SD Department of Environment & Natural Resources
Watershed Protection Program
Total Maximum Daily Load

Ravine Lake Watershed, Beadle County, South Dakota
March 1999

These TMDLs were developed in accordance with Section 303(d) of the federal Clean Water Act and guidance developed by the US Environmental Protection Agency. The 1998 303(d) Waterbody List identified Ravine Lake as impaired by a measure of fecal coliform bacteria and Trophic State Index (TSI) which serves as an indicator of the trophic condition of the lake. TMDLs for fecal coliform bacteria and total phosphorus have been developed and are supported below.

TMDL Summary for Fecal Coliform Bacteria

Waterbody Name	**Ravine Lake**
Hydrologic Unit Code (HUC)	10160006
TMDL Pollutant	**Fecal Coliform**
Water Quality Target	Grab sample fecal coliform counts <400/100mL
TMDL Goal	Reduce number of fecal coliform-related beach closures
303(d) Status	1998 303(d) Waterbody List, Priority 1, Pages 22, 29, 33
Targeted Beneficial Uses	Warmwater semipermanent fish life propagation, immersion recreation, limited contact recreation
Reference Document	Diagnostic/Feasibility Study Report Ravine Lake July, 1990 AGNPS Modeling of the Ravine Lake Watershed, Huron, SD July, 1988

TMDL Summary for Total Phosphorus

Waterbody Name	**Ravine Lake**
Hydrologic Unit Code (HUC)	10160006
TMDL Pollutant	**Total Phosphorus**
Water Quality Target	In-lake phosphorus TSI of <84
TMDL Goal	70% reduction in in-lake total phosphorus
303(d) Status	1998 303(d) Waterbody List, Priority 1, Pages 22, 29, 33
Targeted Beneficial Uses	Warmwater semipermanent fish life propagation, immersion recreation, limited contact recreation
Reference Document	Diagnostic/Feasibility Study Report Ravine Lake July, 1990 AGNPS Modeling of the Ravine Lake Watershed, Huron, SD July, 1988

I. *Executive Summary:*

- ***Waterbody Description and Impairments***

Ravine Lake has a surface area of 83 acres, a mean depth of seven feet and a maximum depth of thirteen feet. The lake has been assigned the following beneficial uses: warm water semipermanent fish life propagation, immersion recreation, limited contact recreation, wildlife propagation and stock watering. The watershed is about 85,560 acres (24 miles long and 6 miles wide) with its axis on a northwest to southeast orientation. Ravine Lake lies within the city of Huron, SD and is an impoundment of Broadland Creek. The overflow from Ravine Lake enters into the James River.

The average in-lake concentration of total phosphorus was approximately 0.810 mg/l in 1988. The result of this high concentration of in-lake phosphorus was a loss in recreational and fish life propagation uses of the lake. Recreational use of Ravine Lake was virtually nonexistent. High levels of phosphorus cause nuisance populations of undesirable vegetation such as blue-green algae species. Prior to any implementation activities in Ravine Lake or the Broadland Creek watershed, the lake experienced extreme hypereutrophy. Fish populations were dominated by rough fish species with game fish present only in limited numbers.

In 1992, average in-lake concentration of total phosphorus was 0.383 mg/l according to the 1995 South Dakota Lakes Assessment Final Report. Total phosphorus concentrations in Broadland Creek ranged from 1.32 mg/l to a high of 7.1 mg/l during the study period from April to July of 1988. These high concentrations coincided with a discharge from drain tile into Broadland Creek. The material discharging from the drain tile is believed to have been effluent from the wastewater treatment facility belonging to a meat packing plant facility. This packing plant went out of business in approximately 1989.

An assessment of the Broadland Creek/Ravine Lake watershed indicated that agricultural nonpoint sources were the main cause of for the continued water quality degradation in Ravine Lake. Major sources of phosphorus indicated by the assessment included cropland runoff, city storm sewer discharges, runoff from the golf course on Broadland Creek and grazing along the lakeshore.

Livestock grazing on the lakeshore, livestock feeding operations and the City of Huron storm sewer discharge to the lake are the sources of fecal coliform bacteria to Ravine Lake. Elevated levels of fecal coliform bacteria have resulted in frequent beach closures on Ravine Lake.

