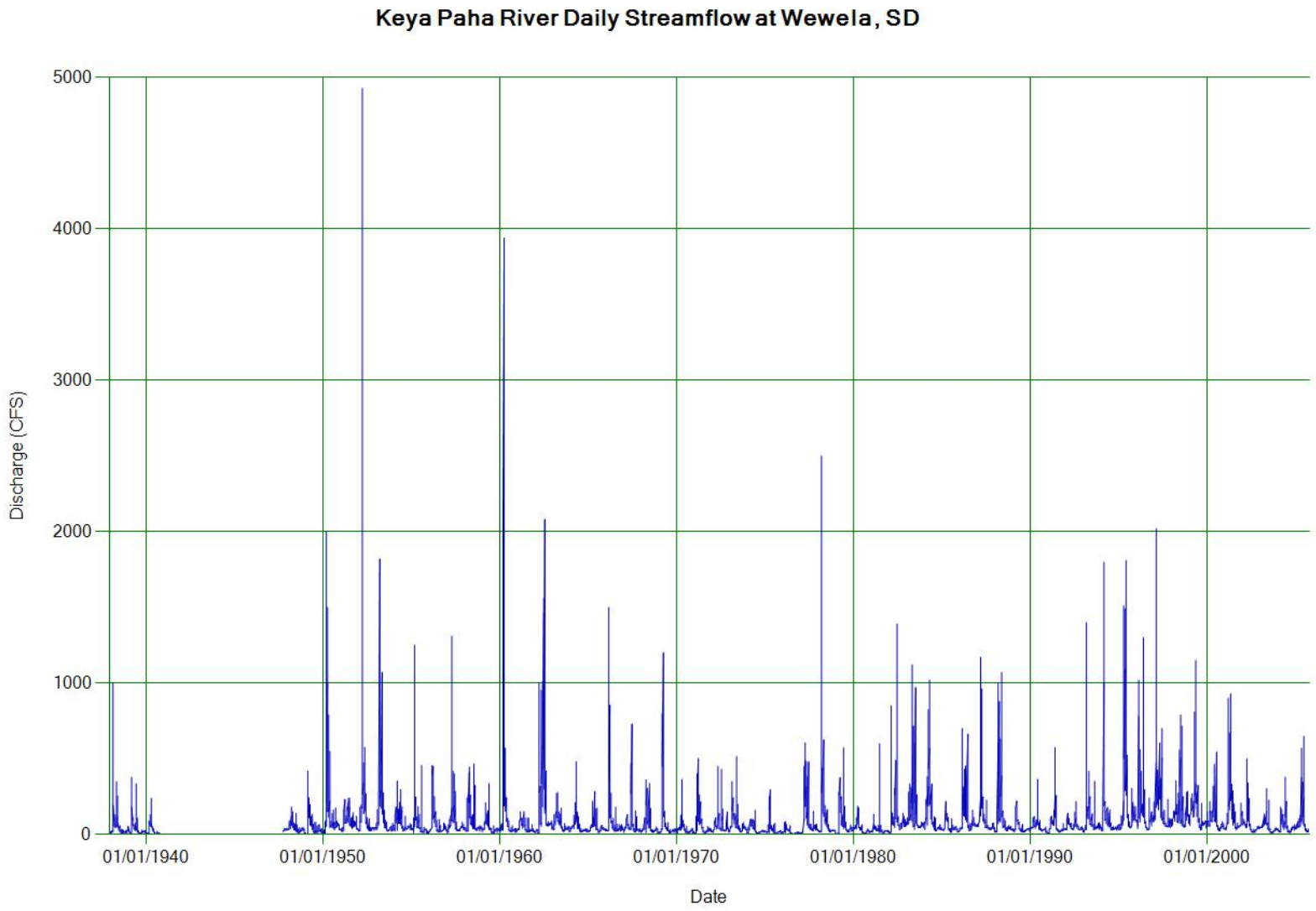

Figure 5. Keya Paya River Daily Streamflow at Wewela, SD

Mean daily flow generated through EDNA was estimated to be 3.05 m^3/s. Mean daily fecal concentrations (average of all samples) were calculated at 875 colonies/ 100 mL. Based on these numbers, the mean daily fecal load in the Keya Paha River could be calculated at 2.3×10^{12} colonies/ day. The result of calculating the mean daily load at the chronic water quality standard of 1000 colonies/ 100 mL yields a mean daily load of 2.6×10^{12} colonies/ day. These estimates suggest that the stream should meet the chronic criteria a majority of the time. Sufficient sample data to calculate geometric means were unavailable. To address the chronic standard, efforts to reduce all samples below the 1000 colonies/100mL threshold will provide assurance the stream meets both the chronic and acute standards at all times.

Table 3 allocates the sources for bacteria production in the watershed into three primary categories. These categories were derived from the use of the National Agricultural Statistics (NASS) data and the South Dakota Game Fish and Parks wildlife data (Huxoll, 2002). These data are further expanded in Table 4 on the following page. The summary is based on several assumptions. Feedlot numbers were calculated as the sum of all dairy, hog, and the NASS estimate of beef in feeding areas. All remaining livestock were assumed to be on grass.

Table 3. Fecal Source Allocation for Keya Paha River

Source	Percentage
Feedlots	33.1%
Livestock on Grass	64.3%
Wildlife	1.2%

Animal feeding operations are present within the watershed. Tripp County has an estimated 140,000 head of cattle with permitted animal feeding operations having the potential of holding a maximum population of over 40,000 animals. The permitted (zero discharge) facilities account for the majority of the animals allocated to the feedlots in Table 3. It is possible that some smaller operations do contribute to the bacteria counts measured in the river, it is more likely that livestock utilizing the stream are the primary source of bacteria. Evidence of this is available in the load duration curve located in Figure 6 which indicates that elevated counts occur throughout all flow regimes.

