

**TOTAL SUSPENDED SOLIDS 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**

**MAY, 2009**

## **Keya Paha River Total Maximum Daily Load**

<b><i>Waterbody Type:</i></b>	River/Stream
<b><i>303(d) Listing Parameter:</i></b>	Total Suspended Solids
<b><i>TMDL Priority Ranking:</i></b>	1
<b><i>Initial Listing date:</i></b>	1998 IR
<b><i>Entity ID:</i></b>	SD-NI-R-KEYA_PAHA_01
<b><i>Designated Use of Concern:</i></b>	Warmwater Semipermanent Fish Life Propagation
<b><i>Listed Stream Miles:</i></b>	60 miles from the Nebraska border upstream to the Tripp and Todd County Line
<b><i>Size of Watershed:</i></b>	1,092,300 acres
<b><i>Analytical Approach:</i></b>	AnnAGNPS, RGAs, Aquarius, EDNA
<b><i>Indicators:</i></b>	Total Suspended Solids Concentration
<b><i>Location:</i></b>	HUC Code: 10150006
<b><i>Target:</i></b>	< 90 mg/L mean concentration with maximum single sample concentrations of < 158 mg/L

### **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 total suspended solids impairment of the Keya Paha River from the Tripp and Todd County Line 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. The river experiences periods of degraded water quality due to total suspended solids 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 looked at 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 total suspended solids listing; bacteria 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, this TMDL will be limited to the portions of the reach that are located in Tripp County (see Figure 2).

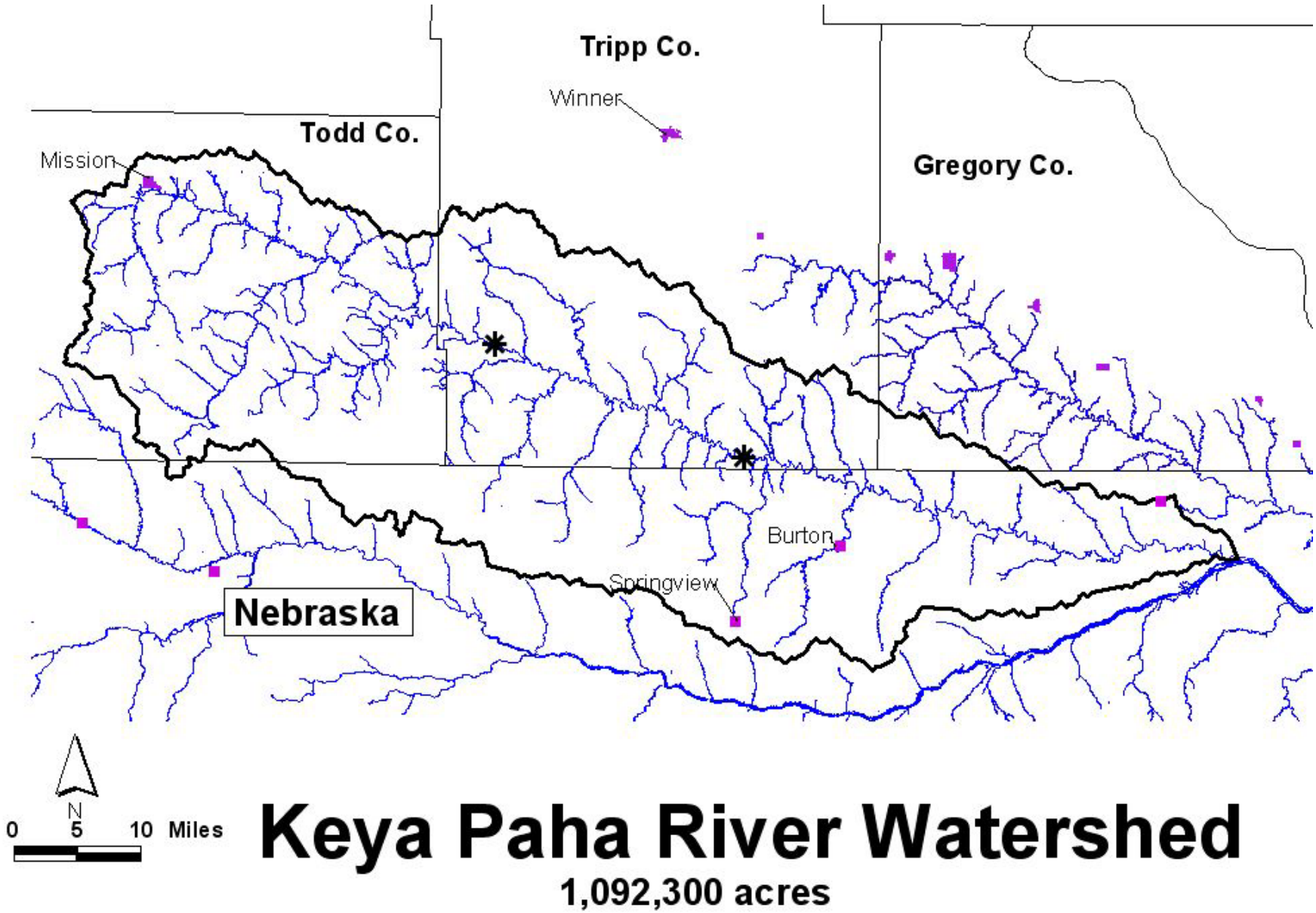


Figure 1. Keya Paha River Watershed from its Confluence with the Niobrara

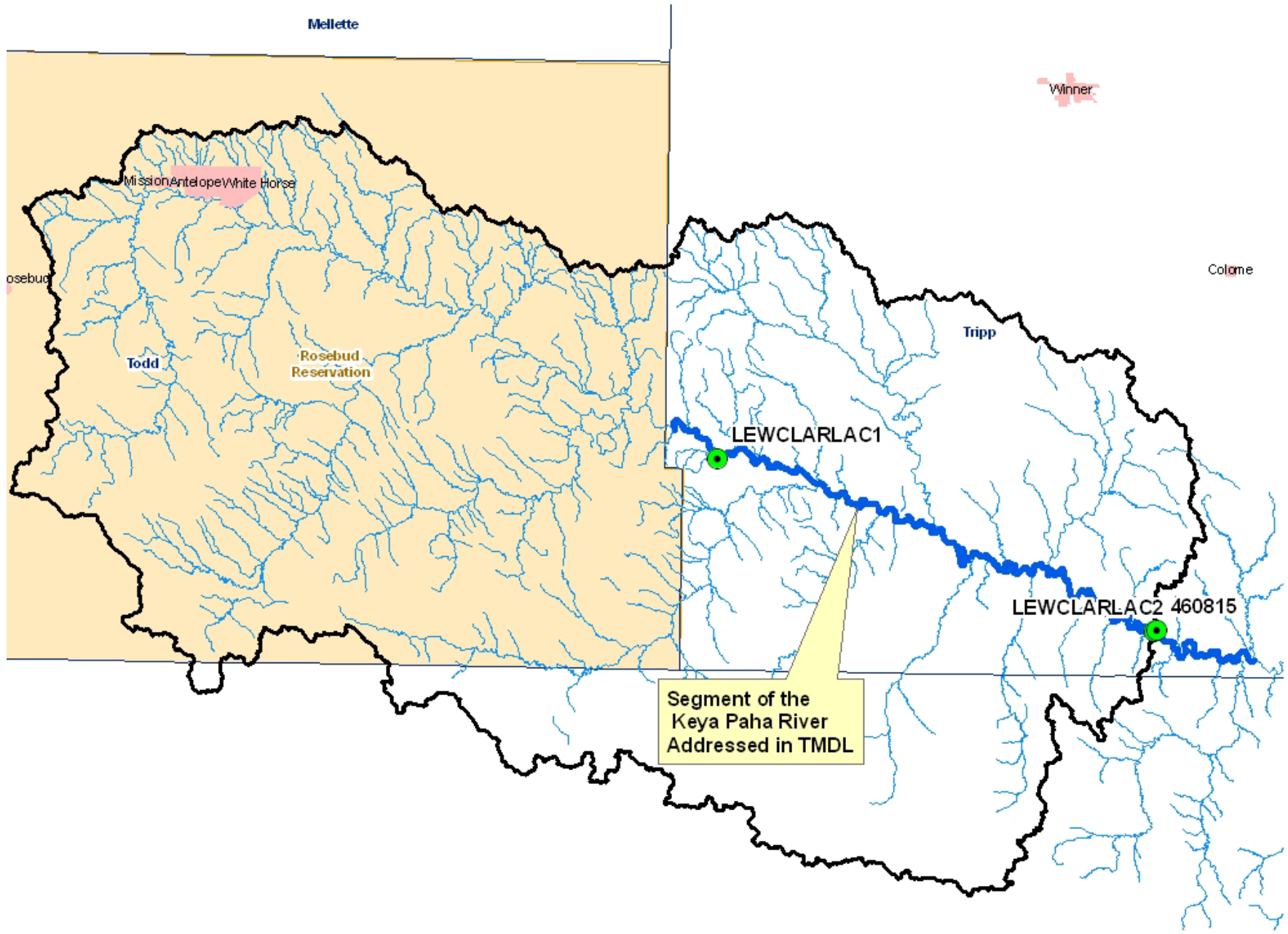


Figure 2. Segment of the Keya Paha Addressed in TMDL



**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 are assigned by the state based on a beneficial use analysis of each waterbody. Water quality standards have been defined in South Dakota state statutes in support of these uses. These standards consist of suites of 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 based on the current water quality standards. Water quality criteria for the semipermanent fish life propagation beneficial use requires that 1) no sample exceeds 158 mg/L and 2) during a 30-day period, the average concentration must not exceed 90 mg/L. This criterion is applicable throughout the year.

