TOTAL SUSPENDED SOLIDS TOTAL MAXIMUM DAILY LOAD EVALUATION FOR CHOTEAU CREEK, BON HOMME AND CHARLES MIX COUNTIES, SOUTH DAKOTA

South Dakota Department of
Environment and Natural Resources

Protecting South Dakota's Tomorrow ... Today

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

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Choteau Creek Total Maximum Daily Load Summary Table

Entity ID:	SD-MI-R-CHOTEAU-01
Location:	HUC Code: 10170101
Size of Watershed:	375,000 acres
Waterbody Type:	Stream
303(d) Listing Parameter:	Total Suspended Solids
Initial Listing date:	2008 IR
TMDL Priority Ranking:	1
Listed Stream Miles:	42 miles from Lewis and Clark Lake to Wagner
Designated Use of Concern:	Warmwater Semipermanent Fish Life Propagation
Analytical Approach:	AnnAGNPS, RGAs, Aquarius
Target:	Meet all applicable water quality standards.
Indicators:	Total Suspended Solids Concentration
High Flow Zone LA:	352 Tons/Day
High Flow Zone WLA:	
Avon	0.81 Tons/Day
Delmont	0 Discharge Facility
Wagner	1.16 Tons/Day
High Flow Zone MOS:	20 Tons/Day
High Flow Zone TMDL:	374 Tons/Day

1.0 Introduction:

The intent of this document is to clearly identify the components of the TMDL submittal to support adequate public participation and facilitate 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 (TSS) impairment of Choteau Creek from Wagner to its confluence with Lewis and Clark Lake, SD-MI-R-CHOTEAU-01.

1.1 Watershed Characteristics

Choteau Creek drains 375,000 acres in southeast South Dakota (Figure 1) and discharges to Lewis and Clark Lake on the Bon Homme and Charles Mix County line (Figure 2). The stream receives runoff from agricultural operations. During the assessment, data were collected indicating the creek experiences periods of degraded water quality as a result of TSS loads. The land use in the watershed is predominately agricultural consisting of 45% grass, 40% row crops, 7% small grains, 6% developed (including farmsteads, roads, and small communities), 1% forested, and 1% water and wetlands.

There are four small communities within the watershed that have permitted waste water treatment facilities. These include Wagner, Delmont, Avon and Armour. The two small communities of Dante and Ravinia are not serviced by community water treatment facilities that discharge to the Choteau Creek watershed.

The largest portion of the Choteau Creek Drainage lies within Charles Mix County. Common soil associations on the uplands in the drainage include the Homme-Ethan-Onita, Highmore- Eakin, Eakin-Highmore-Ethan, Ethan-Betts-Clarno. Soil associations found in the floodplain of the stream include the Bon and Salmo associations. Bon soils are typically characterized by cropping practices while Salmo soils are more likely to be kept in native vegetation and utilized as grazing lands (USDA, 1982).

Charles Mix County is usually warm in summer, but hot spells are frequent and cool days occasional. The county is cold in winter, when arctic air frequently surges over the area. Most of the precipitation fall during the warm period, and rainfall is normally heaviest late in spring and early in summer. Average annual precipitation is 21.5 inches, of this, 17 inches usually falls in April through September. Snowfall accumulations typically total 25 inches annually (USDA, 1982).

Choteau Creek was assessed as an individual portion of the larger Lewis and Clark Watershed Assessment, which looked at individual streams such as Choteau Creek as well as the entire drainage basin and the cumulative effects of the individual waterbodies.

Portions of the Choteau Creek drainage are owned by the Yankton Sioux Tribe. This TMDL strictly addresses the non tribal portions of the drainage.

Segment SD-MI-R-CHOTEAU-01 was listed for TSS and dissolved oxygen in the 2006 Integrated Report (SDDENR, 2006). This TMDL will address the TSS listing on non tribal lands. The dissolved oxygen listing was removed in the 2008 Integrated Report (SDDENR, 2008) as a result of new data indicating that it was in full support of the standard.

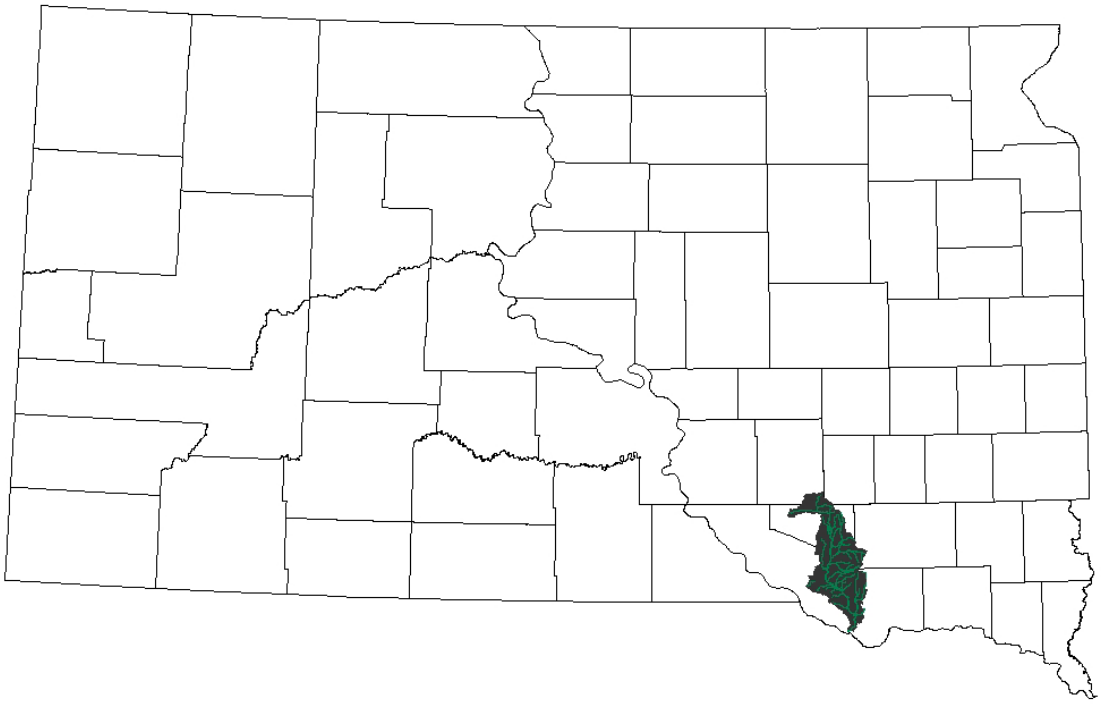

Figure 1. Choteau Creek Watershed Location in South Dakota

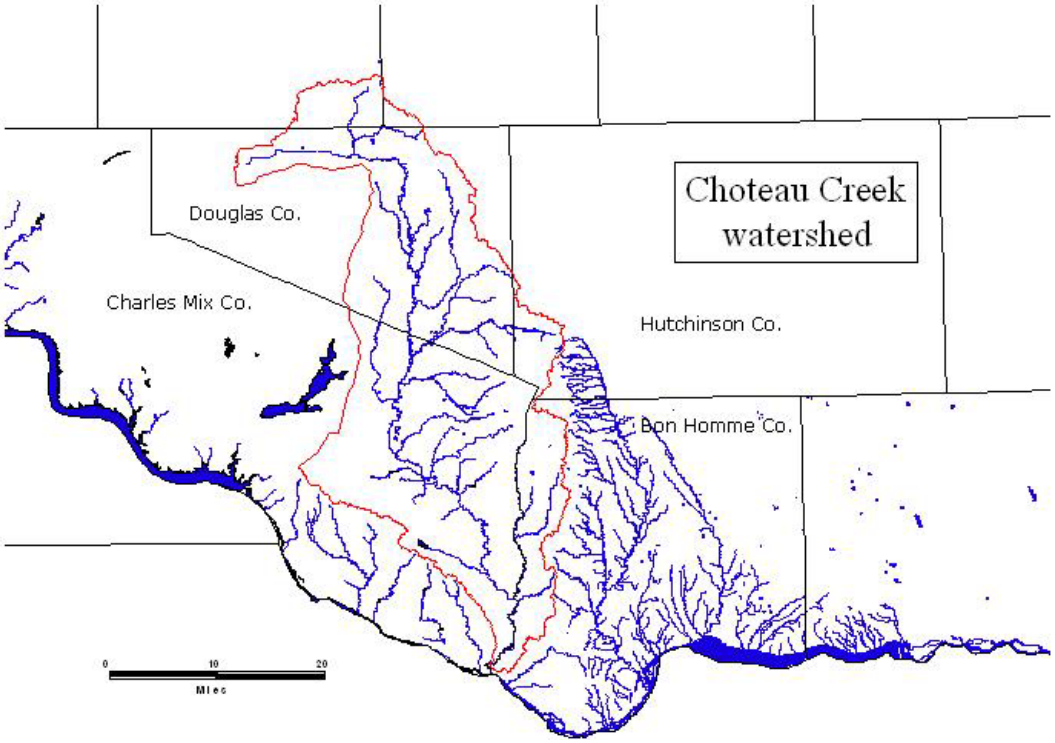

Figure 2. Choteau Creek Watershed

2.0 Water Quality Standards

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

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

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

Choteau Creek from Wagner to its confluence with Lewis and Clark Lake and Dry Choteau from Highway 50 to its confluence with Choteau Creek have been assigned the beneficial uses of, warmwater semi-permanent fish life propagation; irrigation waters, limited contact recreation; and fish and wildlife propagation, recreation, and stock watering. Table 1 lists the criteria that must be met to support the specified beneficial uses. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