There are no municipalities or other point sources that discharge to the Keya Paha River. Septic systems were determined to be an insignificant contributing source to the fecal coliform loads in the river based on the following information. Human fecal production may be estimated at 1.95E+9(Yagow et al, 2001). The human population of Keya Paha watershed from the 2000 census was estimated at 3500 people, or 2/ square mile. When included as a total load in the table, human produced fecals account for less than 0.1% of all fecal coliforms produced in the watershed. These bacteria should all be delivered to a septic system, which if functioning correctly would result in no fecal coliforms entering the river.

Table 4 on the following page lists most animal sources of fecal coliform in the Keya Paha River Watershed. Wildlife densities were generated by the SD Game Fish and Parks in the 2002 County Wildlife Assessment. Livestock data were gathered from the National Agricultural Statistics publication for 2004. Assuming an equal distribution

throughout the watershed, the percentages may be used as the source allocations for each species. There are no point sources of fecal coliform in this watershed and it is assumed that if failing septic systems are present they contribute a negligible load.

Table 4. Fecal Coliform Sources by Species in Keya Paha River

Species	#/mile	#/acre	FC/Animal/Day	FC/Acre	Percent
Dairy cow	0.8	1.3E-03	4.46E+10	55787500	0.8%
Beef	110.0	1.7E-01	3.90E+10	6703125000	91.1%
Hog	24.0	3.8E-02	1.08E+10	405000000	5.5%
Sheep	3.0	4.7E-03	1.96E+10	91875000	1.2%
Horse	1.3	2.0E-03	5.15E+10	104568750	1.4%
All Wildlife	Sum of all Wildlife			93226244	1.3%
Turkey (Wild)[1]	1.10	1.7E-03	1.10E+08	189063	
Goose[2]	0.43	6.7E-04	7.99E+08	536828	
Deer[2]	5.09	8.0E-03	3.47E+08	2759734	
Beaver[2]	1.23	1.9E-03	2.00E+05	384	
Raccoon[2]	1.23	1.9E-03	5.00E+09	9609375	
Coyote/Fox[3]	1.04	1.6E-03	1.75E+09	2843750	
Muskrat[1]	0.55	8.6E-04	2.50E+07	21484	
Opossom[4]	0.61	9.5E-04	5.00E+09	4765625	
Mink[4]	0.29	4.5E-04	5.00E+09	2265625	
Skunk[4]	0.37	5.8E-04	5.00E+09	2890625	
Badger[4]	0.21	3.3E-04	5.00E+09	1640625	
Jackrabbit[4]	1.84	2.9E-03	5.00E+09	14375000	
Cottontail[4]	6.14	9.6E-03	5.00E+09	47968750	
Squirrel[4]	0.43	6.7E-04	5.00E+09	3359375	

1 USEPA 2001

2 Bacteria Indicator Tool Worksheet

3 Best Professional Judgment based off of Dogs

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

Summarizing the fecal coliform production in the watershed for all sources excluding human, a total daily fecal production of 8.15×10^{15} colonies/ day are produced. Comparing that with the average annual load of 2.3×10^{12} colonies/ day, the delivery rate may be calculated at 0.028% of the daily production. A low delivery rate suggests a high possibility for successfully mitigating the source of bacteria.

TMDL and Allocations for Fecal Coliform Bacteria

The fecal coliform load duration curve located in Figure 6 represents the 5 standard flow regimes as expressed in the EPA load duration curve guidance (USEPA, 2001). From 61 years of flow data (1937 to 2003), an annual return event of approximately 175 cfs was calculated through the Aquarius program. This equates to a flow frequency of approximately 9%. The 10th percentile or lower end of this regime is set at 163 cfs. Events that occur within this flow regime would be expected to occur less than once per year. Due to the large volume of data, the 90th percentile concentration was used instead of the flow regime maximum (used when data is limited). The high flow regime had a 90th percentile of 1700 colonies/ 100mL, with one of its 17 samples exceeding the acute criteria and five exceeding the chronic standard.

The moist flow regime is characterized by small to moderate runoff events that may be expected to occur on a fairly frequent basis. The upper end of these flows is around 163 cfs while the lower end is approximately 54 cfs. Of the 31 samples collected within this flow regime, 3 (10%) exceeded the acute standard and 6 (20%) exceeded the chronic standard. The 90th percentile of this flow regime was equal to that of the high flow regime at 1700 colonies/ 100mL.

The midrange flows extend from approximately 54 cfs down to 34 cfs. Of the 28 samples collected from this flow regime, 2 (7%) exceeded the acute standard and 4 (14%) exceeded the chronic standard. The 90th percentile was very close to the two higher flow regimes at 1790 colonies/ 100mL. The first three flow regimes (high, moist, and mid range flows) are all driven by runoff events of varying sizes. The consistent concentration across all three flow regimes suggests an evenly distributed source of bacteria outside of the river itself. The most likely form of evenly distributed bacteria would be grazing livestock.

The dry flows extend down from 34 cfs to approximately 15 cfs at the lower end. There were a total of 28 samples collected from this flow regime, one of which exceeded both the acute and the chronic standards. The 90th percentile concentration within this regime was calculated at 631 colonies/100mL, well within the water quality standards, suggesting full support within this flow regime.