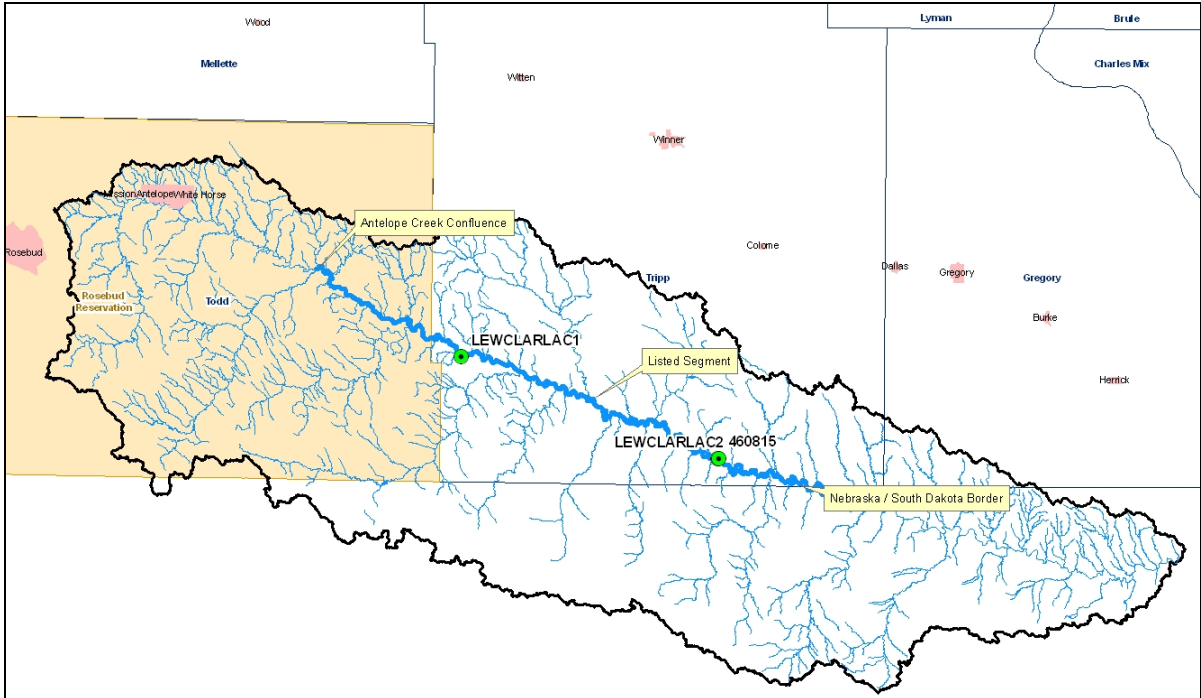
**Table 1. State Water Quality Standards for Keya Paha River.**

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
Alkalinity (CaCO <sub>3</sub> )	≤750 (mean) ≤1,313 (single sample)	mg/L	Wildlife Propagation and Stock Watering
Conductivity	≤2,500 (mean) ≤4,375 (single sample)	µmhos/cm @ 25° C	Irrigation Waters
Nitrogen, nitrate as N	≤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	≤10	mg/L	Wildlife Propagation and Stock Watering
Oil and Grease	≤10		
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 was collected during the Lewis and Clark Watershed Assessment. Data was 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 was used to supplement existing ambient monitoring data from site 460815 which was co-located with site LAC2. Flow data for the Keya Paha River was retrieved from the United States Geological Survey (USGS). Figure 4 represents both the listed segment as well as the sample site locations. The entire segment is listed; however this TMDL will strictly address those waters downstream of the Todd County line.





**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. Elevation Derivatives for National Applications (EDNA) was used to calculate the mean daily flow for the Keya Paha River. Mean daily total suspended solids loadings were calculated using the mean total suspended solids concentration and the mean daily flow. Rapid geomorphic assessments were conducted at 23 locations throughout the Keya Paha basin. AnnAGNPs modeling was completed on 32 individual sub watersheds of the Keya Paha.

**Technical Analysis (Linkage Analysis)**

Analytical results from total suspended solids sampling suggests that the acute standard of 158 mg/L is exceeded approximately 15% of the time and the chronic standard of 90 mg/L approximately 30% of the time. The violations appear to be storm event driven with the highest concentrations occurring during high flow events. Table 2 represents the samples collected from the Keya Paha River at the downstream site. There are no municipalities or other point sources that discharge to the river. All of the loads are nonpoint source in nature.

**Table 2 Keya Paha River Total Suspended Solids Samples at sites LAC2 and 460815**

Date	Tot Sus Sol (mg/L)	Discharge (cfs)	Date	Tot Sus Sol (mg/L)	Discharge (cfs)	Date	Tot Sus Sol (mg/L)	Discharge (cfs)
03/27/1969	135	450	03/28/1979	685	199	07/20/1994	100	45
10/30/1973	17	46	04/12/1979	150	188	10/19/1994	64	49
03/21/1974	61	54	05/15/1979	55	105	01/20/1995	7	29
04/23/1974	60	77	06/19/1979	1000	197	04/20/1995	178	305
06/04/1974	58	31	07/05/1979	114	75	07/18/1995	126	75
07/23/1974	30	6	08/22/1979	58	29	10/17/1995	76	102
08/27/1974	20	5.9	09/19/1979	31	19	01/24/1996	9	74
09/23/1974	30	14	10/12/1979	17	25	04/16/1996	114	223
10/29/1974	9	22	01/28/1980	17	40	07/10/1996	120	63
11/19/1974	17	26	04/15/1980	75	84	10/21/1996	34	91
12/17/1974	3	17	07/25/1980	12	5.6	01/21/1997	92	164
01/27/1975	5	17	10/16/1980	86	23	04/21/1997	154	513
02/25/1975	98	16	01/13/1981	6	19	07/22/1997	26	79
03/18/1975	30	65	04/23/1981	31	33	10/22/1997	55	89
04/22/1975	63	68	04/20/1982	20	70	01/26/1998	20	99
05/21/1975	31	30	05/06/1982	3	47	04/20/1998	171	150
07/23/1975	829	74	07/19/1982	200	90	07/20/1998	168	65
08/19/1975	76	7.4	10/19/1982	60	90	10/19/1998	226	187
09/22/1975	47	13	01/18/1983	22	100	01/20/1999	352	100
10/15/1975	23	15	04/26/1983	92	89	04/21/1999	123	208
11/25/1975	8	3	07/19/1983	248	620	07/21/1999	184	78
12/16/1975	82	6	10/18/1983	31	42	10/28/1999	30	64
01/08/1976	17	10	01/17/1984	16	35	01/11/2000	24	80
02/12/1976	20	70	04/17/1984	136	481	04/17/2000	67	88
03/23/1976	24	49	07/17/1984	155	51	07/19/2000	128	75
04/21/1976	32	34	10/17/1984	154	42	10/10/2000	40	42
05/25/1976	41	54	04/16/1985	60	94	01/08/2001	15	35
06/24/1976	59	11	06/26/1985	50	39	04/16/2001	520	329
07/22/1976	20	1.2	07/16/1985	34	17	07/09/2001	246	144
09/16/1976	67	11	10/22/1985	12	38	10/22/2001	38	52
10/21/1976	8	11	01/22/1986	14	40	01/07/2002	7	65
11/04/1976	7	14	04/22/1986	162	271	04/01/2002	960	396
12/22/1976	9	8	07/14/1986	88	46	07/15/2002	53	22
01/19/1977	14	3	01/19/1987	16	52	10/15/2002	15	26
02/24/1977	8	18	04/13/1987	432	387	01/07/2003	17	49
03/31/1977	111	239	07/13/1987	168	185	04/15/2003	92	71
04/21/1977	265	605	10/19/1987	24	46	07/15/2003	70	26
05/19/1977	59	124	11/02/1988	23	45	10/14/2003	23	22
06/23/1977	102	97	04/17/1989	26	76	01/13/2004	10	24
07/21/1977	88	43	07/19/1989	180	35	04/13/2004	32	58
08/18/1977	60	36	10/18/1989	20	28	07/13/2004	94	28
09/20/1977	22	26	01/16/1990	4	45	10/12/2004	23	30
10/18/1977	41	40	04/17/1990	56	43	10/12/2004	21	30
11/23/1977	20	50	07/17/1990	160	44	01/11/2005	5	44
12/19/1977	9	32	10/16/1990	28	31	04/12/2005	180	105
01/18/1978	12	19	01/23/1991	14	5.5	04/12/2005	172	105
02/27/1978	18	19	04/16/1991	84	91	07/12/2005	84	41
03/29/1978	255	249	07/17/1991	100	28	07/12/2005	84	41
04/19/1978	375	595	10/22/1991	20	31	10/18/2005	19	27
05/16/1978	26	111	01/22/1992	6	32	01/26/2006	41	55
06/20/1978	74	57	04/07/1992	40	50	01/26/2006	40	55
07/19/1978	104	40	07/21/1992	164	70	04/13/2006	134	168
08/29/1978	48	24	10/20/1992	10	33	07/25/2006	23	15
09/19/1978	60	23	01/20/1993	11	16	09/30/2006	20	30
10/18/1978	29	26	04/20/1993	272	251	01/16/2007	3	26
11/29/1978	10	26	07/20/1993	92	51	04/17/2007	49	100
12/19/1978	13	24	10/19/1993	26	44	07/18/2007	68	28
01/17/1979	16	3.5	01/20/1994	18	27	10/15/2007	176	67
02/14/1979	170	5	04/18/1994	50	81			