South Dakota Water Quality Standards criteria do not apply when a low quality fishery (marginal and semipermanent warmwater fisheries) is below the 7 day average low flow that can be expected to occur once in five years (7Q5) or 1.0 cubic foot per second, whichever is greater. Choteau Creek is defined as a low quality fisher making this criterion applicable. A flow of 1 cfs will be used as the cutoff for the fishery standard because the 7Q5 for Choteau Creek is equal to approximately 0.25 cfs

The numeric TMDL target of 90 mg/L established for Choteau Creek took into consideration all current water quality standards. The TSS 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 arithmetic mean of a minimum of 3 samples collected during separate 24-hour periods must not exceed 90 mg/L. These criteria are applicable throughout the year.

Individual parameters determine the support of beneficial uses and compliance with standards. The most restrictive of each of these standards that apply to Choteau Creek are listed in Table 1.

Table 1. State Water Quality Standards for Choteau Creek.

Parameters	Criteria	Unit of Measure	Beneficial Use Requiring this Standard
Total ammonia nitrogen as N	Equal to or less than the result from Equation 3 in Appendix A of Surface Water Quality Standards	mg/L 30 average May 1 to October 31	Warmwater Semipermanent Fish Propagation
	Equal to or less than the result from Equation 4 in Appendix A of Surface Water Quality Standards	mg/L 30 average November 1 to April 31	
	Equal to or less than the result from Equation c in Appendix A of Surface Water Quality Standards	mg/L Daily Maximum	
Dissolved Oxygen	≥4.0	mg/L	Warmwater Semipermanent Fish Propagation
Total Suspended Solids	≤90 (mean) ≤158 (single sample)	mg/L	Warmwater Semipermanent Fish Propagation
Temperature	≤32	°C	Warmwater Semipermanent Fish Propagation
Fecal Coliform Bacteria (May 1- Sept 30)	≤1000 (geometric mean) ≤2000 (single sample)	count/100 mL	Limited Contact Recreation
Escherichia Coli Bacteria (May 1- Sept 30)	≤630 (geometric mean) ≤1178 (single sample)	count/100 mL	Limited Contact Recreation
Alkalinity ($CaCO_3$)	≤750 (mean) ≤1,313 (single sample)	mg/L	Wildlife Propagation and Stock Watering
Conductivity	≤2,500 (mean) ≤4,375 (single sample)	mhos/cm @ 25° C	Irrigation Waters
Nitrogen, nitrate as N	≤50 (mean) ≤88 (single sample)	mg/L	Wildlife Propagation and Stock Watering
pH (standard units)	≥6.5 to ≤9.0	units	Warmwater Semipermanent Fish Propagation
Solids, total dissolved	≤2,500 (mean) ≤4,375 (single sample)	mg/L	Wildlife Propagation and Stock Watering
Total Petroleum Hydrocarbon Oil and Grease	≤10 ≤10	mg/L	Wildlife Propagation and Stock Watering
Sodium Adsorption Ratio	<10	ratio	Irrigation Waters

3.0 Significant Sources

3.1 Point Sources

There are four permitted facilities in the watershed, of these, the City of Delmont is permitted as a zero discharge facility and thus should be treated as a zero in any waste load allocations (WLA).

The City of Armour's wastewater treatment facility discharges to the stream system approximately 45 kilometers upstream of the listed segment. The city's facility is managed so that discharges typically occur twice annually for approximately one week at a time. During the development of the NPDES/Surface Water Discharge permit for the facility, the potential impacts on the downstream segment were considered. SD DENR determined that Armour's discharge to an unnamed tributary of Choteau Creek was a sufficient distance upstream of this segment of Choteau Creek and would not impact the designated beneficial uses of Choteau Creek downstream. Therefore, the effluent limits could be set based strictly on the standards in the segment the facility discharges to. The City of Armour's discharge to Choteau Creek is not causing water quality impacts in the downstream segment of Choteau Creek and will not be given a WLA for this TMDL.

The remaining facilities for the Cities of Avon and Wagner are comprised of retention pond systems that may periodically require a portion of the final pond to be discharged. Table 2 includes the basic system information and permit numbers for each of the facilities within the basin.

Table 2. Permitted Facilities within the Choteau Creek Drainage

Permit Number	Facility Name	System comments	Pond 1 (acres)	Pond 2 (acres)	Pond 3 (acres)	Pond 4 (acres)	Wtlnd 1 (acres)	Wtlnd 2 (acres)
SD0020222	Armour	Pond/wetland system	10	9.7			8.3	
SD0022730	Avon	Pond system	4.1	2		3.8		
SD0021822	Delmont	Pond system						
SD0020184	Wagner (EPA facility)	Pond/IP basin	20.4	12.95	4.4		2.05	2.9

Table 3 includes the information used by SDDENR to calculate a maximum allowable discharge from each of these facilities. The calculation was based on the assumption that in some instance a complete discharge from the facility may be necessary; however the normal operation of these systems would typically result in only a small fraction of the calculated amounts actually being discharged. Flows used in the waste load allocation were determined by the individual facilities peak discharge capability. It is important to note that all discharges are required to meet state water quality concentration standards.

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

Facility Name	Flow (gpd) used in WLA	30-day Avg TSS permit limit	TSS permit limit converted to lb/ft3	TSS WLA (lb/day)
Armour				
Avon	2156228	90	0.005618	1620
Delmont				
Wagner (EPA facility)	9300096	30	0.001873	2328

Including the WLA in the load duration curve required several factors be taken into account. The maximum waste load for all systems in aggregate is 3,948 pounds (1,790 Kg). Associated with this load is also a flow of 17.7 cfs. A flow of 17.7 cfs is met or exceeded in Choteau Creek 24% of the time. Arbitrarily adding this load to the entire flow regime would be a misrepresentation for the lower 76% of the flows, however smaller discharges may impact these flows.

Flow data used to develop the curve includes daily flow data from USGS gauge site 06453255. This site provided over 20 years of daily flow data which included all WWTF discharges during that time period. The flow variability, as a result of the intermittent operation of these facilities, is fully accounted for in the flow frequency curve.

3.2 Non Point Sources

3.2.1 Upland Erosion

To accommodate the large acreage in the Choteau Creek drainage, the watershed was broken into two segments for modeling with AnnAGNPS. The roughly 40,000 acre eastern portion of the basin from the confluence of Choteau and Dry Choteau Creeks was analyzed separately. The AnnAGNPS model suggested that a disproportionate percentage of the TSS load may originate from the Dry Choteau drainage, which generated an erosion rate of 2.3 tons/ acre annually. The 335,000 acres in the western portion of the basin generated an erosion rate of 0.44 tons/acre. These values are erosion rates and may not be used to calculate a delivered load of sediment at the outlet of the watershed. Not only were the erosion rates for Dry Choteau higher than the mainstem, but when compared with the greater Lewis and Clark basin, these loadings were among the highest modeled.

The Choteau Creek drainage contains approximately 258 animal feeding operations. The Dry Choteau drainage area contains only 25 of these operations, four of which are in close enough proximity to the stream to have a potential for contributing suspended solids. These four lots have implementation priority rankings of 25, 38, 86, and 130 (out of 502) in the Lewis and Clark Implementation Project. The relatively high rankings of the top two will result in further analysis and potential remediation during the implementation. However, it is unlikely this will significantly affect the TSS loadings, as their combined acreage is estimated to be less than 7 acres.

3.2.2 Bed and Bank Erosion

There were 262 individual Rapid Geomorphic Assessments (RGAs) completed in the Choteau Creek drainage. Figure 4 depicts the locations of each of the RGAs and also represents their relative stability scores. Each RGA was completed on both the upstream and downstream portions of a road crossing, resulting in what appears to be some sites receiving both a stable and unstable score. These are treated as two separate scores for each crossing, one upstream and the other downstream. This was done to determine potential impacts of culverts and bridges under the assumption that a stable score upstream and an unstable score downstream may be a localized effect of the road crossing.