The low flow regime extends from approximately 15 cfs to a relatively rare no flow condition. A total of 18 samples were collected from this flow regime, of which only a single sample exceeded either the chronic or acute standard. The 90th percentile concentration was 717 colonies/100 mL, which is very similar to the concentration in the dry flow regime.

The similarity between the dry and low flow regimes, along with only 2 instances of acute exceedence and no samples between the acute and chronic thresholds lend further support to the theory that the primary source is grazing livestock.

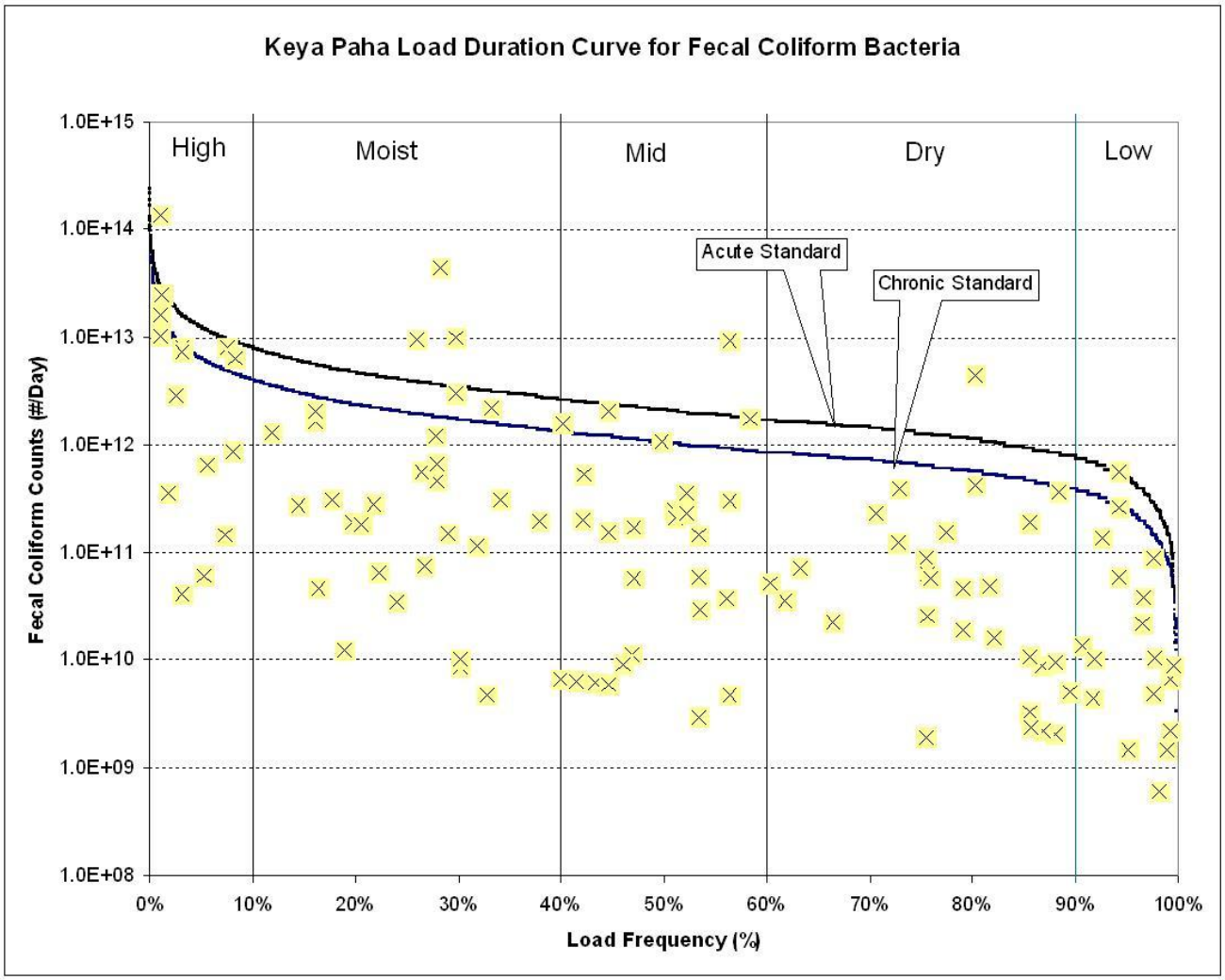

Figure 6. Fecal Coliform Load Duration Curve

Table 5 TMDL Summary for Fecal Coliforms in Keya Paha River

TMDL Component	Flow Zone (expressed as Colonies/Day)				
	High	Moist	Mid	Dry	Low
	>163 cfs	54-163 cfs	35-24 cfs	35-16 cfs	<16 cfs
LA	1.34E+13	3.11E+12	7.82E+11	5.62E+11	1.22E+11
WLA	0	0	0	0	0
MOS	2.25E+12	1.71E+11	4.65E+11	2.45E+11	2.45E+11
TMDL @ 1000 colonies/100 mL	1.56E+13	3.28E+12	1.25E+12	8.07E+11	3.67E+11
Current Load*	2.65E+13	5.57E+12	2.23E+12	5.09E+11	2.63E+11
Load Reduction	41%	41%	44%	0%	0%
*Current Load is the 90th percentile concentration * 90th percentile flow in each regime*					

Wasteload Allocations (WLAs)
There are no point sources of pollutants in this watershed. Therefore, the "wasteload allocation" component of these TMDLs is considered a zero value. The TMDLs are considered wholly included within the "load allocation" component.