The suspended solids load calculated from the water quality data for this project was approximately 7,952 tons/ year for the downstream site. This was calculated based on an EDNA water load of 3.05 m<sup>3</sup>/s and an average TSS concentration of 75 mg/L (75 mg/L was based on 24 samples collected during the project period, this was done to make the data more comparable to data collected in Nebraska during the same time period). This load is higher than the median sediment production rate for the rest of the Lewis and Clark basin. The rate of erosion for this site is equal to 2.73 tons/km<sup>2</sup>.

The upstream site (LAC1) generated a load of 3,382 tons/ year based on 28 samples with a sample concentration of 69.5 mg/L and an EDNA water load of 1.4 m<sup>3</sup>/s. The resulting rate of erosion is 2.46 tons/ km<sup>2</sup>. Further comparison of these sites may be found in Table 3. Average suspended solids concentrations, volatile solids concentrations, and the percent volatile all indicate that the water quality changes very little between the two sites.

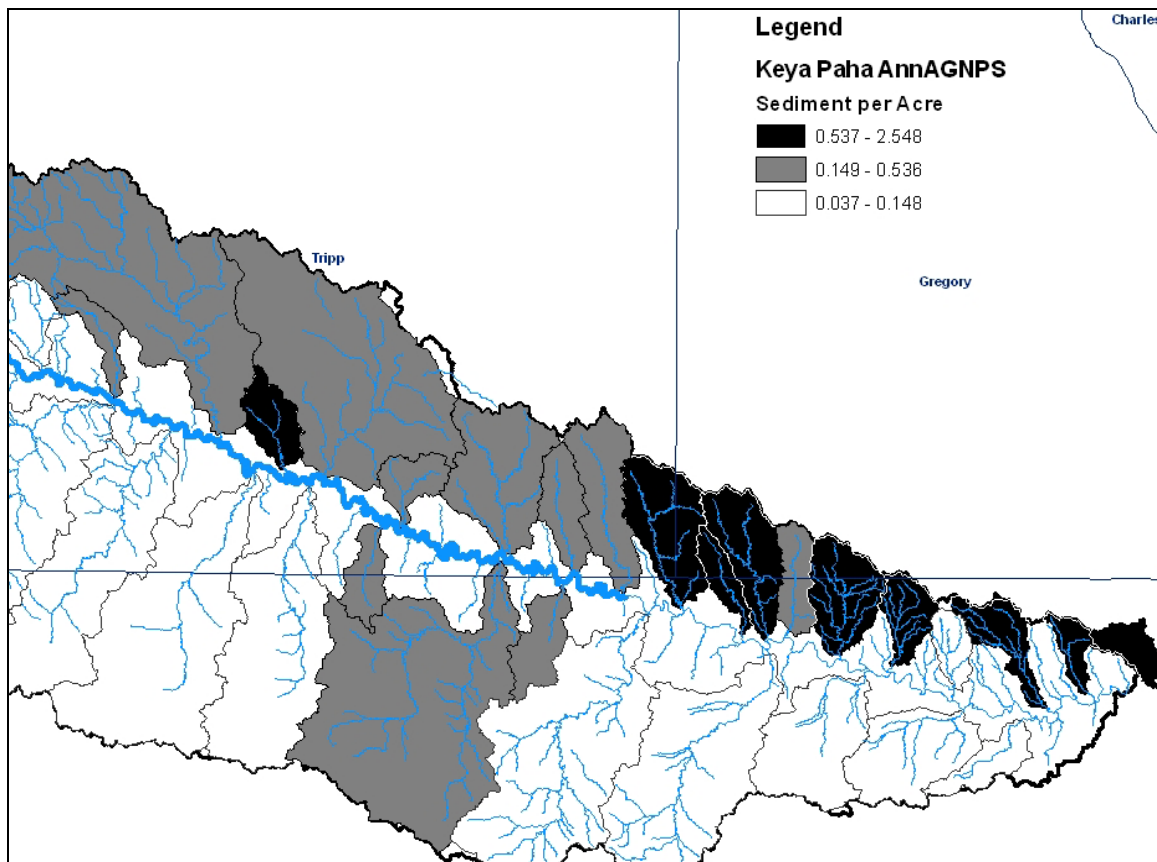
**Table 3. Solids Data collected during the Lewis and Clark Assessment for Sites LAC1 and LAC2**

Site	Sample Date	Solids (Suspended) mg/L	VTSS mg/L	% Volatiles	Site	Sample Date	Solids (Suspended) mg/L	VTSS mg/L	% Volatiles
LAC1	06/10/2004	352	60	17%	LAC 2	06/25/2003	272	40	15%
LAC1	05/12/2004	305	50	16%	LAC 2	06/15/2005	252	32	13%
LAC1	05/12/2004	280	50	18%	LAC 2	03/29/2004	232	32	14%
LAC1	04/13/2005	220	38	17%	LAC 2	04/26/2005	196	20	10%
LAC1	06/15/2005	210	28	13%	LAC 2	05/13/2004	166	28	17%
LAC1	03/29/2004	196	20	10%	LAC 2	06/10/2004	156	32	21%
LAC1	03/29/2004	162	30	19%	LAC 2	08/20/2003	136	26	19%
LAC1	04/27/2005	123	15	12%	LAC 2	06/16/2003	118	26	22%
LAC1	06/25/2003	114	18	16%	LAC 2	07/01/2003	114	18	16%
LAC1	06/16/2003	100	24	24%	LAC 2	04/13/2005	104	19	18%
LAC1	07/01/2003	96	18	19%	LAC 2	05/16/2003	92	22	24%
LAC1	05/13/2004	96	17	18%	LAC 2	07/01/2003	88	16	18%
LAC1	06/09/2004	84	24	29%	LAC 2	06/09/2004	62	18	29%
LAC1	07/10/2003	70	8	11%	LAC 2	07/17/2003	61	13	21%
LAC1	05/16/2003	69	12	17%	LAC 2	06/11/2003	57	14	25%
LAC1	07/30/2003	59	16	27%	LAC 2	05/12/2004	57	10	18%
LAC1	06/11/2003	46	11	24%	LAC 2	05/20/2003	50	7	14%
LAC1	05/20/2003	43	6	14%	LAC 2	07/23/2003	49	19	39%
LAC1	07/23/2003	41	16	39%	LAC 2	05/29/2003	45	9	20%
LAC1	07/23/2003	39	16	41%	LAC 2	06/05/2003	42	4	10%
LAC1	06/05/2003	38	6	16%	LAC 2	07/30/2003	38	15	39%
LAC1	07/30/2003	36	11	31%	LAC 2	08/07/2003	31	5	16%
LAC1	05/29/2003	35	4	11%	LAC 2	08/13/2003	25	6	24%
LAC1	08/07/2003	35	5	14%	LAC 2	08/26/2003	23	6	26%
LAC1	06/05/2003	32	4	13%					
LAC1	08/13/2003	21	6	29%					
LAC1	08/26/2003	19	3	16%					
LAC1	08/20/2003	14	6	43%					
<b>Average</b>		<b>105</b>	<b>19</b>	<b>20%</b>	<b>Average</b>		<b>103</b>	<b>18</b>	<b>20%</b>

AnnAGNPs analysis of the subwatersheds in the Keya Paha basin indicates low rates of sediment production for a majority of the basin when compared to the greater Lewis and Clark drainage (Table 4). Figure 5 depicts a relative ranking with the subwatersheds that the model suggested were producing higher erosion rates (as compared against other drainages within the Keya Paha drainage and not against the greater Lewis and Clark basin) represented by darker shading.