Culverts on small streams such as Choteau Creek may at times create more instability immediately downstream of the structure than bridges do, when installed in similar situations. All of the road crossings along the Dry Choteau segment having the unstable RGA scores have bridges installed. The upstream sites at these road crossings also received unstable scores, indicating that it is unlikely that the road crossings along this portion of the stream are contributing to the channel instability.

Using a gross score of 20 as the dividing line between stable and unstable channels, it appears that the lower reaches of Choteau Creek are more unstable than the rest of the watershed. Based on a combination of the RGA scores and the best professional judgment of the local coordinators, approximately 50 miles of the 420 stream miles (12%) were identified as having intermittent segments of degraded channel stability (see the bolded stream segments in Figure 3). It is interesting to note that the portions of the stream that appear to be most unstable include nearly the entire segment of Choteau Creek that is impaired and is assigned the fisheries and recreation classifications.

These unstable portions of stream may have a variety of causes including increased runoff from adjacent upland areas, poorly designed road crossings, and agricultural pressures in and around the stream riparian area. It is suspected that all of these factors in addition to natural channel erosion processes may be contributing factors in various portions of the watershed.

RGA scores throughout the remainder of the basin indicated a range of conditions. Unstable sites found upstream of the highlighted section in Figure 3 appear to be localized in nature. Remediation success is more likely on localized area such as these, however many of them are located a significant distance upstream of the listed segment. Due to this distance, best management practices applied to these areas are unlikely to result in measurable improvements in the listed segment.

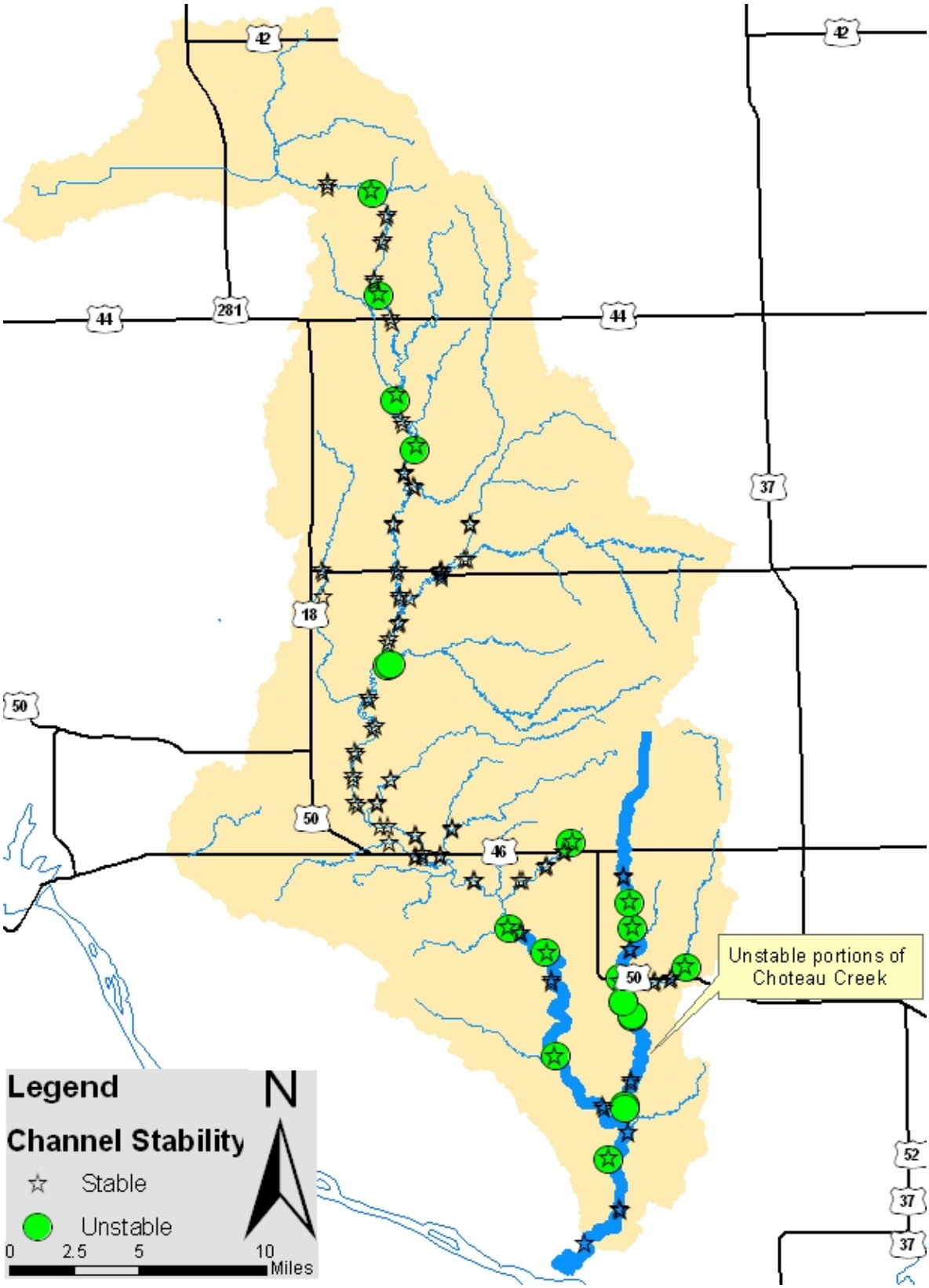

Figure 3. Choteau Creek Channel Stability based on RGA Scores

Streams within ecoregion 42 (including Choteau Creek) that are stable may be expected to generate annual suspended sediment loads ranging from 0.537 T/y/km^2 to 2.43 T/y/km^2 with a median load of 1.03 T/y/km^2 (Klimentz *et al*, 2009). The maximum measured annual load in a stable stream for this ecoregion was measured at 4.39 T/y/km^2.

Substituting suspended solids data for the suspended-sediment data, the same methodology used by Klimentz and Simon was utilized for the Choteau Creek data. A rating equation was developed to create daily yield values in tones per day from mean-daily discharge data. Mean-daily loads were summed for each complete calendar year, providing a mean annual load (T/y). To normalize data for watersheds of different size, sediment load was divided y drainage area, providing calculations of mean annual sediment yield (T/y/km^2).

A sediment load of 22.5 T/y/km^2 was calculated for the stream. Depending on the reduction target selected (maximum vs. median of stable channels) reduction in sediment transport of 81% to 95% is necessary to reach the expected loading in a stable channel.

Considering all of the assessment data, it appears that the smaller Dry Choteau drainage may be the primary source of impairment for the greater drainage area. Nonpoint source modeling indicated it was more likely to generate excess sediment loads and RGA analysis indicated most of its primary channel is unstable. It is possible that as the channel in Dry Choteau degraded, it resulted in a head cut that moved up the mainstem of Choteau Creek. Implementation priority should focus on the Dry Choteau drainage with particular emphasis placed on riparian areas along the unstable segments of the stream.

4.0 Technical Analysis

4.1 Data Collection Method

Data on Choteau Creek were collected during the Lewis and Clark Watershed Assessment from one sampling point located on Charles Mix County Road 2 near the mouth of the creek. The data collected during the assessment were used to supplement existing data from SD DENR ambient water quality monitoring site 460134 which was co-located at site LAC5. Flow data for Choteau Creek were retrieved from the United States Geological Survey (USGS). Figure 4 represents the listed segment of the watershed as well as the drainage area of the watershed.

The Aquarius hydrologic statistics function was used to evaluate stream flows. Sediment source evaluation was conducted through the use of the AnnAGNPS model as well as the evaluation of RGA results. Analysis completed with these programs was completed according to the most recent version of the Water Quality Modeling in South Dakota document (SDDENR, 2009), except where noted.