Load Allocations (LAs)
Approximately 99% of the landuse in the watershed is agricultural. The majority of the TMDL load has been allocated to these nonpoint source loads in the following load allocations. In the high flow regime, a 41% reduction in fecal coliform bacteria from anthropogenic sources (livestock) is necessary to reach the target of a single sample maximum fecal coliform concentration of less than 1000 colonies/ 100mL. This concentration is the same as the chronic standard, however this reduction is based on reducing a single sample. The resulting chronic values from this reduction would be far less than 1000 colonies/ 100mL. Due to sampling frequency, it was not possible to calculate a valid chronic concentration, but reducing the single sample maximum to the chronic threshold assures full support of both uses. The moist flow regime requires a 41% reduction in fecal coliform bacteria. The mid range flows require a 44% reduction in bacteria. 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 standards will be met.

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

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

Critical Conditions
The impairments to the Keya Paha River are most severe during the late summer. This is the result of warm temperatures (encouraging livestock use of the stream) and peak recreational use of the waters.

Follow-Up Monitoring and TMDL Review

It is critical that monitoring of the suspended solids concentrations be conducted during the implementation of best management practices at both the start and end of the listed segment. These data will provide information on the effectiveness of the BMPs.

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

Public Participation

The project was presented at many meetings during the assessment period. With Randall Resource, Conservation, and Development Associated, Inc, (RC&D) as the leading sponsor, the project was not limited by state boundaries. The project had many partners from both South Dakota as well as Nebraska: Many of the organizations listed below saw several updated presentations as the project progressed. In addition to the many meetings that were attended, a website was also developed and maintained throughout the project.

South Dakota Conservation Districts: Aurora, Bennett, Bon Homme, Charles Mix, Clearfield-Keya Paha, Douglas, Gregory, Hutchinson, Todd, Yankton

Nebraska Natural Resource Districts:
Lewis and Clark, Lower Niobrara, Middle Niobrara, Upper Elkhorn

Government: National Park Service, Nebraska DEQ, NRCS, SD DENR, SD Department of Agriculture, SD GF&P, USACOE, USGS

Organizations: Bon Homme - Yankton Rural Water, Cedar-Knox Rural Water, Cities of Yankton and Springfield, Knox Co. Commission, Lewis and Clark SD-NE Preservation Association, Rosebud Cattlemen's Association, Spring/Bull Creek Watershed District, So. Central Water Development District, Village of Niobrara, Yankton and Rosebud Sioux Tribes

R.C.&D's
Badlands, Lower James, Northeast Nebraska, North Central Nebraska, South Central SD

Industry: Natural Resource Solutions, Brooking South Dakota

The findings from these public meetings and comments have been taken into consideration in development of the Keya Paha Suspended Solids TMDL.

Implementation Plan

Implementation activities for the Keya Paha River watershed were incorporated within the Lewis and Clark implementation Project which covers all of the subwatersheds that drain to Lewis and Clark Lake on the Missouri River.

Literature Cited

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

Huxoll, Cory, 2002, South Dakota Game Fish and Parks; South Dakota Game Report No. 2003-11; 2002 Annual Report County Wildlife Assessments with a summary of the 1991-2002 Assessments.

SDDENR (South Dakota Department of Environment and Natural Resources). 2009. Water Quality Modeling in South Dakota, May, 2009 Revision; Pierre, SD.

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

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

EPA REGION VIII TMDL REVIEW

TMDL Document Info:

Document Name:	**Fecal Coliform Total Maximum Daily Load Evaluation for Keya Paha River, Tripp County, South Dakota**
Submitted by:	**Cheryl Saunders, SD DENR**
Date Received:	**October 29, 2009**
Review Date:	**November 19, 2009**
Reviewer:	**Vern Berry, EPA**
Rough Draft / Public Notice / Final?	**Public Notice Draft**
Notes:	

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

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

Approval Notes to Administrator:

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

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

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

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

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

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

1. Problem Description

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

1.1 TMDL Document Submittal Letter

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

Minimum Submission Requirements.

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

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

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

which matches similar identifying information in the TMDL document for which a review is being requested.

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

SUMMARY: The Keya Paha River fecal coliform TMDL was submitted to EPA for review during the public notice period via an email from Cheryl Saunders, SD DENR on October 29, 2009. The email included the draft TMDL document and a public notice announcement requesting review and comment.

COMMENTS: None

1.2 Identification of the Waterbody, Impairments, and Study Boundaries

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

Minimum Submission Requirements:

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

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

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

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

SUMMARY: The Keya Paha River is a stream located in Tripp County, South Dakota and is a tributary of the Niobrara River in the Keya Paha sub-basin (HUC 10150006). The River has a total drainage area of over 1 million acres in south central South Dakota. The 303(d) listed

segment of Keya Paha River includes 60 miles of the river from the Tripp and Todd County line to the Nebraska border (SD-NI-R-KEYA_PAHA_01). It is listed as high priority for TMDL development. The headwaters of the Keya Paha River are located on the Rosebud Indian Reservation in Todd County, South Dakota. However, the TMDL document only addresses the portion of the River that is located in Tripp County (see Figure 2 of the TMDL).

The designated uses for Keya Paha River include warmwater semi-permanent fish life propagation waters, limited-contract recreation waters, fish and wildlife propagation, recreation, and stock watering. The segment was listed on the 2008 303(d) list for total suspended solids (TSS) which is impairing the warmwater fish life propagation uses, and for fecal coliform bacteria which is impairing the limited contact recreation uses. The TSS impairment in this segment was addressed by SDDENR in a separate TMDL document.

COMMENTS: The HUC code shown on page 1 of the TMDL document does not match that of the Keya Paha watershed – we believe the correct HUC code is 10150006.