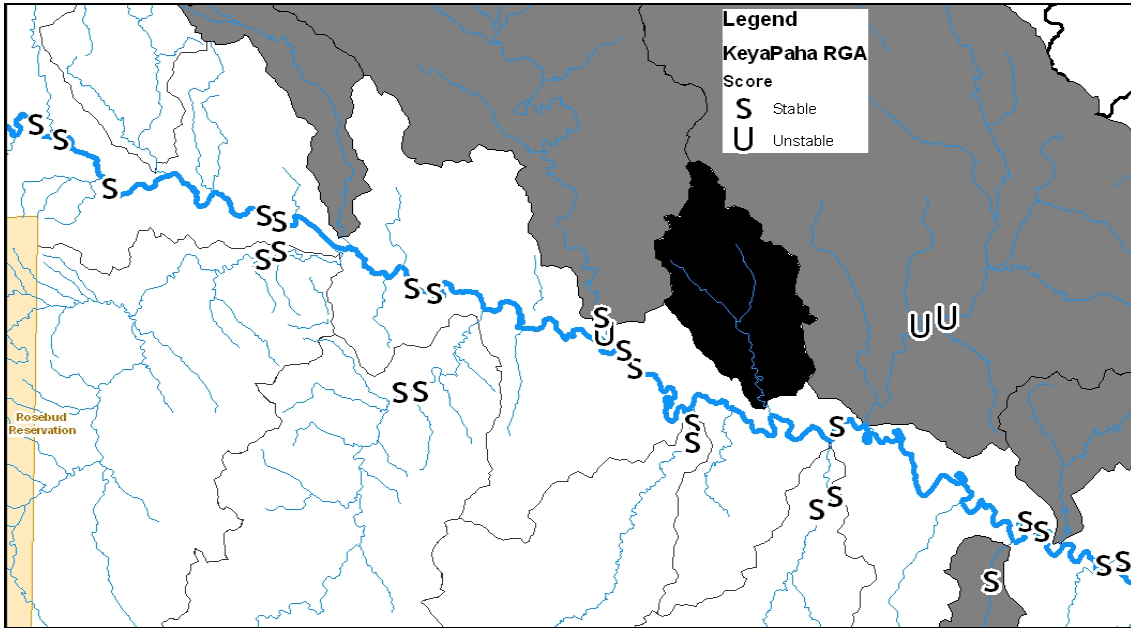
**Table 4. Results of AnnAGNPS modeling expressed by grouping sub-tributaries according to geographic area or “parent” tributary**

<b>Trib./ General Area</b>	<b># of subwatersheds</b>	<b>Drainage area (acres)</b>	<b>Sediment prod. (tons)</b>	<b>Tons/acre</b>
Ponca Creek	<u>28</u>	324,287	372,542	<u>1.15</u>
East River area (SD)	<u>21</u>	592,444	589,553	<u>1.01</u>
Keya Paha River	<u>32</u>	629,121	180,005	<u>0.28</u>
Niobrara River	<u>21</u>	2,386,284	144,809	<u>0.06</u>
Santee area (NE)	<u>2</u>	311,287	1,208,402	<u>3.88</u>



**Figure 5. Keya Paha AnnAGNPS**

Rapid Geomorphic Assessments (RGAs) were completed at 23 sites within the Keya Paha basin. Figure 6 depicts the areas where RGAs were completed with the AnnAGNPS results shaded. The results were broken into stable and unstable stream channels with approximately 12% of the sites ranking as unstable. The three unstable sites were located on tributaries.

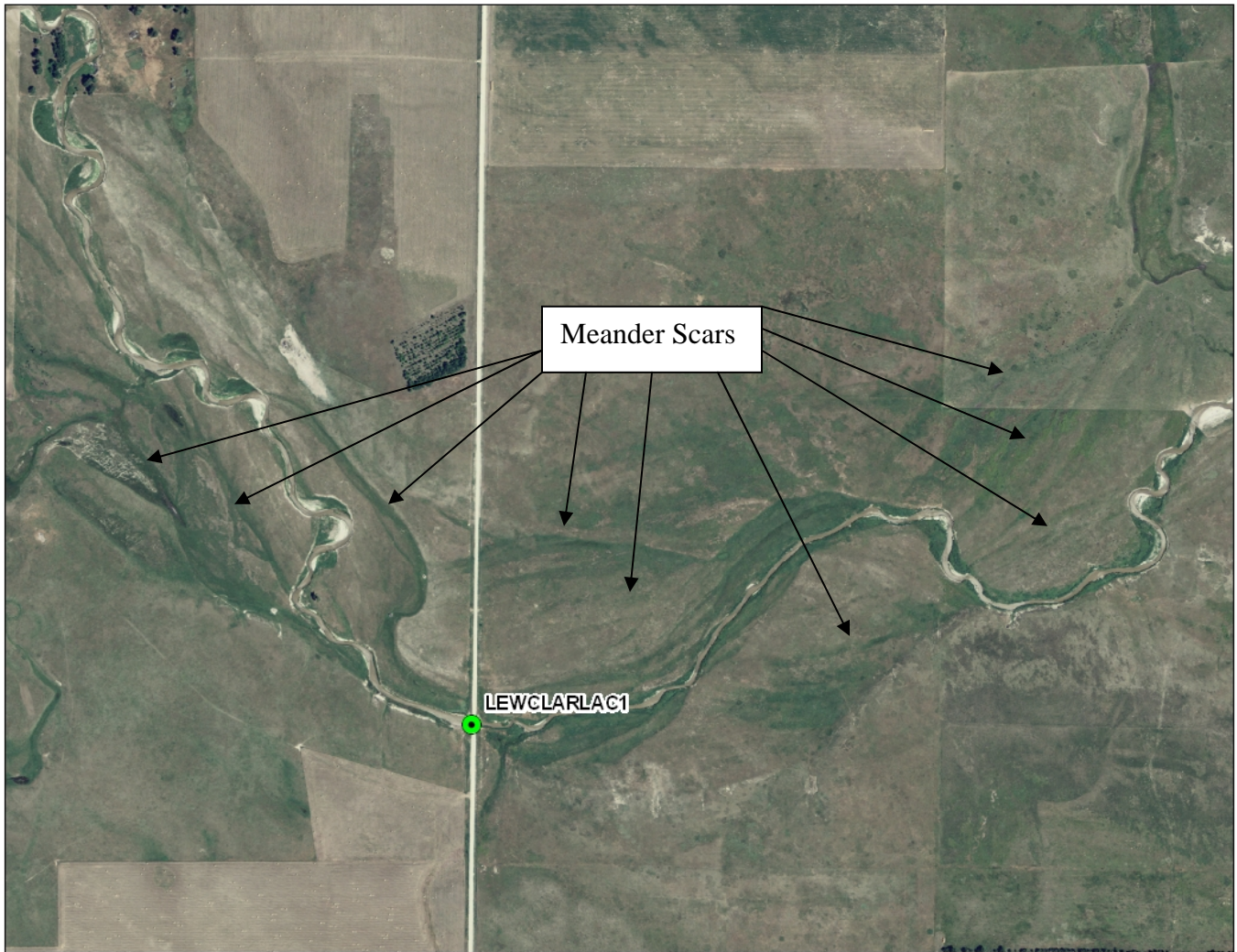


**Figure 6. Keya Paha RGA Locations**

The primary elements considered when allocating sources within the Keya Paha watershed were predicted sheet and rill erosion loads, potential for bank failure based on RGA assessment, and the natural soil conditions of both the listed segment as well as upstream contributions.

Sheet and rill erosion from the Keya Paha watershed was predicted by the AnnAGNPS model to be less than many of the other watersheds in the Lewis and Clark basin. There may be several factors contributing to this, but the primary reason suspected is the high percentage of native range, in particular in locations that may be more erosion prone.

The RGA analysis indicated a relatively stable channel. Aggravated banks on the outsides of the meanders were common, as were old meander scars on the floodplain indicating that the river has moved frequently over time. The primary soils through the stream corridor consist of the Invale Cass associations. These soils are characterized by loamy fine sands overlying fine to medium sands. These types of soils are typically non-cohesive and are more prone to failures, which is evident in the frequency of meander scars (See Figure 7). Particle size data collected by the USGS is insufficient to conduct analysis, but it does suggest that the high sand content in the streams bed and banks mobilizes during higher velocity events.