- ***Stakeholder Description***

  Beadle Conservation District
  Beadle County
  City of Huron
  SD DENR
  Beadle County Sportsmens Club
  Lake and Riverfront Committee
  NRCS

- ***Intent to Submit as a Clean Water Act Section 303(d) TMDL***

In accordance with Section 303(d) of the Clean Water Act, the South Dakota Department of Environment and Natural Resources submits for EPA, Region VIII review and approval, the total phosphorus and fecal coliform total maximum daily loads (TMDLs) for Ravine Lake as provided in this summary and attached document. These TMDLs have been established at a level necessary to meet the applicable water quality standards for nutrients and bacteria with consideration of seasonal variation and a margin of safety. The following designated use classifications will be protected through implementation of this TMDL: warmwater semipermanent fish life propagation, immersion recreation and limited contact recreation.

II. *Problem Characterization:*

- ***Maps***

See Figure 1

- ***Waters Covered by TMDL***

Ravine Lake

- ***Rationale for Geographic Coverage***

The Ravine Lake Diagnostic/Feasibility Study was initiated during the spring of 1989 at the request of the Beadle County Conservation District and the City of Huron, SD. The study was funded primarily with local funding sources and technical assistance and equipment from the State of South Dakota. The primary waterbody of interest to the local residents was Ravine Lake. The sources of impairment were from the watershed, not from within the lake. Efforts to remediate water quality in Ravine Lake have centered on watershed implementation, with some dredging.