DENR RESPONSE: The HUC code was incorrect on the draft submission and has been changed for the final document.

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 Keya Paha River segment addressed by this TMDL is impaired based on fecal coliform concentrations that are impacting the limited contact recreation beneficial use. South Dakota has applicable numeric standards for fecal coliform that may be applied to this river segment. The numeric standards being implemented in this TMDL are: a daily maximum value of fecal coliform of 2000 cfu/100mL in any one sample, or a maximum geometric mean of 1000 cfu/100mL during a 30-day period. Discussion of additional applicable water quality standards for Keya Paha River can be found on pages 3 and 4 of the TMDL.

COMMENTS: The Table 1 criteria should be checked to make sure the chronic descriptions are correct. Typically, the fecal coliform and total coliform chronic standards are expressed as "geometric mean" rather than "mean" (i.e., arithmetic mean or average).

Also, SD has bacteria standards for E. coli that are not mentioned in the TMDL nor included in the water quality standards table (Table 1). At a minimum, this TMDL document should acknowledge the existence of the E. coli standards, mention whether any E. coli data was collected during the assessment project, include the values in Table 1, and describe whether or not the reductions in fecal coliform loading specified in this TMDL are likely to also result in the E. coli standards being met. Ultimately, DENR should develop a plan that describes how the E. coli monitoring and criteria will be phased into the existing monitoring and TMDL programs and how the fecal coliform criteria will be phased out.

DENR RESPONSE: The word "Geometric" was added for further clarification. In addition, the newly adopted E coli standards were also added to the table.

Text was added to the linkage analysis section of the document addressing E coli. The data was not added to this document as it strictly addresses the fecal coliform impairment. Currently, there are no data suggesting that there is an E. coli impairment in this stream segment.

2. Water Quality Targets

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

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

Minimum Submission Requirements:

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

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

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

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

SUMMARY: The water quality targets for this TMDL are based on the numeric water quality standards for fecal coliform established to protect the limited contact recreation beneficial use for the Keya Paha River. The fecal coliform daily maximum value is $\leq$ 2000 cfu/100mL in any one sample, and the maximum geometric mean is $\leq$ 1000 cfu/100mL during a 30-day period.

COMMENTS: The primary numeric target for this TMDL is based on the 30-day geometric mean, limited contact recreation, fecal coliform standard. On page 5 of the TMDL is says the target is based on the "the current daily maximum criteria for fecal coliform bacteria." We suggest changing that wording to read something similar to: "The numeric TMDL target established for the Keya Paha River is 1000 cfu/100mL, which is based on the chronic standard for fecal coliform."

DENR RESPONSE: The changes were made as requested.

3. Pollutant Source Analysis

A TMDL analysis is conducted when a pollutant load is known or suspected to be exceeding the loading capacity of the waterbody. Logically then, a TMDL analysis should consider all sources of the pollutant of concern in some manner. The detail provided in the source assessment step drives the rigor of the pollutant load allocation. In other words, it is only possible to specifically allocate quantifiable loads or load reductions to each significant source (or source category) when the relative load contribution from each source has been estimated. Therefore, the pollutant load

from each significant source (or source category) should be identified and quantified to the maximum practical extent. This may be accomplished using site-specific monitoring data, modeling, or application of other assessment techniques. If insufficient time or resources are available to accomplish this step, a phased/adaptive management approach may be appropriate. The approach should be clearly defined in the document.

Minimum Submission Requirements:

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

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

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

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

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

SUMMARY: The TMDL document identifies the land use in the watershed as predominately agricultural consisting of cropland (42%) and grazing or pasture land (57%), with the remaining 1% of the watershed composed of water, wetlands, roads, housing and forested lands.

Table 3 allocates the sources for bacteria production in the watershed into three primary categories. These categories were derived from the use of the National Agricultural Statistics (NASS) data and the South Dakota Game Fish and Parks wildlife data. Feedlot numbers were calculated as the sum of all dairy, hog, and the NASS estimate of beef in feeding areas. All remaining livestock were assumed to be on grass. There are no municipal or other point source discharges to the Keya Paha River.

Several animal feeding operations are present within the watershed. Tripp County has an estimated 140,000 head of cattle with permitted animal feeding operations having the potential of holding a maximum population of over 40,000 animals. The permitted (zero discharge) facilities account for the majority of the animals allocated to the feedlots in Table 3. It is possible that some smaller operations do contribute to the bacteria counts measured in the river, but it is more likely that livestock utilizing the stream are the primary source of bacteria. Evidence of this is shown on the load duration curve located which indicates that elevated counts occur throughout all flow regimes. Septic systems were determined to be an insignificant contributing source to the fecal coliform loads in the river based on the information provided in the TMDL document.

Table 3. Fecal Source Allocation for Keya Paha River

Source	Percentage
Feedlots	33.1%
Livestock on Grass	64.3%
Wildlife	1.2%

COMMENTS: How many animal feeding areas are located in the watershed? Was AnnAGNPS used to help identify animal feeding areas that may be contributing higher bacteria loads to the river?

DENR RESPONSE: The report states that the most likely source of bacteria is grazing livestock. The majority of animals located in feeding areas are in permitted zero discharge facilities. As a result of this analysis, it was deemed unnecessary to utilize the feeding area portion of the AnnAGNPS model.