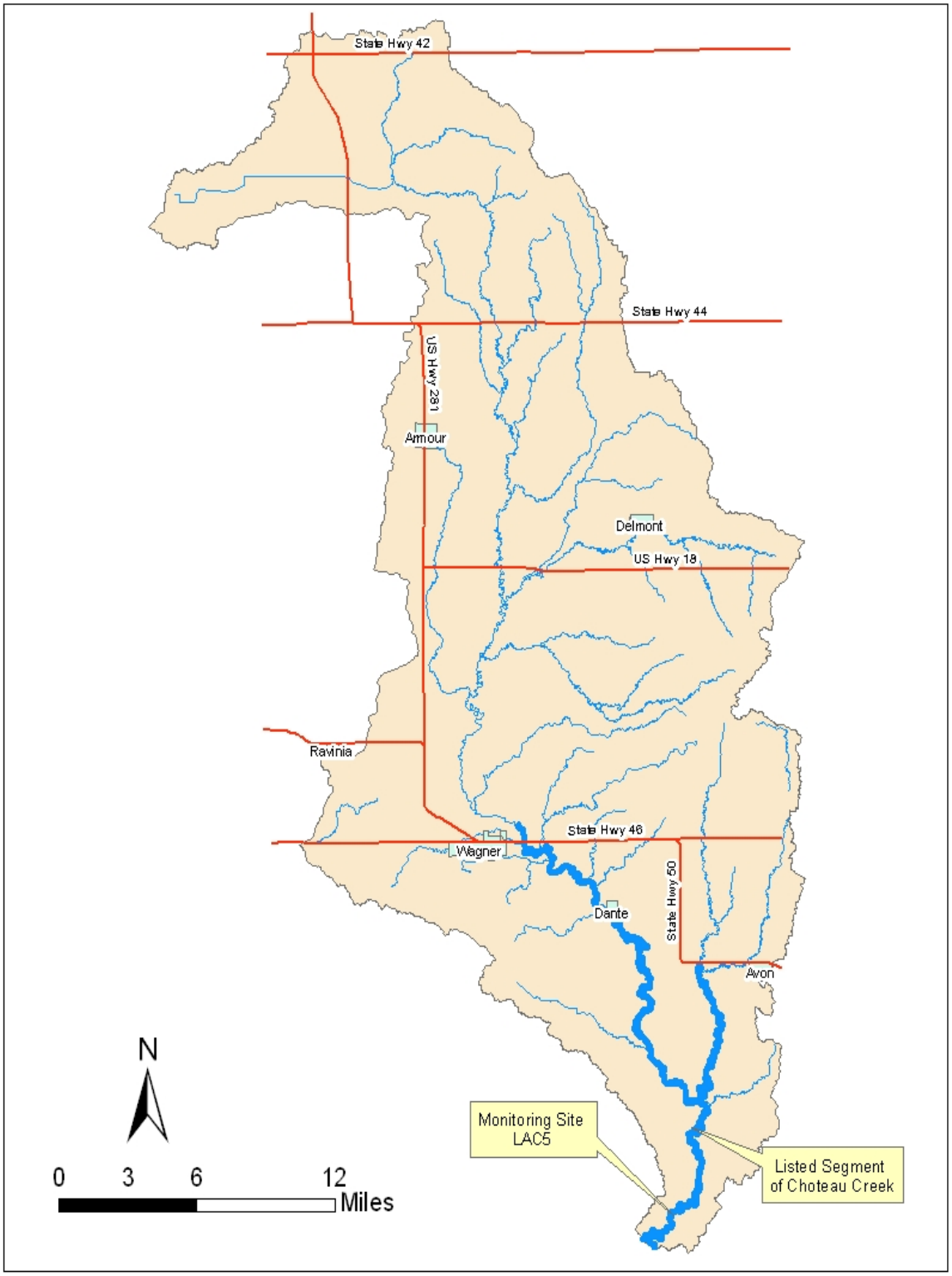

Figure 4. Listed Segment of Choteau Creek

4.2 Flow Analysis

Water quantity data were collected during the project and supplemented with USGS data from station 06453255 located on Choteau Creek near Avon, South Dakota. This USGS station is located a few miles upstream of the water quality monitoring station. The difference between the drainage areas for the two gauges is less than 2% with no significant tributaries entering the creek between the sites. Daily flows from over 20 years data were used to generate the load duration curve. This relatively robust dataset provided the basis for a load duration curve that accurately represents the Choteau Creek flow frequencies. Water quality data from the Lewis and Clark Project as well as SDDENR ambient water quality monitoring were utilized in the development of this TMDL. Sites LAC5 and 460134 are both located at the same point on the creek.

4.3 Flow Zone 1 (High Flows)

The high flow zone is composed of the highest 10% of flows that occurred in Choteau Creek. The 10th percentile equates to a flow of 107 cfs and is the division between flow zones 1 and 2 as defined in the EPA load duration curve guidance. This flow is slightly less than the $Q_{1.5,}$ which is approximately 150 cfs. This is still very close to the channel forming flow making the 90% flow exceedence a good division for flow zone 1. The acute water quality standard was exceeded in four of the eleven samples collected from this zone, see Table 4.

As a result of the exceptionally high concentration measured on June 21, 2005, the 90th percentile concentration was used for calculating the example TMDL in this flow zone (Table 7). Slightly reducing the zone percentile was preferred to dropping the sample as an outlier. The resulting reductions of 89% agree with the sediment reductions suggested in section 3.2.2 (81% to 95%). The resulting TMDL of 374 T/day was calculated at the 95th percentile flow of 1540 cfs utilizing the chronic threshold of 90 mg/L of total suspended solids.

Insufficient data are available to evaluate the chronic criteria for this stream. By utilizing the chronic threshold instead of the acute criteria, reductions are calculated to reduce the maximum daily concentration to 90 mg/L. This provides assurance that both the acute and chronic criteria are fully supported.

Table 4. Data Collected from the High Flow Zone in Choteau Creek

Station ID	Sample Date	TSS (mg/L)	Flow (CFS)	Flow Zone
460134	04/14/1999	856	915	Zone 1
460134	04/18/2001	146	328	Zone 1
LEWCLART5	06/13/2005	196	249	Zone 1
460134	07/29/1999	200	227	Zone 1
460134	04/17/2006	38	184	Zone 1
460134	04/17/2007	11	184	Zone 1
460134	04/26/2004	15	182	Zone 1
460134	04/26/2004	13	182	Zone 1
460134	04/22/2008	42	180	Zone 1
460134	04/18/2005	19	160	Zone 1
LEWCLART5	06/21/2005	2700	120	Zone 1

4.4 Flow Zones 2 and 3

Flow zones 2 and 3 are characterized by discharge frequency exceedence of 10%-40% and 40%-60% respectively. These divisions were made according to the EPA Load Duration Curve Guidance and the data from these flow zones may be found in Table 5.

No exceedence of the states water quality standards were detected in these flow zones. The highest measured concentration was collected during the Lewis and Clark Assessment Project on May 19, 2003 at a concentration of 76 mg/L indicating that both acute and chronic standards are met 100% of the time. TMDL calculations for zone 2 were based on a flow of 102 cfs and the 90 mg/L chronic threshold.

To calculate the example TMDL for Zone 3, the 95th percentile flow of 5.9 cfs was used. Each of the WWTF could account for all of the flow in this zone. For the example TMDL, the flow was divided evenly among the three sources and then multiplied by either the permit limit or the chronic threshold of 90 mg/L.

Table 5. Mid and Moist Flow Zone Data

Station ID	Sample Date	TSS (mg/L)	Flow (CFS)	Flow Zone
LEWCLART5	07/07/2005	72	103	Zone 2
460134	07/19/2004	26	100	Zone 2
460134	07/09/2003	48	66	Zone 2
LEWCLART5	7/9/2003	38	66	Zone 2
460134	05/20/2009	74	60	Zone 2
460134	04/08/2002	22	59	Zone 2
460134	07/16/2007	36	54	Zone 2
460134	07/24/2006	33	48	Zone 2
460134	07/19/2001	44	47	Zone 2
460134	07/24/2003	72	45	Zone 2
LEWCLART5	7/24/2003	64	45	Zone 2
460134	07/26/2005	66	43	Zone 2
460134	07/01/2008	46	42	Zone 2
LEWCLART5	5/14/2003	36	20	Zone 2
LEWCLART5	5/19/2003	76	17	Zone 2
LEWCLART5	7/31/2003	49	14	Zone 2
460134	01/26/1999	22	12	Zone 2
LEWCLART5	6/24/2003	23	11	Zone 2
460134	04/24/2000	49	9.1	Zone 2
460134	10/17/2006	19	7	Zone 2
460134	10/19/2004	6	6.6	Zone 2
460134	10/19/2005	15	6.6	Zone 2
LEWCLART5	5/7/2003	20	6.2	Zone 2
LEWCLART5	7/2/2003	55	6.1	Zone 2
460134	10/15/2007	34	6.1	Zone 2
460134	10/20/2008	13	5.9	Zone 3
460134	01/15/2002	21	5.5	Zone 3
460134	02/17/2009	5	5.3	Zone 3
460134	10/27/2003	7	4.9	Zone 3
460134	10/27/2003	6	4.9	Zone 3
460134	10/25/1999	18	3.8	Zone 3
460134	01/26/2000	3	3.7	Zone 3
460134	01/23/2006	5	3.1	Zone 3
460134	01/23/2007	3	3.1	Zone 3

4.5 Flow Zones 4 and 5

The division between zones 4 and 5 was altered from the EPA load duration curve guidance. The guidance suggests that these flow zones be separated at the 90% flow exceedence. In Choteau Creek, the 90% flow exceedence equates to a flow of approximately 0.5 cfs. All sample data collected from flows less than 1 cfs may not be considered when determining impairment because it is below the low quality fishery cutoff.

A flow rate of 1 cfs is exceeded in Choteau Creek approximately 80% of the time. Flow zone 4 was characterized by flows that were exceeded between 60% and 80% of the time. Zone 5 flows are those that are exceeded over 80% of the time and are less than 1 cfs.