**Figure 7. Aerial Photo of Site LAC1 with Numerous Channel Meander Scars Evident**

Examination of the upstream and downstream (sites LAC1 vs. LAC2) concentrations and loads indicate that erosion rates are consistent throughout the entire basin suggesting no particular source is generating excessive loads. BMPs may be able to improve the condition of several of the tributaries, particularly those that scored poorly in the RGAs. This information taken in aggregate suggests that the concentrations measured in the Keya Paha River are natural occurrences and that the current state standard may not be an appropriate measure for this stream.

### **TMDL and Allocations for Total Suspended Solids**

The suspended solids load duration curve located in Figure 8 represents the 5 standard flow regimes as expressed in the EPA load duration curve guidance. The high flow regime is characterized by the most frequent rate of standard exceedence. From 61 years of flow data (1937 to 2003), an annual return event (1 year flow event) of approximately 175 cfs was calculated through the Aquarius program. This equates to a flow frequency of approximately 9%. Events that occur within this flow regime would be expected to occur less than once per year. This regime had the highest frequency of exceedence with 14 of the 23 samples or 60% exceeding the acute standard and 100% exceeding the chronic standard. The highest concentration was 1000 mg/L. BMPs will have limited impact on events that occur in this flow regime.

The moist flow regime is characterized by small 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 50 samples collected within this flow regime, 11 (22%) exceeded the acute standard and 18 (36%) exceeded the chronic standard. The single highest concentration collected from this flow regime was 829 mg/L.

The midrange flows extend from approximately 54 cfs down to 35 cfs. Of the 36 samples collected from this flow regime, 2 (5%) exceeded the acute standard and 7 (19%) exceeded the chronic standard. The single highest concentration in this flow regime was 180 mg/L.

The dry flows extend down from 35 cfs to approximately 15 cfs at the lower end. There were a total of 46 samples collected from this flow regime, none of which exceeded the acute standard and only 3 (6%) were above the chronic standard. The single highest concentration recorded was 100 mg/L. The water quality standard was fully supported within this flow regime.

The low flow regime extends from approximately 15 cfs to a relatively rare no flow condition. A total of 21 samples were collected from this flow regime, of which only a single sample exceeded both the chronic or acute standard. That sample had a concentration of 170 mg/L and was collected during the 1979 sample season. The remaining samples within this flow regime are all less than one half the concentration of this sample suggesting that the standard was fully supported in this flow regime.



Figure 8. Keya Paha River Total Suspended Solids Load Duration Curve.

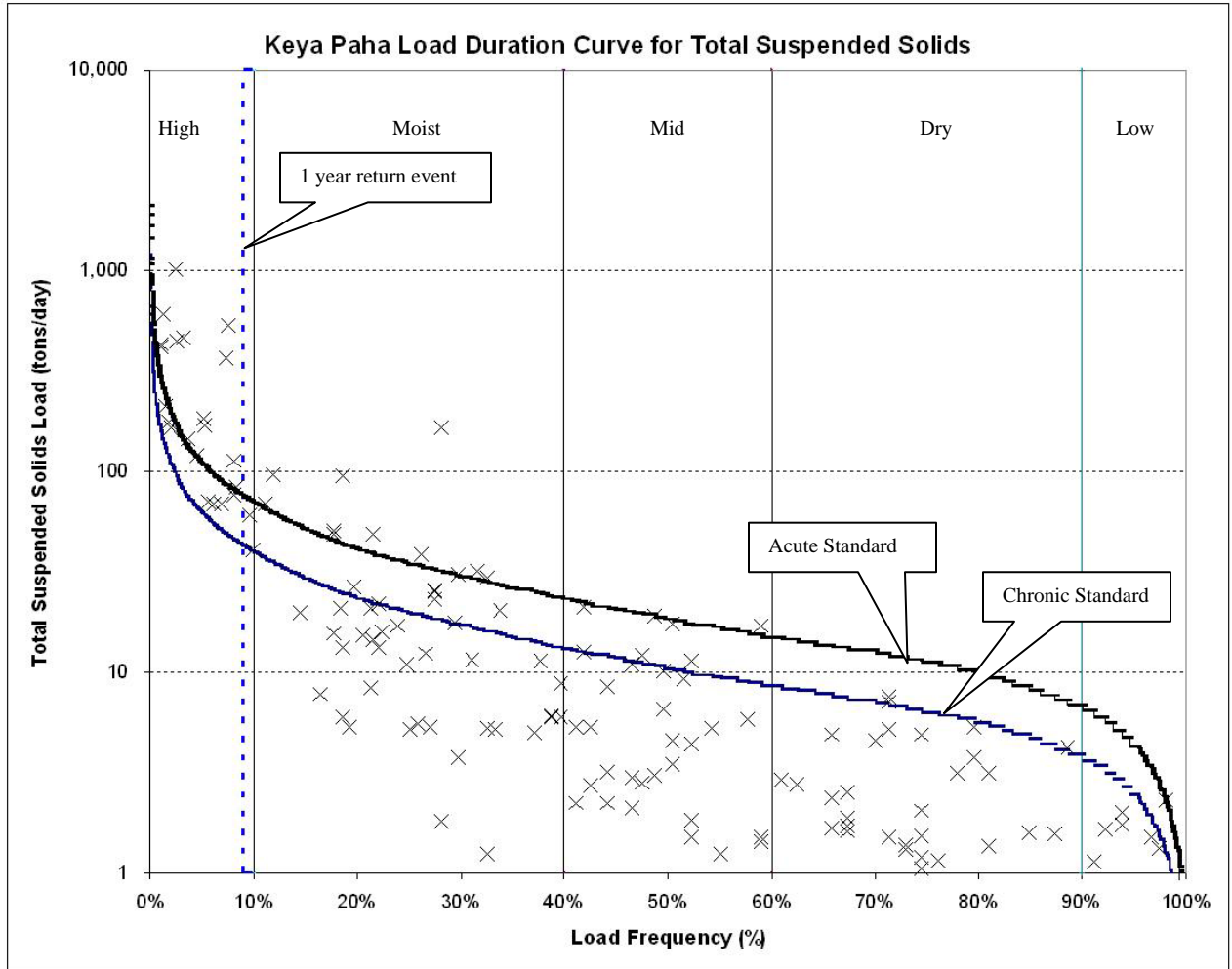


Table 5 TMDL Summary for Suspended Solids in Keya Paha River

TMDL Component	Flow Zone (expressed as Tons/day)				
	High	Moist	Mid	Dry	Low
	>163 cfs	163-54 cfs	54-35 cfs	35-16 cfs	<16 cfs
LA	132.7	30.9	7.8	5.6	1.2
WLA	0	0	0	0	0
MOS	22.4	1.7	4.6	2.4	2.4
<b>TMDL @ 90 mg/L</b>	<b>155.0</b>	<b>32.6</b>	<b>12.4</b>	<b>8.0</b>	<b>3.6</b>
Current Load*	1,123.1	65.1	17.8	6.1	3.1
Load Reduction	86%	50%	30%	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, an 86% reduction in suspended solids from all sources is necessary to reach the target of a suspended solids concentration of less than 90 mg/L. The moist flow regime requires a 50% reduction in suspended solids loads. The mid range flows require a 30% reduction in total suspended solids. The remaining flow regimes do not require reductions to maintain support of the standards. Using the chronic standard as the reduction target for a single sample provides assurance that both the chronic and acute standards are maintained at all times.

### **Seasonal Variation**

Different seasons of the year can yield differences in water quality due to changes in precipitation and agricultural practices. Suspended solids attributed to runoff events are most likely to occur in the spring. The timing of these events have the potential to impact aquatic life reproduction.

### **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 suspended solids impairments to the Keya Paha River are most severe during runoff events which could impact aquatic life reproduction.

### **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. This data will provide information on the effectiveness of the BMPs.

The Department may adjust the load and/or wasteload allocations in this TMDL to account for new information or circumstances that are developed or come to light during the implementation of the TMDL and a review of the new information or circumstances indicate that such adjustments are appropriate. Adjustment of the load and waste load allocation will only be made following an opportunity for public participation. New information generated during TMDL implementation may include, among other things, monitoring data, BMP effectiveness information and land use information. The Department will propose adjustments only in the event that any adjusted LA or WLA will not result in a change to the loading capacity; the adjusted TMDL, including its WLAs



and LAs, will be set at a level necessary to implement the applicable water quality standards; and any adjusted WLA will be supported by a demonstration that load allocations are practicable. The Department will notify EPA of any adjustments to this TMDL within 30 days of their adoption.

### **Public Participation**

The project was presented at many 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.

Notice of availability of the proposed TMDL for Pierre Creek was provided in the *Mission County Tribune*, *Winner Advocate*, *Sioux Falls Argus Leader*, and *Pierre Capital Journal* in June of 2009. A comment period of 30 days was provided to the public. Comments were received from USEPA Region 8. These comments and responses to them may be found in Appendix A.