- ***Pollutant(s)of Concern***

Total phosphorus
Fecal coliform

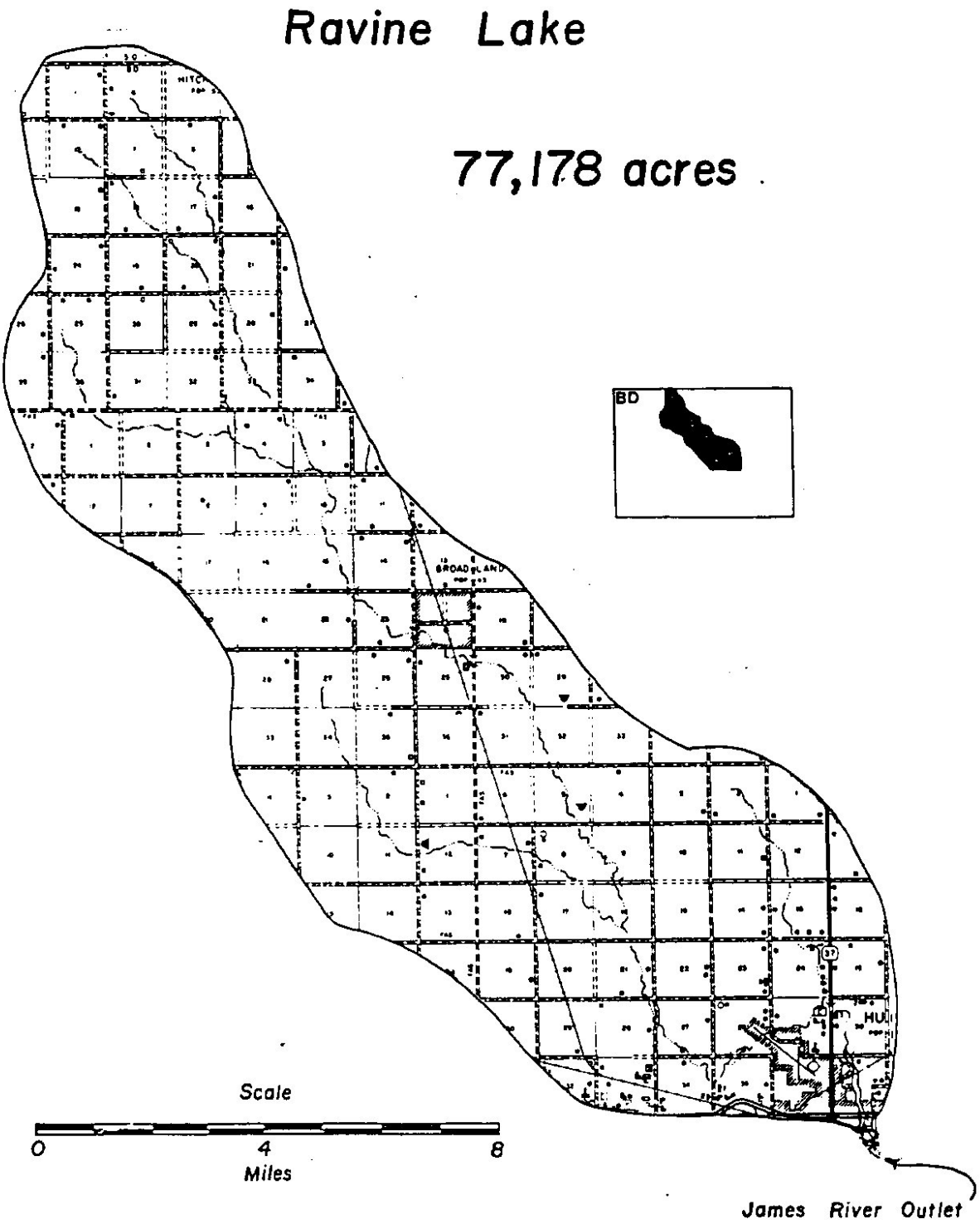

Figure 1. Ravine Lake Watershed

- ***Use Impairments or Threats***

The average in-lake concentration of total phosphorus was approximately 0.810 mg/l in 1988. In 1992, average in-lake concentration of total phosphorus was 0.383 mg/l according to the 1995 South Dakota Lakes Assessment Final Report. Total phosphorus concentrations in Broadland Creek ranged from 1.32 mg/l to a high of 7.1 mg/l during the study period from April to July of 1988. These high concentrations coincided with a discharge from drain tile into Broadland Creek. The material discharging from the drain tile is believed to have been effluent from the wastewater treatment facility belonging to a meat packing plant facility. This packing plant went out of business in approximately 1989.

Excessive phosphorus loads to Ravine Lake have resulted in impairments to the beneficial uses of immersion recreation, limited contact recreation and warm water semipermanent fish life propagation. The phosphorus load to Ravine Lake has resulted in excessive nuisance vegetation growth and increased eutrophication. The result of this eutrophication, is a loss of aesthetics of the lake, occasional odor problems, seasonal low dissolved oxygen concentrations and increased threat of winterkill and as a result impairs designated beneficial uses of the lake.

Livestock grazing on the lakeshore, livestock feeding operations and the City of Huron storm sewer discharge to the lake are the sources of fecal coliform bacteria to Ravine Lake. Elevated numbers of fecal coliform bacteria in the lake have historically resulted in beach closures several times during the summer months. Fecal coliform bacteria are considered to be indicators of the presence of pathogenic bacteria. Fecal coliform bacteria impair the beneficial use of immersion recreation.

- ***Probable Sources***

Both urban and agricultural nonpoint pollution are the suspected sources for both parameters. Agricultural nonpoint sources include animal feeding operations and cropland runoff. Urban nonpoint sources include storm sewer discharges and golf course runoff.

III. TMDL Endpoint:

- ***Description***

The TMDL goal for Ravine Lake is to reduce the in-lake annual mean total phosphorus concentration by 70%. Reducing inflow concentrations of phosphorus will result in a lower ambient total phosphorus concentration in Ravine Lake. A lower phosphorus concentration in the lake will result in a smaller standing crop of blue-green algae at any given time and will result in algal "blooms" of a lower intensity and shorter duration. This will improve

average dissolved oxygen concentrations in the lake and therefore be beneficial to the fishery.

A reduction at the source of fecal coliform bacteria will result in bacteria counts within the limits of the South Dakota Water Quality Standards. The TMDL goal to reduce the number of beach closures related to fecal coliform bacteria at Ravine Lake will be obtained when every grab sample for fecal coliform meets the water quality standard of <400 colonies/100 mL. This will improve the condition of the lake for the designated beneficial use of immersion recreation.

- ***Endpoint Link to Surface Water Quality Standards***

Reduce average annual in-lake phosphorus concentrations by 70% and reduce total phosphorus TSI to <84.

Reduce in lake fecal coliform counts to <400 per 100 ml in any grab sample and eliminate beach closures on Ravine Lake.

IV. TMDL Analysis and Development

- ***Data Sources***

Data used for the Ravine Lake TMDL was taken from the 1990 D/F study report for Ravine Lake, the 1988 Ravine Lake AGNPS report, and the 1995 Lake Assessment Report. The Beadle County Conservation District conducted a fecal coliform study in the summer of 1998. These documents are located in the Water Resources Assistance Program office of the SD DENR. Beach closure files are located in the Drinking Water office of the SD DENR.

- ***Analyses Techniques or Models***

Water quality data was collected from 10 monitoring sites within the Ravine Lake/Broadland Creek watershed. Samples collected at each site were taken according to South Dakota's EPA approved Standard Operating Procedures for Field Samplers. Water samples were sent to the State Health Laboratory in Pierre for analysis. Quality Assurance/Quality Control samples were collected on 10% of the samples according to South Dakota's EPA approved Clean Lakes Quality Assurance/Quality Control Plan.

In addition to water quality monitoring, data was collected to complete a comprehensive watershed landuse model. The AGNPS (Agriculture Nonpoint Pollution Source) model was used to provide comparative values for 40 acre cells in the watershed. The model identifies the possible scenarios for reducing phosphorus in the watershed, targeting the sources for the load allocations.