To calculate the example TMDL for Zone 4, the 95th percentile flow of 2.9 cfs was used. At this flow, each of the WLA as well as the LA may at any given time account for part or all of the flow. The flow frequency curve already accounts for this flow variability. The example TMDL in Table 7 was calculated based on an even allocation of the flow among the sources multiplied by their appropriate permit limit or the chronic threshold.

Although the TSS standard does not apply to zone 5, any permitted discharge is still required to meet its permit limits. An example TMDL was not calculated for this zone.

Table 6 depicts the data collected from the dry and low flow zones. No exceedences of the standards were measured in either of these flow zones.

Table 6. Dry and Low Flow Zone Data

Station ID	Sample Date	TSS (mg/L)	Flow (CFS)	Flow Zone
460134	01/14/2004	16	2.8	Zone 4
460134	01/19/2005	8	2.8	Zone 4
460134	01/14/2008	7	2.8	Zone 4
460134	10/30/2001	10	2.4	Zone 4
460134	10/23/2000	29	2.1	Zone 4
LEWCLART5	8/8/2003	62	2.1	Zone 4
460134	01/08/2003	6	1.8	Zone 4
460134	01/08/2001	7	1.2	Zone 4
LEWCLART5	6/4/2003	25	1.2	Zone 4
LEWCLART5	8/12/2003	82	1.2	Zone 4
LEWCLART5	8/12/2003	92	1.2	Zone 4
460134	10/22/2002	6	1.1	Zone 4
LEWCLART5	5/28/2003	26	1.1	Zone 4
LEWCLART5	6/19/2003	43	1	Zone 4
LEWCLART5	6/19/2003	39	1	Zone 4
460134	04/15/2003	34	0.99	Zone 5
460134	07/25/2000	33	0.96	Zone 5
460134	07/15/2002	56	0.87	Zone 5
LEWCLART5	8/27/2003	31	0.62	Zone 5
LEWCLART5	8/21/2003	48	0.54	Zone 5

4.6 Load Duration Curve

The load duration curve located in Figure 4 depicts the flow zones and sample data as described in section 4.3 through 4.5.

The waste load allocations for Avon and Wagner were taken into consideration and included within the TMDL calculations and table. The individual waste load allocations for each of these facilities were not included in the graphic due to their infrequent discharges. Arbitrarily adding these loads across all of the flow regimes would be a misrepresentation of how the system(s) function, essentially suggesting a continuous discharge.

The gauge used to develop the flow frequency curve used for the load duration curve in Figure 5 is located downstream of all the permitted facilities addressed in this TMDL. The flow variability as a result of the intermittent operation of these facilities is fully accounted for in the curve.

Table 7 presents numeric examples of the TMDLs calculated for specific flows from each of the flow zones represented in Figure 5. The true TMDL is the curve itself which fully accounts for flow dynamics while incorporating the water quality standard.

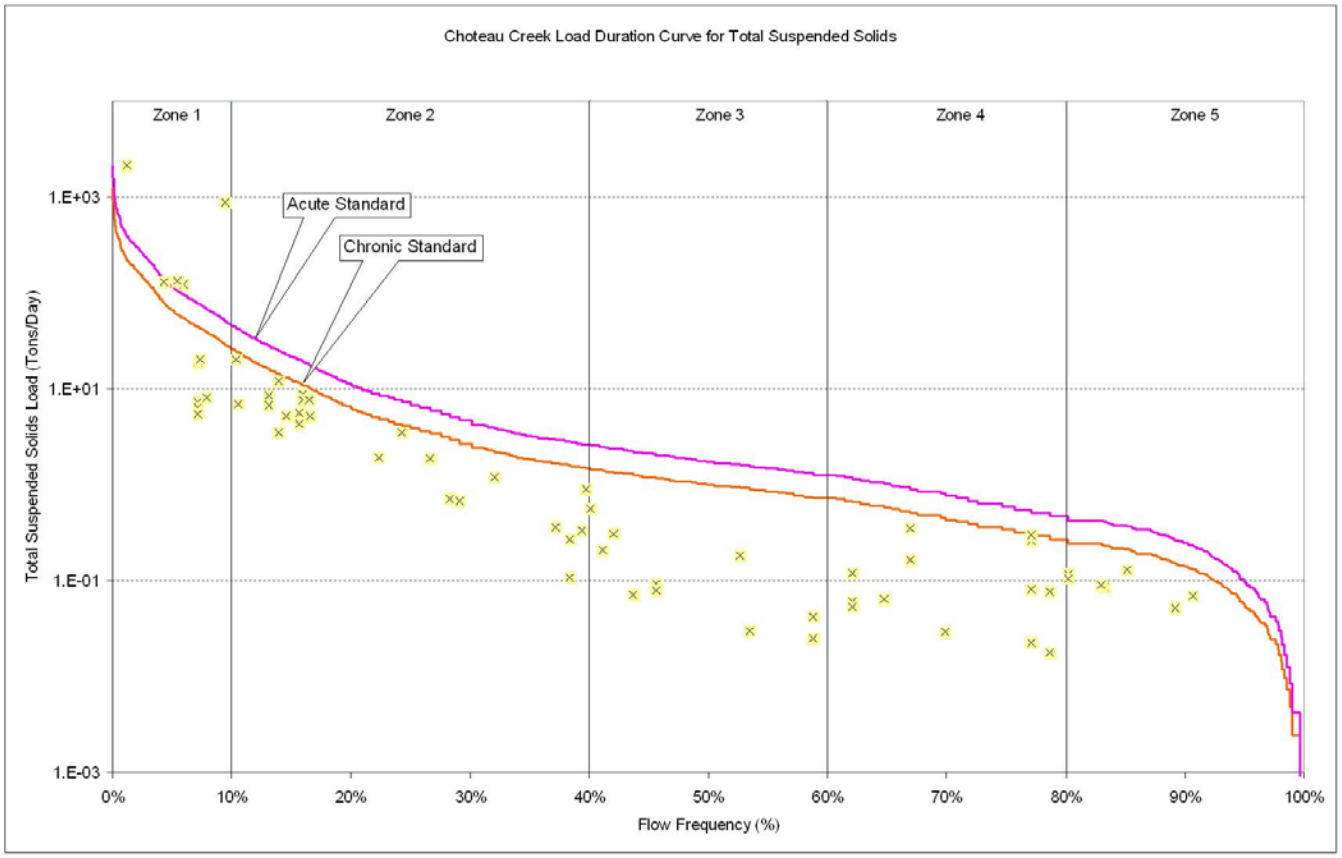

Figure 5. Choteau Creek Load Duration Curve for Total Suspended Solids

5.0 TMDL and Allocations

Table 7. Total Maximum Daily Load (TMDL) by Flow Regime

TMDL Component	Flow Zone (expressed as Tons/Day)			
	Zone 1	Zone 2	Zone 3	Zone 4
	>107 cfs	107-6.1 cfs	6.1-3 cfs	3-1 cfs
LA	352.08	21.48	0.73	0.33
WLA Avon*	0.81	0.81	0.43	0.21
WLA Wagner*	1.16	1.16	0.14	0.07
WLA Delmont*	-	-	-	-
MOS	20.17	1.32	0.13	0.10
TMDL @ 90 mg/L	374.22	24.78	1.44	0.70
Current Load**	3,284.82	19.54	0.55	0.52
Load Reduction	89%	0%	0%	0%

WLA are calculated at the maximum flow in each flow zone that is less than the maximum discharge capacity of the system. Flow zones that exceed the design capacity of the system use the maximum discharge of the system to calculate the WLA

***Current Load is the 95th percentile concentration * 95th percentile flow in each regime with the exception of the Zone 1, in which the 90th percentile concentration was used.*

5.1 Load Allocations (LAs)

An 89% reduction in solids is required in the high flow regime to fully attain the current water quality standards. Load reductions are possible in this flow regime, but an 89% reduction may be difficult or impossible to achieve. Consideration for creating a high flow off ramp should be given for Choteau Creek. Although the channel stabilization suggests the standard may be fully attained, this may be socially and economically unobtainable.

5.2 Wasteload Allocations (WLAs)

There are two point sources of pollutants in this watershed. The wasteload allocations were calculated through two methods depending on which flow zones they were located in. In flow zones where the stream flows exceeded the designed discharge capacity of the facility, the wasteload allocation was set equal to the discharge of the final pond in the system. In flow zones where the designed discharge of the facilities was greater than the flow regimes example TMDL flow, the flows were divided evenly among the three sources (Avon, Wagner, nonpoint source). Each sources flow was then multiplied by the permit limit or the chronic TSS threshold.

Of the five flow zones, the only one with a water quality exceedence was zone 1. The WLA for this flow zone accounted for less than 2% of the potential daily load. Full support of the standard in the lower flow zones where the WLA compose a more significant portion of the total load suggests that the permitted facilities are not having negative impacts on the suspended solids loads in the stream.