4. TMDL Technical Analysis

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

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

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

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

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

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

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

Minimum Submission Requirements:

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

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

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

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

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

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

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

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

Recommendation:

☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

SUMMARY: The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Keya Paha River 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 Keya Paha River was collected during the Lewis and Clark Watershed Assessment. Data was collected at two sampling locations, but the site furthest downstream was chosen to represent the segment. The downstream site is where the USGS flow gage is located, and the ambient water quality data is more extensive. Elevation Derivatives for National Applications (EDNA) was used to calculate the mean daily flow for Keya Paha River. Mean daily fecal coliform loadings were calculated through the use of the mean fecal coliform concentration, and the mean daily flow. The result is an estimated average daily fecal coliform load of 2.3×10^{12} cfu/day at the downstream site.

The TMDL loads and loading capacities were also derived using the load duration curve (LDC) approach. The LDC was divided into 5 distinct flow regimes – high flow ($\geq$ 163 cfs), moist flow (between 163 cfs and 54 cfs), midrange flow (between 54 cfs and 35 cfs), dry flow (between 35 cfs and 15 cfs) and low flow (< 15 cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 6 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 midpoint of each flow regime: high flow = 1.6E+13 cfu/day; moist flow = 303E+12 cfu/day; midrange flow = 1.2E+12 cfu/day; dry flow = 8.1E+11 cfu/day and low flow = 3.7E+11 cfu/day.

COMMENTS: The flow ranges in Table 5 should be checked and corrected for the midrange and dry flows. Moist flow is shown as 54-163 cfs; Mid is 35-24 cfs; and Dry is 35-16 cfs. There is no range that covers the flow from 54-35 cfs and the Mid and Dry range flows overlap. The flow ranges in the text on page 13 appear to be correct.

DENR RESPONSE: The text in the table was modified to correctly match the text on page 13.

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 Keya Paha River TMDL data description and summary are included mostly in the Technical Analysis section of the document. The recent water quality monitoring was conducted over the period from May 2003 to July 2005, but the full data set includes 123 fecal coliform samples from 1968 to the present. The data set also includes the 61 years of flow record on the Keya Paha River that was used by the Aquarius program to develop a load duration curve for this TMDL.

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 Keya Paha River TMDL document says that there are no municipal or other point source discharges to Keya Paha River. Therefore, the WLA for this TMDL 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 Load Allocations section of the TMDL explains that the landuse in the watershed is 99% agricultural. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Table 5 includes the load allocations at each of the five flow regimes – 1.3E+13 cfu/day at high flows; 3.1E+12 cfu/day at moist flows; 7.8E+11 cfu/day at midrange flows; 5.6E+11 cfu/day at dry flows and 1.2E+11 cfu/day at low flow.

COMMENTS: Perhaps it's coincidence, or the fact that both the Keya Paha TSS and FC TMDLs were derived from the same data set for flow, but the LAs for this TMDL are very similar to those for the TSS TMDL. The load allocations for the TSS TMDL also started with 1.3, 3.1, 7.8, 5.6 and 1.2. Please check the loading calculations for this TMDL and make sure the values shown in Table 5 are accurate.

The load allocations section says that an 41% reduction is needed "…to reach the target of a single sample maximum total suspended solids concentration of less than 90 mg/L." TMDL target for this TMDL is based on the 30-day geometric mean fecal coliform standard, not the single sample maximum. We suggest changing that wording to read something similar to: a 41% reduction is needed "…to reach the target of a geometric mean fecal coliform concentration of less than 1000 cfu/100mL."

DENR RESPONSE: The values shown in Table 5 are accurate. The values between the two TMDLs are remarkably similar but easily explained. As mentioned, it begins with the use of identical flow data, creating a constant between the tables. Further compounding the similarities are the values used for the TMDL. The chronic standard of 1000 colonies/ 100mL was selected for this TMDL. The TSS TMDL that is referenced utilized a concentration of 90 mg/L. This 9 vs. 10 would have been expected to produces digits that were 90% of each other, however there is one additional factor to be taken

into consideration, that being the conversion of colonies/100mL and mg/L to colonies/day and tons/ day respectively. The bacterial conversion begins with the digits 24 while the first to non zero digits in the solids conversion are 27. Multiplying 9 by 27 results in 243 while 10 by 24 results in 240, nearly identical numbers.

To avoid any issues with concern over the TMDLs ability to meet the chronic standard, it was written with reductions that were sufficient to reduce the maximum measured sample on a given day to meet a value that is equal to the chronic threshold. In the case of the Keya Paha, this results in an extra 100% margin of Safety. Since no point sources exist in the watershed, this was deemed acceptable. While the semantics used may not be totally accurate, the response from EPA does not adequately address the situation either. The reductions will reach a single sample maximum of 1000 colonies/ 100 mL. It is not based on the chronic standard, but it will assure that it is met. Ultimately, the required reduction to meet the chronic standard would be less than the 41%, however insufficient data exits to calculate this. Additional language has been added to the TMDL to further clarify this.

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 Keya Paha River 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 Table 5 of the TMDL.

COMMENTS: None.

4.5 Seasonality and variations in assimilative capacity:

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

Minimum Submission Requirements:

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

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

SUMMARY: By using the load duration curve approach to develop the TMDL allocations seasonal variability in fecal coliform loads are taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months.

COMMENTS: None.

5. Public Participation

EPA regulations require that the establishment of TMDLs be conducted in a process open to the public, and that the public be afforded an opportunity to participate. To meaningfully participate in the TMDL process it is necessary that stakeholders, including members of the general public, be able to understand the problem and the proposed

solution. TMDL documents should include language that explains the issues to the general public in understandable terms, as well as provides additional detailed technical information for the scientific community. Notifications or solicitations for comments regarding the TMDL should be made available to the general public, widely circulated, and clearly identify the product as a TMDL and the fact that it will be submitted to EPA for review. When the final TMDL is submitted to EPA for approval, a copy of the comments received by the state and the state responses to those comments should be included with the document.