### **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. Site specific BMPs may yield some reductions, however the concentrations appear to be a natural condition for this river suggesting a reevaluation of the water quality standards may be a better long term solution.

Appendix A. Public Comments and DENR Responses

**EPA REGION VIII TMDL REVIEW**

TMDL Document Info:

<b>Document Name:</b>	<b>Total Suspended Solids Total Maximum Daily Load Evaluation for in Keya Paha River, Tripp County, South Dakota</b>
<b>Submitted by:</b>	<b>Cheryl Saunders, SD DENR</b>
<b>Date Received:</b>	<b>June 23, 2009</b>
<b>Review Date:</b>	<b>July 27, 2009</b>
<b>Reviewer:</b>	<b>Vern Berry, EPA</b>
<b>Rough Draft / Public Notice / Final?</b>	<b>Public Notice Draft</b>
<b>Notes:</b>	

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

- Approve
- Partial Approval
- Disapprove
- Insufficient Information

**Approval Notes to Administrator:**

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

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

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

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

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

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

## **1. Problem Description**

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

### **1.1 TMDL Document Submittal Letter**

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

Minimum Submission Requirements.

- A TMDL submittal letter should be included with each TMDL document submitted to EPA requesting a formal review.
- The submittal letter should specify whether the TMDL document is being submitted for initial review and comments, public review and comments, or final review and approval.
- Each TMDL document submitted to EPA for final review and approval should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter should contain

such identifying information as the name and location of the waterbody and the pollutant(s) of concern, which matches similar identifying information in the TMDL document for which a review is being requested.

Recommendation:

Approve  Partial Approval  Disapprove  Insufficient Information

**SUMMARY:** The Keya Paha River total suspended solid (TSS) TMDL was submitted to EPA for review during the public notice period via an email from Cheryl Saunders, SD DENR on June 23, 2009. The email included the draft TMDL document and a public notice announcement requesting review and comment.

**COMMENTS:** None

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

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

Minimum Submission Requirements:

- The TMDL document should clearly identify the pollutant and waterbody segment(s) for which the TMDL is being established. If the TMDL document is submitted to fulfill a TMDL development requirement for a waterbody on the state's current EPA approved 303(d) list, the TMDL document submittal should clearly identify the waterbody and associated impairment(s) as they appear on the State's/Tribe's current EPA approved 303(d) list, including a full waterbody description, assessment unit/waterbody ID, and the priority ranking of the waterbody. This information is necessary to ensure that the administrative record and the national TMDL tracking database properly link the TMDL document to the 303(d) listed waterbody and impairment(s).
- One or more maps should be included in the TMDL document showing the general location of the waterbody and, to the maximum extent practical, any other features necessary and/or relevant to the understanding of the TMDL analysis, including but not limited to: watershed boundaries, locations of major pollutant sources, major tributaries included in the analysis, location of sampling points, location of discharge gauges, land use patterns, and the location of nearby waterbodies used to provide surrogate information or reference conditions. Clear and concise descriptions of all key features and their relationship to the waterbody and water quality data should be provided for all key and/or relevant features not represented on the map.
- If information is available, the waterbody segment to which the TMDL applies should be identified/geo-referenced using the National Hydrography Dataset (NHD). If the boundaries of the TMDL do not correspond to the Waterbody ID(s) (WBID), Entity\_ID information or reach code (RCH\_Code) information should be provided. If NHD data is not available for the waterbody, an alternative geographical referencing system that unambiguously identifies the physical boundaries to which the TMDL applies may be substituted.

Recommendation:

Approve  Partial Approval  Disapprove  Insufficient Information

**SUMMARY:** 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-contact 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 fecal coliform impairment in this segment will be 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 correct HUC number, 10150006 was updated on the first page.*

### 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 TSS concentrations for warmwater semi permanent fish life propagation. South Dakota has applicable numeric standards for TSS that may be applied to this river segment. The numeric standards being implemented in this TMDL are: a daily maximum value of TSS of 158 mg/L in any one sample, or a maximum geometric mean of 90 mg/L for 5 samples over 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, TSS and total coliform chronic standards are expressed as “geometric mean” rather than “mean” (i.e., arithmetic mean or average).

**DENR RESPONSE:**

*The document was checked and corrected for the interchanged use of arithmetic mean and geometric mean. Total Suspended Solids use an arithmetic mean of a minimum of 3 samples over 30 days and bacteria use a geometric mean with a minimum of 5 samples over 30 days.*

## 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 TSS based on the warmwater semi permanent fish life propagation beneficial use for the Keya Paha River. The TSS daily maximum value is  $\leq 158$  mg/L in any one sample, and the maximum geometric mean is  $\leq 90$  mg/L for 5 samples over a 30 day period.

**COMMENTS:** The primary numeric target for this TMDL is based on the 30-day geometric mean, warmwater semi permanent fish life, TSS standard. On page 3 of the TMDL it says the target is based on the “the current daily maximum criteria for total suspended solids.” We suggest changing that wording to read something similar to: “The numeric TMDL target established for the Keya Paha River is 90 mg/L, which is based on the chronic standard for total suspended solids.”

**DENR RESPONSE:**

*The text on page 3 was modified to more accurately represent that the TMDL will be based on the water quality standards.*

### 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.

Most of the stream sites where RGAs were conducted appear to represent stable conditions. Based on the data collected at the two sites on the Keya Paha River, the erosion rates appear to be consistent in the watershed suggesting that no particular source is generating excessive loads. This suggests that the TSS concentrations measured in the Keya Paha River are a result of natural sources and that the current state standard may need to be revised for this stream.

There are no municipal or other point source discharges to the Keya Paha River.

**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 sediment loads to the river?

**DENR RESPONSE:**

*Animal feeding operations were addressed during the assessment for their potential to contribute bacteria. Due to their low density, small size, and duration/frequency of use (typically short term wintering areas), they were not considered a measurable source of suspended sediments. The feedlot portion of the AnnAGNPS model is tailored more towards the contribution of nutrients to a watershed and does not do a particularly good job with non volatile solids from small feeding areas. Larger feeding areas (several acres in size and larger) are typically permitted facilities that do not discharge.*

## 4. TMDL Technical Analysis

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

A TMDL analysis determines the maximum pollutant loading rate that may be allowed to a waterbody without violating water quality standards. The TMDL analysis should demonstrate an

understanding of the relationship between the rate of pollutant loading into the waterbody and the resultant water quality impacts. This stressor → response relationship between the pollutant and impairment and between the selected targets, sources, TMDLs, and load allocations needs to be clearly articulated and supported by an appropriate level of technical analysis. Every effort should be made to be as detailed as possible, and to base all conclusions on the best available scientific principles.

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

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

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

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

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

Minimum Submission Requirements:

- A TMDL must identify the loading capacity of a waterbody for the applicable pollutant, taking into consideration temporal variations in that capacity. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).
- The total loading capacity of the waterbody should be clearly demonstrated to equate back to the pollutant load allocations through a balanced TMDL equation. In instances where numerous LA, WLA and seasonal TMDL capacities make expression in the form of an equation cumbersome, a table may be substituted as long as it is clear that the total TMDL capacity equates to the sum of the allocations.
- The TMDL document should describe the methodology and technical analysis used to establish and quantify the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.
- It is necessary for EPA staff to be aware of any assumptions used in the technical analysis to understand and evaluate the methodology used to derive the TMDL value and associated loading allocations. Therefore, the TMDL document should contain a description of any important assumptions (including the basis for those assumptions) made in developing the TMDL, including but not limited to:
  - (1) the spatial extent of the watershed in which the impaired waterbody is located and the spatial extent of the TMDL technical analysis;
  - (2) the distribution of land use in the watershed (e.g., urban, forested, agriculture);
  - (3) a presentation of relevant information affecting the characterization of the pollutant of concern and its allocation to sources such as population characteristics, wildlife resources, industrial activities etc...;

- (4) present and future growth trends, if taken into consideration in determining the TMDL and preparing the TMDL document (e.g., the TMDL could include the design capacity of an existing or planned wastewater treatment facility);
  - (5) an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.
- The TMDL document should contain documentation supporting the TMDL analysis, including an inventory of the data set used, a description of the methodology used to analyze the data, a discussion of strengths and weaknesses in the analytical process, and the results from any water quality modeling used. This information is necessary for EPA to review the loading capacity determination, and the associated load, wasteload, and margin of safety allocations.
  - TMDLs must take critical conditions (e.g., stream flow, loading, and water quality parameters, seasonality, etc...) into account as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1) ). TMDLs should define applicable critical conditions and describe the approach used to determine both point and nonpoint source loadings under such critical conditions. In particular, the document should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.
  - Where both nonpoint sources and NPDES permitted point sources are included in the TMDL loading allocation, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document must include a demonstration that nonpoint source loading reductions needed to implement the load allocations are actually practicable [40 CFR 130.2(i) and 122.44(d)].