6.0 Margin of Safety (MOS) and Seasonality

6.1 Margin of Safety

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

6.2 Seasonality

Different seasons of the year can yield differences in water quality due to changes in precipitation and agricultural practices. Some seasonal variation in the suspended solids load would be expected. The data indicates that violations are directly linked to high flow conditions, which most often occur during the spring months.

7.0 Public Participation

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

FEDERAL AGENCIES
Environmental Protection Agency (EPA) provided the primary source of funds for the completion of the assessment on Lewis and Clark Lake.

Natural Resource Conservation Service (NRCS) provided technical assistance, particularly in the collection of soils data for the AnnAGNPS portion of the report.

The Farm Service Agency provided a great deal of information that was utilized in the completion of the AnnAGNPS modeling portion of the assessment.

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

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

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

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

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

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

Industry: Natural Resouce Solutions, Brooking South Dakota

8.0 Monitoring Strategy

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.

9.0 Implementation Plan

An implementation project began in 2006 for the greater Lewis and Clark watershed and is will encompass the Choteau Creek Watershed and address the TMDL for this waterbody.

10.0 Literature Cited

Klimentz, L., Simon, A., Schwartz, J., 2009. Characterization of Suspended-Sediment Transport Conditions for Stable, ”Reference” Streams in Selected Ecoregions of EPA Region 8.

SDDENR (South Dakota Department of Environment and Natural Resources). 2006. The 2008 South Dakota Integrated Report for Surface Water Quality Assessment Pierre, SD.

SDDENR (South Dakota Department of Environment and Natural Resources). 2008. The 2008 South Dakota Integrated Report for Surface Water Quality Assessment Pierre, SD.

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

USDA (United States Department of Agriculture) 1982, Soil Survey of Charles Mix County, South Dakota

USEPA (United States Environmental Protection Agency) 2007, An Approach for using Load Duration Curves in the Development of TMDLs

Appendix A. Public Notice Comments

EPA Region VIII TMDL Review

TMDL Document Info:

Document Name:	**Total Suspended Solids Total Maximum Daily Load Evaluation for Choteau Creek, Bon Homme and Charles Mix Counties, South Dakota**
Submitted by:	**Cheryl Saunders, SD DENR**
Date Received:	**February 23, 2010**
Review Date:	**March 19, 2010**
Reviewer:	**Vern Berry, EPA**
Rough Draft / Public Notice / Final?	**Public Notice Draft**
Notes:	

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

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

Approval Notes to Administrator:

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

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

Under Section 303(d) of the Clean Water Act, waterbodies that are not attaining one or more water quality standard (WQS) are considered "impaired." When the cause of the impairment is determined to be a pollutant, a TMDL analysis is required to assess the appropriate maximum allowable pollutant loading rate. A TMDL document consists of a technical analysis conducted to: (1) assess the maximum pollutant loading rate that a waterbody is able to assimilate while maintaining water quality standards; and (2) allocate that assimilative capacity among the known sources of that pollutant**.** A well written TMDL document will describe a path forward that may be used by those who implement the TMDL recommendations to attain and maintain WQS.

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

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

1. Problem Description

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

1.1 TMDL Document Submittal Letter

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

Minimum Submission Requirements.

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

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

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

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

SUMMARY: The Choteau Creek 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 February 23, 2010. 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: Choteau Creek is a stream located in Bon Homme and Charles Mix Counties, South Dakota and is a tributary of the Missouri River in the Lewis and Clark Lake sub-basin (HUC 10170101). The Creek has a total drainage area of approximately 375,000 acres in south eastern South Dakota. The 303(d) listed segment of Choteau Creek includes 42 miles of the Creek from the town of Wagner to its confluence with Lewis and Clark Lake (SD-MI-R-CHOTEAU_01). It is listed as high priority for TMDL development.

The designated uses for Choteau Creek include warmwater semi permanent fish life propagation waters, limited-contract recreation waters, fish and wildlife propagation, recreation, and stock watering. The segment was listed on the 2008 303(d) list for total suspended solids (TSS) which is impairing the warmwater fish life propagation uses.

COMMENTS: Portions of the Choteau Creek watershed include lands owned by members of the Yankton Sioux Tribe (e.g., Wagner's NPDES permit was issued by EPA because it's on Tribal land). The TMDL should be revised to acknowledge the existence of Tribal ownership of land in the watershed, and include a statement that the TMDL is not applicable to Tribal lands within the watershed.

DENR Response: *Language was added in the Watershed Characteristics section stating that this TMDL is applicable to only non tribal lands..*

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 Choteau Creek 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 Creek 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 30-day average of ≤ 90 mg/L. Discussion of additional applicable water quality standards for Choteau Creek can be found on pages 6 and 7 of the TMDL.

Comments: None.

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 Choteau Creek. 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: The primary numeric target for this TMDL is based on the 30-day average, warmwater semi permanent fish life, TSS standard. On page 6 of the TMDL it says the target is based on the "the current daily water quality standards." We suggest changing that wording to read something similar to: "The numeric TMDL target established for Choteau Creek is 90 mg/L, which is based on the 30-day average standard for total suspended solids."

DENR Response: *Adjustments were made to this section to more accurately reflect its intent which was to state that both the acute and chronic criteria were taken into consideration when developing the numeric target of 90 mg/L.*

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 (47%) and grazing or pasture land (45%), with the remaining 8% of the watershed composed of water, wetlands, roads, housing and forested lands.

The AnnAGNPS model suggested that a disproportionate percentage of the TSS load may originate from the Dry Choteau drainage, which generated an erosion rate of 2.3 tons/ acre annually. The 335,000 acres in the western portion of the basin generated an erosion rate of 0.44 tons/acre. Not only were the erosion rates for Dry Choteau higher than the mainstem, but when compared with the greater Lewis and Clark basin, the loads from this sub-basin were among the highest modeled.

The Choteau Creek drainage contains approximately 258 animal feeding operations. The Dry Choteau drainage area contains only 25 of these operations, four of which are in close enough proximity to the stream to have a potential for contributing suspended solids.

There were 262 individual Rapid Geomorphic Assessments (RGAs) completed in the Choteau Creek drainage. It appears that the lower reaches of Choteau Creek are more unstable than the rest of the watershed.

There are four small communities within the watershed that have permitted waste water treatment facilities. These include Wagner, Delmont, Avon and Armour. The City of Delmont is permitted as a zero discharge facility and thus should be treated as a zero in any waste load allocations (WLA). The two small communities of Dante and Ravinia are not serviced by community water treatment facilities that discharge to the Choteau Creek watershed.

The City of Armour's wastewater treatment facility discharges to the stream system approximately 45 kilometers upstream of the listed segment. The City's facility is managed so that discharges typically occur twice annually for approximately one week at a time. SD DENR determined that Armour's discharge to an unnamed tributary of Choteau Creek was a sufficient distance upstream of the impaired segment of Choteau Creek; would not impact the designated beneficial uses of Choteau Creek downstream; and would not be given a WLA for this TMDL.

Table 3, excerpted from the TMDL document, includes the information used by SDDENR to calculate a maximum allowable discharge from the two remaining facilities, Avon and Wagner. The calculations were based on the assumption that on occasion a complete discharge from the facility may be necessary. However, the normal operation of these facilities would require only a portion of the calculated amounts actually being discharged. Flows used in the waste load

allocations were determined by the peak discharge of each facility. All discharges are required to meet state water quality standards.

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

Facility Name	Flow (gpd) used in WLA	30-day Avg TSS permit limit	TSS permit limit converted to lb/ft3	TSS WLA (lb/day)
Armour				
Avon	2156228	90	0.005618	1620
Delmont				
Wagner (EPA facility)	9300096	30	0.001873	2328

Comments: None.

4. TMDL Technical Analysis

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

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

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

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

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

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

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

Minimum Submission Requirements:

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

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

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

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

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

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

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

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

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

SUMMARY: The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It

should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Choteau Creek TMDL describes how the TSS loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segment.

Data on Choteau Creek was collected during the Lewis and Clark Watershed Assessment. Data was collected at a sampling station near the mouth of the Creek. The Annualized Agricultural Nonpoint Source model (AnnAGNPS) was used to predict erosion rates for the two main portions of the basin (i.e., Choteau Creek and Dry Choteau Creek).

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 stream miles evaluated in the watershed contained sites ranked as unstable and contributing to increased sediment loading.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDC was divided into 5 distinct flow regimes – high flow ($\geq$ 107 cfs), moist flow (between 107 cfs and 6.1 cfs), midrange flow (between 6.1 cfs and 3 cfs), dry flow (between 3 cfs and 1 cfs) and low flow (< 1 cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 5 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 = 374.22 tons/day; moist flow = 24.78 tons/day; midrange flow = 1.44 tons/day; and dry flow = 0.70 tons/day.