Minimum Submission Requirements:

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

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

Recommendation:

☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

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

COMMENTS: None.

6. Monitoring Strategy

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

Minimum Submission Requirements:

☒ When a TMDL involves both NPDES permitted point source(s) and nonpoint source(s) allocations, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL

document should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring.

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

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

SUMMARY: Keya Paha River should continue to be monitored as part of the Lewis and Clark Implementation Project. 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 Implementation Plan section of the TMDL document says that an implementation plan has already been developed for all of the subwatersheds that drain to Lewis

and Clark Lake. Since there are no point sources in the Keya Paha River watershed there is no need to include a discussion of reasonable assurance in this TMDL document.

COMMENTS: It would be informative to provide a brief summary of the status of Lewis and Clark Implementation Project.

DENR RESPONSE: The status of the implementation project is dynamic and would be outdated information by the time the TMDL was published. Although this would be informative, DENR would prefer not to include this information.

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 Keya Paha River fecal coliform TMDL includes daily loads expressed as colonies per day. The daily TMDL loads are included in TMDL and Allocations section of the TMDL document.

COMMENTS: None.

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

FEB 01 2010

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
Keya Paha River; Fecal Coliform; SD-NI-R-KEYA_PAHA_01

Dear Mr. Pirner:

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

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

Sincerely,

Eddie A. Sierra
Acting Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

Enclosure

ENCLOSURE 1: APPROVED TMDLs

Fecal Coliform Total Maximum Daily Load Evaluation for Keya Paha River, Tripp County, South Dakota (October 2009).

1 Pollutant TMDLs completed.

1 Causes addressed from the 2008 303(d) list.

Submitted: 1/13/2010

Segment: Keya Paha River - from headwaters to Nebraska border

303(d) ID: SD-NI-R-KEYA_PAHA_01

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

Water Quality Targets: <= 1000 cfu/100mL 30-day geometric mean; <= 2000 cfu/100mL single sample maximum

Allocation*	Value	Units	Permits
WLA	0	CFU/DAY	
MOS	1.71E+11	CFU/DAY	
LA	3.11E+12	CFU/DAY	
TMDL	3.28E+12	CFU/DAY	

Notes: Loads shown represent the loads during the moist flow regime as defined by the load duration curve for the Keya Paha River (see Table 5 in the TMDL document). 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

ENCLOSURE 2

EPA REGION VIII TMDL REVIEW

TMDL Document Info:

Document Name:	**Fecal Coliform Total Maximum Daily Load Evaluation for Keya Paha River, Tripp County, South Dakota**
Submitted by:	**Cheryl Saunders, SD DENR**
Date Received:	**January 13, 2010**
Review Date:	**January 26, 2010**
Reviewer:	**Vern Berry, EPA**
Rough Draft / Public Notice / Final?	**Final**
Notes:	

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

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

Approval Notes to Administrator:

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

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

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

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

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

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

1. Problem Description

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

1.1 TMDL Document Submittal Letter

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

Minimum Submission Requirements.

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

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

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

Recommendation:

☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

SUMMARY: The Keya Paha River fecal coliform TMDL was submitted to EPA for review and approval via an email from Cheryl Saunders, SD DENR on January 13, 2010. The email included the final TMDL document and a letter requesting approval of the TMDLs.

COMMENTS: None

1.2 Identification of the Waterbody, Impairments, and Study Boundaries

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

Minimum Submission Requirements:

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

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

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

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

SUMMARY: The Keya Paha River is a stream located in Tripp County, South Dakota and is a tributary of the Niobrara River in the Keya Paha sub-basin (HUC 10150006). The River has a total drainage area of over 1 million acres in south central South Dakota. The 303(d) listed segment of Keya Paha River includes 60 miles of the river from the Tripp and Todd County line to the Nebraska border (SD-NI-R-KEYA_PAHA_01). It is listed as high priority for TMDL development. The headwaters of the Keya Paha River are located on the Rosebud Indian Reservation in Todd County, South Dakota. However, the TMDL document only addresses the portion of the River that is located in Tripp County (see Figure 2 of the TMDL). Likewise, EPA's approval of the TMDL for the Keya Paha River is applicable only to that portion of the watershed that is not located within Indian Country.

The designated uses for Keya Paha River include warmwater semi-permanent fish life propagation waters, limited-contract recreation waters, fish and wildlife propagation, recreation, and stock watering. The segment was listed on the 2008 303(d) list for total suspended solids (TSS) which is impairing the warmwater fish life propagation uses, and for fecal coliform bacteria which is impairing the limited contact recreation uses. The TSS impairment in this segment was addressed by SDDENR in a separate TMDL document.

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 Keya Paha River segment addressed by this TMDL is impaired based on fecal coliform concentrations that are impacting the limited contact recreation beneficial use. South Dakota has applicable numeric standards for fecal coliform that may be applied to this river segment. The numeric standards being implemented in this TMDL are: a daily maximum value of fecal coliform of 2000 cfu/100mL in any one sample, or a maximum geometric mean of 1000 cfu/100mL during a 30-day period. Discussion of additional applicable water quality standards for Keya Paha River can be found on pages 3 and 4 of the TMDL.

COMMENTS: None.