Recommendation:

- Approve  Partial Approval  Disapprove  Insufficient Information

**SUMMARY:** The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Keya Paha River TMDL described how the TSS 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. The Annualized Agricultural Nonpoint Source model (AnnAGNPS) was used to predict erosion rates for each tributary that drains to the Keya Paha River. However, AnnAGNPS does not address channel stability or channel erosion so a number of rapid geomorphic assessments (RGAs) were conducted in portions of the watershed. Scores from the RGAs help determine whether the channel is stable or unstable. Approximately 12% of the RGA sites were ranked as unstable and contributing to increased sediment loading.

Elevation Derivatives for National Applications (EDNA) was used to calculate the mean daily flow for Keya Paha River. Mean daily TSS loadings were calculated through the use of the mean TSS concentration (24 TSS samples were collected during the assessment), and the mean daily flow. The result is an estimated average daily TSS load 7,952 tons/year 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 8 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 = 155 tons/day; moist flow = 32.6 tons/day; midrange flow = 12.4 tons/day; dry flow = 8.0 tons/day and low flow = 3.6 tons/day.

**COMMENTS:** The Technical Analysis section (p. 8) includes a paragraph about the AnnAGNPS analysis of sediment production that says that the Keya Paha basin has low production when compared to the larger Lewis and Clark drainage. However, the EDNA calculations (p. 7) indicate a higher production rate for the Keya Paha when compared to the larger Lewis and Clark basin. Why are these results different? Could the results be reconciled?

It's not clear how the loading capacity loads (i.e., Table 5 – TMDL @ 90 mg/L loads) were derived. Typically these are taken from the mid-point of each of the flow regimes. Also, it is not clear why the current load was calculated from the 90<sup>th</sup> percentile concentration at the 90<sup>th</sup> percentile flow in each flow regime. Similar TMDLs have used the 90<sup>th</sup> percentile concentration at the 50<sup>th</sup> percentile flow (mid-point) in each flow zone.

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 11 appear to be correct.

**DENR RESPONSE:**

*The results between the AnnAGNPS and EDNA calculations are different because these models use different data sets and are used as different indicators.*

*The AnnAGNPS model is strictly a sheet and rill erosion model. It does not have the ability to detect or model bed and bank erosion process that occur within waterbody. As a watershed increases in size and becomes more perennial in nature, the AnnAGNPS model tends to deviate further from the measured sediment loads in waterbody. This is why the AnnAGNPS model was primarily utilized on the smaller tributaries of the Keya Paha and not the mainstem.*

*The EDNA calculations were based on modeled water volumes and field collected suspended solids data. These calculations provide a better representation of the entire basins sediment producing ability.*

*These two models can not nor should be reconciled. The differences generated by these two modeling efforts is an important part of understanding this river system and strongly suggest that the majority of the suspended solids is originating from the bed and banks and is not attributed to upland practices and erosion processes.*

*The use of the 90<sup>th</sup> percentile flow was selected instead of the 50<sup>th</sup> percentile flow due to changes in how DENR calculates the margins of safety. As a result of EPA encouragement to move from an implicit to an explicit margin of safety, a calculation from the EPA Load Duration Curve Guidance was adopted. This new explicit margin of safety utilized the difference between the median flow and the low flow in each flow regime as the MOS for that flow zone. Utilizing the 50<sup>th</sup> percentile would result in the lowest flow zone attributing 100% of the load and waste load allocations to the margin of safety resulting in a zero value for each of these components.*

*Regardless of the use of flows at either the 50<sup>th</sup> or 90<sup>th</sup> (or any other percentile), the reductions required remain constant because they are based upon the concentration in*

*the stream. The water quality standards are based on a concentration, the curve itself is the true dynamic representation of the TMDL. Since the table is simply a representation of a given point on the curve and the reduction percentages remain the same, by utilizing the 90<sup>th</sup> percentile with the EPA recommended margin of safety, a more realistic depiction of the TMDL is presented, particularly at the lower flow zones.*

*The flow zones were corrected in Table 5 to accurately reflect the break points in the flow regimes on the load duration curve.*

#### **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 and included 24 TSS samples. 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 three flow regimes – 132.7 tons/day at high flows; 30.9 tons/day at moist flows; 7.8 tons/day at midrange flows; 5.6 tons/day at dry flows and 1.2 tons/day at low flow.

**COMMENTS:** The load allocations section says that an 86% 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 TSS standard, not the single sample maximum. We suggest changing that wording to read something similar to: an 86% reduction is needed “...to reach the target of a geometric mean total suspended solids concentration of less than 90 mg/L.”

**DENR RESPONSE:**

*The load allocations section was modified to accurately reflect that the load would be reduced to the water quality standard.*

#### **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:** The MOS section mentions only three flow zones rather than the 5 flow zones included in this TMDL.

**DENR RESPONSE:**

*The MOS section of this TMDL was modified to address this comment as well as concerns raised on other TMDL submitted during the same time frame.*

#### **4.5 Seasonality and variations in assimilative capacity:**

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

Minimum Submission Requirements:

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

Recommendation:

Approve  Partial Approval  Disapprove  Insufficient Information

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

**COMMENTS:** None.

## **5. Public Participation**

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

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

Minimum Submission Requirements:

- The TMDL must include a description of the public participation process used during the development of the TMDL (40 C.F.R. §130.7(c)(1)(ii) ).
- TMDLs submitted to EPA for review and approval should include a summary of significant comments and the State's/Tribe's responses to those comments.

Recommendation:

- Approve
- Partial Approval
- Disapprove
- Insufficient Information

**SUMMARY:** The State's submittal includes a summary of the public participation process that has occurred which 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](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:** The limited amount of data currently available for the Keya Paha River suggests that this would be a good candidate for an adaptive management approach to implementation. Collecting additional data during and after implementation would be a necessary part of any implementation and follow-up scenario.

**DENR RESPONSE:**

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

## 7. Restoration Strategy

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

Minimum Submission Requirements:

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

Recommendation:

Approve  Partial Approval  Disapprove  Insufficient Information

**SUMMARY:** The Implementation Plan section of the TMDL document says that 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:**

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

## 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 TSS TMDL includes daily loads expressed as tons 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

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SEP 29 2009

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OCT 2 2009

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

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 TSS; 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,

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

Enclosures



Printed on Recycled Paper

APPROVED TMDLS

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

Waterbody Name & AU ID	TMDL Parameter/ Pollutant (303(d) list cause)	Water Quality Targets	TMDL WLA / LA / MOS**	Supporting Documentation (not an exhaustive list of supporting documents)
Keya Paha River (from the Tripp and Todd County line to the Nebraska border)* SD-NI-R-KEYA_PAHA_01	Total Suspended Solids (total suspended solids)	≤ 158 mg/L daily maximum in any one sample; ≤ 90 mg/L 30-day average.	LC = 155 tons/day at high flow LA = 132.7 tons/day at high flow WLA = 0 tons/day at high flow MOS = 22.4 tons/day at high flow	■ Total Suspended Solids Total Maximum Daily Load for Keya Paha River, Tripp County, South Dakota (SD DENR, May 2009)

\* Indicates that the waterbody has been included on the State's Section 303(d) list of waterbodies in need of TMDLs.

\*\* Loads shown represent the average loads during high flow periods as defined by the load duration curve for the Keya Paha River (see Figure 8 and Table 5 of the TMDL). The higher flows are when the biggest differences occur between the instream flows and the water quality targets, therefore the greatest load reductions are needed to meet the water quality standards.

LC = loading capacity; WLA = wasteload allocation; LA = load allocation; MOS = margin of safety

TMDL = LC = ∑ WLA<sub>s</sub> + ∑ LA<sub>s</sub> + MOS

## EPA REGION VIII TMDL REVIEW

## TMDL Document Info:

<b>Document Name:</b>	<b>Total Suspended Solids Total Maximum Daily Load Evaluation for in Keya Paha River, Tripp County, South Dakota</b>
<b>Submitted by:</b>	<b>Cheryl Saunders, SD DENR</b>
<b>Date Received:</b>	<b>September 1, 2009</b>
<b>Review Date:</b>	<b>September 24, 2009</b>
<b>Reviewer:</b>	<b>Vern Berry, EPA</b>
<b>Rough Draft / Public Notice / Final?</b>	<b>Final</b>
<b>Notes:</b>	

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

- Approve  
 Partial Approval  
 Disapprove  
 Insufficient Information

**Approval Notes to Administrator:**

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

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

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

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

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

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

## **1. Problem Description**

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

### **1.1 TMDL Document Submittal Letter**

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

#### **Minimum Submission Requirements.**

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



Recommendation:

Approve  Partial Approval  Disapprove  Insufficient Information

**SUMMARY:** The Keya Paha River total suspended solid (TSS) TMDL was submitted to EPA for review and approval via an email from Cheryl Saunders, SD DENR on September 1, 2009. The email included the final TMDL document and a letter requesting approval of the TMDLs.