South Dakota's water quality standards do not apply when the flow in stream designated as a low quality fishery (marginal and semi permanent warmwater fisheries), is below the 7 day average low flow that can be expected to occur once in five years (7Q5) or 1.0 cubic foot per second, whichever is greater. Choteau Creek is designated as a semi permanent fishery, so this provision applies. A flow of 1 cfs was be used as the cutoff for Choteau Creek because the 7Q5 flow is equal to approximately 0.25 cfs. Therefore, loads were not calculated for the lowest flow zone (i.e., Figure 5, Zone 5 in the document) in the TMDL.

COMMENTS: On page 12 (Section 3.2.2) it says that a sediment load of 22.5 T/y/km^2 was calculated for the stream. It is not clear how that calculation was made, please explain.

DENR Response: *This calculation was completed using the methodology developed by Klimentz and Simon in the document "Characterization of Suspended-Sediment Transport Conditions for Stable, "Reference" Streams in Selected Ecoregions of EPA Region 8". This methodology was copied from Klimentz and included in this document.*

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 Choteau Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. Data on Choteau Creek was collected during the Lewis and Clark Watershed Assessment from one sampling point located on Charles Mix County Road 2 near the mouth of the creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site 460134 which was co-located at site LAC5. Flow data for Choteau Creek was retrieved from the United States Geological Survey (USGS), and includes over 20 years of flow data which was used to generate the load duration curve.

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: There are two point sources of pollutants in this watershed. The wasteload allocations were calculated through two methods depending on which flow zones they were located in. In flow zones where the stream flows exceeded the designed discharge capacity of the facility, the wasteload allocation was set equal to the discharge of the final pond in the system. In flow zones where the designed discharge of the facilities was greater than the flow regimes example TMDL flow, the flows were divided evenly among the three sources (Avon, Wagner, nonpoint source). Each sources flow was then multiplied by the permit limit or the chronic TSS threshold. See Table 7 in the TMDL document for the WLA values for each facility and flow zone.

Comments: None.

4.3 Load Allocations (LA):

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

Minimum Submission Requirements:

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

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

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

SUMMARY: The Watershed Characteristics section of the TMDL explains that the landuse in the watershed is 92 percent agricultural. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the form of load allocations. Table 7 includes the load allocations at each of the flow regimes – 352.08 tons/day at high flows; 21.45 tons/day at moist flows; 0.73 tons/day at midrange flows; and 0.33 tons/day at dry flows.

Comments: None.

4.4 Margin of Safety (MOS):

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

Minimum Submission Requirements:

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

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

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

SUMMARY: The Choteau Creek TMDL includes an explicit MOS derived by calculating the difference between the loading capacity at the mid-point of each of the five flow zones and the loading capacity at the minimum flow in each zone. The explicit MOS values are included in Table 7 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.

Public Participation

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

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

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

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

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

Comments: None.

6. Monitoring Strategy

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

Minimum Submission Requirements:

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

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

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

SUMMARY: Choteau Creek 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 Choteau Creek watershed there is no need to include a discussion of reasonable assurance in this TMDL document.

Comments: None.

8. Daily Loading Expression

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

Minimum Submission Requirements:

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

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

SUMMARY: The Choteau Creek 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.

DEPARTMENT of ENVIRONMENT and NATURAL RESOURCES
PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

April 15, 2010

Vern Berry
US EPA Region 8
1595 Wynkoop Street
Denver, CO 80202-1129

Dear Mr. Berry:

The South Dakota Department of Environment and Natural Resources (DENR) hereby submits the attached "Total Suspended Solids Total Maximum Daily Load Evaluation for Choteau Creek, Bon Homme and Charles Mix Counties, South Dakota" report for USEPA final approval. The TMDL contained in this report was developed by the department with public input in accordance with section 303(d) of the federal Clean Water Act. This TMDL has been established at levels necessary to meet applicable water quality standards with consideration of seasonal variation, margin of safety, and all known sources of pollution. Choteau Creek is listed in the 2010 South Dakota Integrated Report.

Based on comments received during the public comment period, changes to the report were addressed. The comments and the responses to the comments were attached to the end of the document. With this submittal, the department is asking for USEPA approval of this TMDL as required by the Clean Water Act. With your approval this TMDL document will also be available via our homepage at:
http://denr.sd.gov/dfta/wp/tmdlpage.aspx

We look forward to your agency's approval of this TMDL. We also want to thank members of your staff for their assistance and insights during the development process.

Sincerely,

Richard A. Hanson
Environmental Senior Scientist
Water Resource Assistance Program

Enclosure: "Total Suspended Solids TMDL Evaluation for Choteau Creek, Bon Homme and Charles Mix Counties, South Dakota" report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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RECEIVED
MAY 10 2010
DEPT. OF ENVIRONMENT AND NATURAL RESOURCES, SECRETARY'S OFFICE

MAY 0 3 2010

Ref: 8EPR-EP

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

Re: TMDL Approvals
Choteau Creek; TSS; SD-MI-R-CHOTEAU_01

Dear Mr. Pirner:

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

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

Sincerely,

Eddie A. Sierra

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

Enclosures

Printed on Recycled Paper

ENCLOSURE 1: APPROVED TMDLs

1 Pollutant TMDLs completed.

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

Determinations that no pollutant TMDL needed.

Submitted: 4/16/2010

Segment: Choteau Creek from Wagner to Lewis and Clark Lake

303(d) ID: SD-MI-R-CHOTEAU-01

Parameter/Pollutant (303(d) list cause): TOTAL SUSPENDED SOLIDS - 518

Water Quality Targets: 90 mg/L 30-day average; 158 mg/L daily maximum

Allocation*	Value	Units	Permits
WLA	0.81	TONS/DAY	SD0022730
WLA	1.16	TONS/DAY	SD0020184
MOS	20.17	TONS/DAY	
LA	352.08	TONS/DAY	
TMDL	374.22	TONS/DAY	

Notes: The loads shown represent the loads during the high flow regime as defined by the load duration curve for Choteau Creek (see Figure 5 of the TMDL). The high flows are when the largest differences occur between the existing load and the target load, therefore the greatest load reduction is needed to meet the water quality standards.

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

ENCLOSURE 2

EPA REGION VIII TMDL REVIEW

TMDL Document Info:

Document Name:	**Total Suspended Solids Total Maximum Daily Load Evaluation for Choteau Creek, Bon Homme and Charles Mix Counties, South Dakota**
Submitted by:	**Cheryl Saunders, SD DENR**
Date Received:	**April 16, 2010**
Review Date:	**April 26, 2010**
Reviewer:	**Vern Berry, EPA**
Rough Draft / Public Notice / Final?	**Final**
Notes:	

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

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

Approval Notes to Administrator:

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

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

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

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

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

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

1. Problem Description

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

1.1 TMDL Document Submittal Letter

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

Minimum Submission Requirements.

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

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

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

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

SUMMARY: The Choteau Creek total suspended solids (TSS) TMDL was submitted to EPA for review and approval via an email from Cheryl Saunders, SD DENR on April 16, 2010. The email included the final TMDL document and a letter requesting final review and approval.

COMMENTS: None

1.2 Identification of the Waterbody, Impairments, and Study Boundaries

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

Minimum Submission Requirements:

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

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

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

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

SUMMARY: Choteau Creek is a stream located in Bon Homme and Charles Mix Counties, South Dakota and is a tributary of the Missouri River in the Lewis and Clark Lake sub-basin (HUC 10170101). The Creek has a total drainage area of approximately 375,000 acres in south eastern South Dakota. The 303(d) listed segment of Choteau Creek includes 42 miles of the Creek from the town of Wagner to its confluence with Lewis and Clark Lake (SD-MI-R-CHOTEAU_01). It is listed as high priority for TMDL development.

Portions of the Choteau Creek drainage are owned by the Yankton Sioux Tribe. The Choteau Creek TSS TMDL strictly addresses the non tribal portions of the drainage.

The designated uses for Choteau Creek include warmwater semi permanent fish life propagation waters, limited-contract recreation waters, fish and wildlife propagation, recreation, and stock watering. The segment was listed on the 2008 303(d) list for total suspended solids (TSS) which is impairing the warmwater semi permanent fish life beneficial use.

COMMENTS: None.

1.3 Water Quality Standards

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

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

Minimum Submission Requirements:

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

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

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

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

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

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

SUMMARY: The Choteau Creek 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 Creek segment. The numeric standards being implemented in this TMDL are: a daily maximum value of TSS of ≤ 158 mg/L in any one sample, and a 30-day average of ≤ 90 mg/L. Discussion of additional applicable water quality standards for Choteau Creek can be found on pages 6 and 7 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 target for this TMDL is based on the numeric water quality standards for TSS which were adopted to protect the warmwater semi permanent fish life propagation beneficial use for Choteau Creek. The numeric TSS TMDL target of 90 mg/L was established for Choteau Creek, and took into consideration the current water quality standards for TSS.