2. Water Quality Targets

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

Minimum Submission Requirements:

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

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

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

Recommendation:

☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

SUMMARY: The water quality targets for this TMDL are based on the numeric water quality standards for fecal coliform established to protect the limited contact recreation beneficial use for the Keya Paha River. The fecal coliform daily maximum value is $\leq$ 2000 cfu/100mL in any one sample, and the maximum geometric mean is $\leq$ 1000 cfu/100mL during a 30-day period.

COMMENTS: None.

3. Pollutant Source Analysis

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

Minimum Submission Requirements:

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

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

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

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

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

SUMMARY: The TMDL document identifies the land use in the watershed as predominately agricultural consisting of cropland (42%) and grazing or pasture land (57%), with the remaining 1% of the watershed composed of water, wetlands, roads, housing and forested lands.

Table 3 allocates the sources for bacteria production in the watershed into three primary categories. These categories were derived from the use of the National Agricultural Statistics (NASS) data and the South Dakota Game Fish and Parks wildlife data. Feedlot numbers were calculated as the sum of all dairy, hog, and the NASS estimate of beef in feeding areas. All remaining livestock were assumed to be on grass. There are no municipal or other point source discharges to the Keya Paha River.

Several animal feeding operations are present within the watershed. Tripp County has an estimated 140,000 head of cattle with permitted animal feeding operations having the potential of holding a maximum population of over 40,000 animals. The permitted (zero discharge) facilities account for the majority of the animals allocated to the feedlots in Table 3. It is possible that some smaller operations do contribute to the bacteria counts measured in the river, but it is more likely that livestock utilizing the stream are the primary source of bacteria. Evidence of this is shown on the load duration curve located which indicates that elevated counts occur throughout all flow regimes. Septic systems were determined to be an insignificant

contributing source to the fecal coliform loads in the river based on the information provided in the TMDL document.

Table 3. Fecal Source Allocation for Keya Paha River

Source	Percentage
Feedlots	33.1%
Livestock on Grass	64.3%
Wildlife	1.2%

COMMENTS: None.

4. TMDL Technical Analysis

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

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

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

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

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

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

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

Minimum Submission Requirements:

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

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

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

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

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

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

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

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

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

SUMMARY: The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Keya Paha River 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 Keya Paha River was collected during the Lewis and Clark Watershed Assessment. Data was collected at two sampling locations, but the site furthest downstream was chosen to represent the segment. The downstream site is where the USGS flow gage is located, and the ambient water quality data is more extensive. Elevation Derivatives for National Applications (EDNA) was used to calculate the mean daily flow for Keya Paha River. Mean daily fecal coliform loadings were calculated through the use of the mean

fecal coliform concentration, and the mean daily flow. The result is an estimated average daily fecal coliform load of 2.3×10^{12} cfu/day at the downstream site.

The TMDL loads and loading capacities were also derived using the load duration curve (LDC) approach. The LDC was divided into 5 distinct flow regimes – high flow (≥ 163 cfs), moist flow (between 163 cfs and 54 cfs), midrange flow (between 54 cfs and 35 cfs), dry flow (between 35 cfs and 15 cfs) and low flow (< 15 cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 6 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 midpoint of each flow regime: high flow = 1.6E+13 cfu/day; moist flow = 303E+12 cfu/day; midrange flow = 1.2E+12 cfu/day; dry flow = 8.1E+11 cfu/day and low flow = 3.7E+11 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 Keya Paha River TMDL data description and summary are included mostly in the Technical Analysis section of the document. The recent water quality monitoring was conducted over the period from May 2003 to July 2005, but the full data set includes 123 fecal coliform samples from 1968 to the present. The data set also includes the 61 years of flow record on the Keya Paha River that was used by the Aquarius program to develop a load duration curve for this TMDL.

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 Keya Paha River TMDL document says that there are no municipal or other point source discharges to Keya Paha River. Therefore, the WLA for this TMDL 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 Load Allocations section of the TMDL explains that the landuse in the watershed is 99% agricultural. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Table 5 includes the load allocations at each of the five flow regimes – 1.3E+13

cfu/day at high flows; 3.1E+12 cfu/day at moist flows; 7.8E+11 cfu/day at midrange flows; 5.6E+11 cfu/day at dry flows and 1.2E+11 cfu/day at low flow.

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 Keya Paha River 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 Table 5 of the TMDL.

COMMENTS: None.

4.5 Seasonality and variations in assimilative capacity:

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

Minimum Submission Requirements:

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

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

SUMMARY: By using the load duration curve approach to develop the TMDL allocations seasonal variability in fecal coliform loads are taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months. Also, the fecal coliform standard only applies to streams from May 1 through September 30, which is the season that the TMDL addresses.

COMMENTS: None.

5. Public Participation

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

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

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

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

SUMMARY: The State's submittal includes a summary of the public participation process that has occurred which describes the ways the public has been given an opportunity to be involved in the TMDL development process so far. In particular, the State has encouraged participation through public meetings in the watershed, and a website was developed and maintained throughout the project. The TMDL was available

for a 30-day public notice period prior to finalization. The final document included a summary of the comments received and the State's response to each comment.

COMMENTS: None.

6. Monitoring Strategy

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

Minimum Submission Requirements:

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

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

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

SUMMARY: Keya Paha River should continue to be monitored as part of the Lewis and Clark Implementation Project. 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 Implementation Plan section of the TMDL document says that an implementation plan has already been developed for all of the subwatersheds that drain to Lewis and Clark Lake. Since there are no point sources in the Keya Paha River 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 Keya Paha River fecal coliform TMDL includes daily loads expressed as colonies per day. The daily TMDL loads are included in TMDL and Allocations section of the TMDL document.

COMMENTS: None.