**COMMENTS:** None.

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

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

Minimum Submission Requirements:

- The TMDL document should clearly identify the pollutant and waterbody segment(s) for which the TMDL is being established. If the TMDL document is submitted to fulfill a TMDL development requirement for a waterbody on the state's current EPA approved 303(d) list, the TMDL document submittal should clearly identify the waterbody and associated impairment(s) as they appear on the State's/Tribe's current EPA approved 303(d) list, including a full waterbody description, assessment unit/waterbody ID, and the priority ranking of the waterbody. This information is necessary to ensure that the administrative record and the national TMDL tracking database properly link the TMDL document to the 303(d) listed waterbody and impairment(s).
- One or more maps should be included in the TMDL document showing the general location of the waterbody and, to the maximum extent practical, any other features necessary and/or relevant to the understanding of the TMDL analysis, including but not limited to: watershed boundaries, locations of major pollutant sources, major tributaries included in the analysis, location of sampling points, location of discharge gauges, land use patterns, and the location of nearby waterbodies used to provide surrogate information or reference conditions. Clear and concise descriptions of all key features and their relationship to the waterbody and water quality data should be provided for all key and/or relevant features not represented on the map.
- If information is available, the waterbody segment to which the TMDL applies should be identified/geo-referenced using the National Hydrography Dataset (NHD). If the boundaries of the TMDL do not correspond to the Waterbody ID(s) (WBID), Entity\_ID information or reach code (RCH\_Code) information should be provided. If NHD data is not available for the waterbody, an alternative geographical referencing system that unambiguously identifies the physical boundaries to which the TMDL applies may be substituted.

Recommendation:

Approve  Partial Approval  Disapprove  Insufficient Information

**SUMMARY:** 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 fecal coliform impairment in this segment will be 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 TSS concentrations for warmwater semi permanent fish life propagation. South Dakota has applicable numeric standards for TSS that may be applied to this river segment. The numeric standards being implemented in this TMDL are: a daily maximum value of TSS of  $\leq 158$  mg/L in any one sample, and a 30-day average of  $\leq 90$  mg/L. Discussion of additional applicable water quality standards for Keya Paha River can be found on pages 4 and 5 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 TSS based on the warmwater semi permanent fish life propagation beneficial use for the Keya Paha River. The TSS daily maximum value is  $\leq 158$  mg/L in any one sample, and the 30-day average is  $\leq 90$  mg/L.

**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.

Most of the stream sites where rapid geomorphic assessments (RGAs) were conducted appear to represent stable conditions. Based on the data collected at the two sites on the Keya Paha River, the erosion rates appear to be consistent in the watershed suggesting that no particular source is generating excessive loads. This suggests that the TSS concentrations measured in the Keya Paha River are a result of natural sources and that the current state standard may need to be revised for this stream.

There are no municipal or other point source discharges to the Keya Paha River.

**COMMENTS:** None.

## 4. TMDL Technical Analysis

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

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

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

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

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

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

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

Minimum Submission Requirements:

- A TMDL must identify the loading capacity of a waterbody for the applicable pollutant, taking into consideration temporal variations in that capacity. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).
- The total loading capacity of the waterbody should be clearly demonstrated to equate back to the pollutant load allocations through a balanced TMDL equation. In instances where numerous LA, WLA and seasonal TMDL capacities make expression in the form of an equation cumbersome, a table may be substituted as long as it is clear that the total TMDL capacity equates to the sum of the allocations.
- The TMDL document should describe the methodology and technical analysis used to establish and quantify the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.
- It is necessary for EPA staff to be aware of any assumptions used in the technical analysis to understand and evaluate the methodology used to derive the TMDL value and associated loading allocations. Therefore, the TMDL document should contain a description of any important assumptions (including the basis for those assumptions) made in developing the TMDL, including but not limited to:
  - (1) the spatial extent of the watershed in which the impaired waterbody is located and the spatial extent of the TMDL technical analysis;

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

- The TMDL document should contain documentation supporting the TMDL analysis, including an inventory of the data set used, a description of the methodology used to analyze the data, a discussion of strengths and weaknesses in the analytical process, and the results from any water quality modeling used. This information is necessary for EPA to review the loading capacity determination, and the associated load, wasteload, and margin of safety allocations.
- TMDLs must take critical conditions (e.g., stream flow, loading, and water quality parameters, seasonality, etc...) into account as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable critical conditions and describe the approach used to determine both point and nonpoint source loadings under such critical conditions. In particular, the document should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.
- Where both nonpoint sources and NPDES permitted point sources are included in the TMDL loading allocation, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document must include a demonstration that nonpoint source loading reductions needed to implement the load allocations are actually practicable [40 CFR 130.2(i) and 122.44(d)].

Recommendation:

- Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Keya Paha River TMDL described how the TSS 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. The Annualized Agricultural Nonpoint Source model (AnnAGNPS) was used to predict erosion rates for each tributary that drains to the Keya Paha River. However, AnnAGNPS does not address channel stability or channel erosion so a number of rapid geomorphic assessments (RGAs) were conducted in portions of the watershed. Scores from the RGAs help determine whether the channel is stable or unstable. Approximately 12% of the RGA sites were ranked as unstable and contributing to increased sediment loading.

Elevation Derivatives for National Applications (EDNA) was used to calculate the mean daily flow for Keya Paha River. Mean daily TSS loadings were calculated through the use of the mean TSS concentration (24 TSS samples were collected during the assessment), and the mean daily flow. The result is an estimated average daily TSS load 7,952 tons/year 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 8 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 = 155 tons/day; moist flow = 32.6 tons/day; midrange flow = 12.4 tons/day; dry flow = 8.0 tons/day and low flow = 3.6 tons/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 and included 24 TSS samples. 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 three flow regimes – 132.7 tons/day at high flows; 30.9 tons/day at moist flows; 7.8 tons/day at midrange flows; 5.6 tons/day at dry flows and 1.2 tons/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 an explicit load allocation (e.g., 10 lbs/day), or may be implicitly built into the TMDL analysis through the use of conservative assumptions and values for the various factors that determine the TMDL pollutant load → water quality effect relationship. Whether explicit or implicit, the MOS should be supported by an appropriate level of discussion that addresses the level of uncertainty in the various components of the TMDL technical analysis, the assumptions used in that analysis, and the relative effect of those assumptions on the final TMDL. The discussion should demonstrate that the MOS used is sufficient to ensure that the water quality standards would be attained if the TMDL pollutant loading rates are met. In cases where there is substantial uncertainty regarding the linkage between the proposed allocations and achievement of water quality standards, it may be necessary to employ a phased or adaptive management approach (e.g., establish a monitoring plan to determine if the proposed allocations are, in fact, leading to the desired water quality improvements).

##### Minimum Submission Requirements:

- TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as loadings set aside for the MOS).
- If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS should be identified and described. The document should discuss why the assumptions are considered conservative and the effect of the assumption on the final TMDL value determined.
- If the MOS is explicit, the loading set aside for the MOS should be identified. The document should discuss how the explicit MOS chosen is related to the uncertainty and/or potential error in the linkage analysis between the WQS, the TMDL target, and the TMDL loading rate.
- If, rather than an explicit or implicit MOS, the TMDL relies upon a phased approach to deal with large and/or unquantifiable uncertainties in the linkage analysis, the document should include a description of the planned phases for the TMDL as well as a monitoring plan and adaptive management strategy.

##### Recommendation:

- Approve    Partial Approval    Disapprove    Insufficient Information

**SUMMARY:** The 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 TSS 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 was also available for a 30-day public notice period prior to finalization.

**COMMENTS:** None.

## 6. Monitoring Strategy

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

### Minimum Submission Requirements:

- When a TMDL involves both NPDES permitted point source(s) and nonpoint source(s) allocations, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring.
- Under certain circumstances, a phased TMDL approach may be utilized when limited existing data are relied upon to develop a TMDL, and the State believes that the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation and merit development of a second phase TMDL. EPA recommends that a phased TMDL document or its implementation plan include a monitoring plan and a scheduled timeframe for revision of the TMDL. These elements would not be an intrinsic part of the TMDL and would not be approved by EPA, but may be necessary to support a rationale for approving the TMDL. [http://www.epa.gov/owow/tmdl/tmdl\\_clarification\\_letter.pdf](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 TSS TMDL includes daily loads expressed as tons per day. The daily TMDL loads are included in TMDL and Allocations section of the TMDL document.

**COMMENTS:** None.