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 (47%) and grazing or pasture land (45%), with the remaining 8% of the watershed composed of water, wetlands, roads, housing and forested lands.

The AnnAGNPS model suggested that a disproportionate percentage of the TSS load may originate from the Dry Choteau drainage, which generated an erosion rate of 2.3 tons/ acre annually. The 335,000 acres in the western portion of the basin generated an erosion rate of 0.44 tons/acre. Not only were the erosion rates for Dry Choteau higher than the mainstem, but when compared with the greater Lewis and Clark basin, the loads from this sub-basin were among the highest modeled.

The Choteau Creek drainage contains approximately 258 animal feeding operations. The Dry Choteau drainage area contains only 25 of these operations, four of which are in close enough proximity to the stream to have a potential for contributing suspended solids.

To characterize channel stability in Choteau Creek, 262 Rapid Geomorphic Assessments (RGAs) were conducted. RGA's are a qualitative technique used to quickly identify and compare the evolutionary stage of channels. Based on these assessments it appears that the lower reaches of Choteau Creek are more unstable than the rest of the watershed.

There are four small communities within the watershed that have permitted waste water treatment facilities. These include Wagner, Delmont, Avon and Armour. The City of Delmont is permitted as a zero discharge facility and thus should be treated as a zero in any waste load allocations (WLA). The two small communities of Dante and Ravinia are not serviced by community water treatment facilities that discharge to the Choteau Creek watershed.

The City of Armour's wastewater treatment facility discharges to the stream system approximately 45 kilometers upstream of the listed segment. The City's facility is managed so that discharges typically occur twice annually for approximately one week at a time. SD DENR determined that Armour's discharge, to an unnamed tributary of Choteau Creek, was a sufficient distance upstream of the impaired segment of Choteau Creek that it would not impact the designated beneficial uses of Choteau Creek downstream. Therefore, it was not given a WLA for this TMDL.

Table 3, excerpted from the TMDL document, includes the information used by SDDENR to calculate a maximum allowable discharge from the two remaining facilities, Avon and Wagner. The calculations were based on the assumption that on occasion a complete discharge from the facility may be necessary. However, the normal operation of these facilities would require only a portion of the calculated amounts actually being discharged. Flows used in the waste load allocations were determined by the peak discharge of each facility. All discharges are required to meet state water quality standards.

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

Facility Name	Flow (gpd) used in WLA	30-day Avg TSS permit limit	TSS permit limit converted to lb/ft3	TSS WLA (lb/day)
Armour				
Avon	2156228	90	0.005618	1620
Delmont				
Wagner (EPA facility)	9300096	30	0.001873	2328

Including the WLA in the load duration curve required several factors be taken into account. The maximum waste load for both facilities in aggregate is 3,948 pounds (1,790 kg). Associated with this load is also a flow of 17.7 cfs. A flow of 17.7 cfs is met or exceeded in Choteau Creek 24% of the time. Arbitrarily adding this load to the entire flow regime would be a misrepresentation for the lower 76% of the flows, however smaller discharges may impact these flows.

COMMENTS: None.

4. TMDL Technical Analysis

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

A TMDL analysis determines the maximum pollutant loading rate that may be allowed to a waterbody without violating water quality standards. The TMDL analysis should demonstrate an understanding of the relationship between the rate of pollutant loading into the waterbody and the resultant water quality impacts. This stressor → response relationship between the pollutant and impairment and between the selected targets, sources, TMDLs, and load allocations needs to be clearly articulated and supported by an appropriate level of

technical analysis. Every effort should be made to be as detailed as possible, and to base all conclusions on the best available scientific principles.

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

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

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

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

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

Minimum Submission Requirements:

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

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

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

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

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

☒ The TMDL document should contain documentation supporting the TMDL analysis, including an inventory of the data set used, a description of the methodology used to analyze the data, a discussion of strengths and weaknesses in the analytical process, and the results from any water quality modeling used. This information is necessary for

EPA to review the loading capacity determination, and the associated load, wasteload, and margin of safety allocations.

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

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

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

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

Data on Choteau Creek was collected during the Lewis and Clark Watershed Assessment. Data was collected at a sampling station near the mouth of the Creek. The Annualized Agricultural Nonpoint Source model (AnnAGNPS) was used to predict erosion rates for the two main portions of the basin (i.e., Choteau Creek and Dry Choteau Creek).

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 stream miles evaluated in the watershed contained sites ranked as unstable and contributing to increased sediment loading.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. The LDC was divided into 5 distinct flow regimes – high flow ($\geq$ 107 cfs), moist flow (between 107 cfs and 6.1 cfs), midrange flow (between 6.1 cfs and 3 cfs), dry flow (between 3 cfs and 1 cfs) and low flow (< 1 cfs). The result is a flow-variable TMDL target across the flow regime shown in Figure 5 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 95th percentile flow within each flow regime: high flow = 374.22 tons/day; moist flow = 24.78 tons/day; midrange flow = 1.44 tons/day; and dry flow = 0.70 tons/day.

South Dakota's water quality standards do not apply when the flow in stream designated as a low quality fishery (marginal and semi permanent warmwater fisheries), is below the 7 day average low flow that can be expected to occur once in five years (7Q5) or 1.0 cubic foot per second, whichever is greater. Choteau Creek is designated as a semi permanent fishery, so this provision applies. A flow of 1 cfs was used as the cutoff for Choteau Creek because the 7Q5 flow is equal to approximately 0.25 cfs. Therefore, loads were not calculated for the lowest flow zone (i.e., Figure 5, Zone 5 in the document) in the TMDL.

The Choteau Creek TMDL document included TSS allocations for both point and non-point sources, but did not include a demonstration of reasonable assurance. Issuance of an NPDES permit that complies with the WLAs in the approved TMDL should not be construed as reasonable assurance that the permit will not cause or contribute to a water quality standards violation, however because the permits for Avon and Wagner include end of pipe limits equivalent to the TSS water quality standard for Choteau Creek the discharges

should not exceed the water quality standard. It remains the duty of SD DENR and EPA (for the Wagner permit) to demine if issuance of an NPDES permit in is compliance with 40 CFR 122.4.

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 Choteau Creek TMDL data description and summary are included mostly in the Technical Analysis section of the document. Data on Choteau Creek was collected during the Lewis and Clark Watershed Assessment from one sampling point located on Charles Mix County Road 2 near the mouth of the creek. The data collected during the assessment was used to supplement existing data from SD DENR ambient water quality monitoring site 460134 which was co-located at site LAC5. Flow data for Choteau Creek was retrieved from the United States Geological Survey (USGS), and includes over 20 years of flow data which was used to generate the load duration curve.

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: There are two point sources of pollutants in this watershed. The wasteload allocations were calculated through two methods depending on which flow zones they were located in. In flow zones where the stream flows exceeded the designed discharge capacity of the facility, the wasteload allocation was set equal to the discharge of the final pond in the system. In flow zones where the design flow discharge from the facilities, were greater than the flow regime TMDL flow, the flows were divided evenly among the three sources (Avon, Wagner, nonpoint source). Each source's flow was then multiplied by the permit limit or the chronic TSS threshold. See Table 7 in the TMDL document for the WLA values for each facility and flow zone.

COMMENTS: None.

4.3 Load Allocations (LA):

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

Minimum Submission Requirements:

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

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

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

SUMMARY: The Watershed Characteristics section of the TMDL explains that the landuse in the watershed is 92 percent agricultural. Therefore the majority of the loading capacity has been allocated to the nonpoint sources in the watershed as a single load allocation within each flow zone. Table 7 includes the load allocations at each of the flow regimes – 352.08 tons/day at high flows; 21.48 tons/day at moist flows; 0.73 tons/day at midrange flows; and 0.33 tons/day at dry flows.

COMMENTS: None.

4.4 Margin of Safety (MOS):

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

Minimum Submission Requirements:

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

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

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

SUMMARY: The Choteau Creek TMDL includes an explicit MOS derived by calculating the difference between the loading capacity at the mid-point of each of the five flow zones and the loading capacity at the minimum flow in each zone. The explicit MOS values are included in Table 7 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. In particular, the State has encouraged participation through public meetings in the watershed, and a website was developed and maintained throughout the project. The TMDL has been available for a 30-day public notice period prior to finalization.

COMMENTS: None.

6. Monitoring Strategy

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

Minimum Submission Requirements:

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

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

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

SUMMARY: Choteau Creek 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. The Choteau Creek TMDL document included TSS allocations for both point and non-point sources, but did not include a demonstration of reasonable assurance. However, because the permits for Avon and Wagner include end of pipe limits equivalent to the TSS water quality standard for Choteau Creek the discharges should not exceed the water quality standard.

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 Choteau Creek 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.