- ***Seasonality***

Different seasons of the year can yield differences in water quality due to changes in precipitation and agricultural practices. To determine seasonal differences, Ravine Lake samples were separated into spring (March-April), summer (May-July) and fall (August-September) collection periods. There were no winter samples collected on this project due to unsafe ice conditions.

- ***Margin of safety***

At the beginning of the assessment period, during 1988, the average annual total phosphorus concentration was measured as 0.810 mg/l. After the discharge from the packing plant was eliminated in 1989, by 1992, the average annual total phosphorus concentration was measured as 0.383 mg/l. This results in a 53% reduction for average annual in-lake total phosphorus concentration. During the ongoing restoration project for Ravine Lake, the implementation of cropland BMPs has exceeded the original plan of study requirements. The AGNPS computer model results called for the implementation of BMPs on 5320 acres of cropland in the watershed. To date, at least 8000 acres of cropland in the watershed have been converted to Conservation Reserve Program (CRP) acres. In addition, 4000 acres of cropland have been converted from conventional tillage practices to no-till practices. Of the original 70,000 cubic yards planned for sediment removal, the total actually removed was 95,800 cubic yards of soft sediment. Additionally, of the original 1000 linear feet of shoreline scheduled for stabilization, the actual amount of shoreline stabilized was approximately 2600 linear feet.

The removal of the discharge of wastewater effluent from the packing plant resulted in greater than a 50% reduction in average annual total in-lake phosphorus concentrations. This reduction in in-lake phosphorus is over and above the reduction calculated by the AGNPS modeling effort. Since the actual implementation significantly exceeds the implementation called for by AGNPS modeling, it is believed a 70% total phosphorus reduction is possible from 1988 levels. The additional implementation of agricultural BMPs conducted to date represents a margin of safety for total phosphorus.

The fencing of one-half mile of Ravine Lake shoreline resulted in there being no beach closures due to fecal coliform bacteria during 1998. As a margin of safety a one hundred-foot buffer strip was created and planted with trees between the fence and the lakeshore.

V. Allocation of TMDL Loads or Responsibilities:

- ***Wasteload Allocation***

There are no point sources of pollutants that are of concern in this watershed, therefore the "wasteload allocation" component of this TMDL is zero.

- ***Load Allocation***

The results of the AGNPS model indicates that a 50% reduction in phosphorus loading to the lake could be achieved by cropland management and using more conservation tillage practices on about 5320 acres of cropland within the watershed.

At the beginning of the assessment period, during 1988, the average annual total phosphorus concentration was measured as 0.810 mg/l. After the discharge from the packing plant was eliminated in 1989, by 1992, the average annual total phosphorus concentration was measured as 0.383 mg/l. This results in a 53% reduction for average annual in-lake total phosphorus concentration.

Removal of 70,000 cubic yards of soft sediment from Ravine Lake will reduce suspended solids and the particulate fraction of total phosphorus. Stabilization of 1000 linear feet of eroding lakeshore will also reduce suspended solids and associated total phosphorus.

The beneficial uses of Ravine Lake require that any one in-lake grab sample cannot exceed 400 colonies/100 mL for fecal coliform.

- ***Allocation of Responsibility***

The AGNPS model indicated if BMPs for 5320 acres of cropland were installed a 50% reduction in total phosphorus loads to Ravine Lake could be achieved. The installation of 8000 acres of CRP and 4000 acres of no-till was achieved through the efforts of Beadle Conservation District working in cooperation with local agricultural producers. The South Dakota Lakes & Streams removed 95,800 cubic yards of sediment in partnership with the City of Huron and Beadle Conservation District. A private landowner cooperated with other project stakeholders to fence of 1000 feet of lakeshore to prevent livestock from watering in the lake. The EPA Section 319 program, South Dakota Board of Water and Natural Resources, SD DENR, City of Huron and Beadle County cooperated in providing the necessary funds to complete this project. In addition, individual farmers in the Ravine Lake/Broadland Creek watershed provided matching funds.

VI. Schedule of Implementation:

Implementation of practices commenced on this watershed during September of 1994 and were completed in the fall of 1998. In 1997, the Beadle County Conservation District purchased a no till drill that they allow the farmers to use at no cost. Last year this drill was used on approximately 4000 acres of cropland in the watershed. In the last 8 years, over 8800 acres of cropland has been taken out of production and put into the CRP program in the watershed.

A sediment removal operation was conducted on Ravine Lake during 1998 and approximately 95,800 cubic yards of phosphorus rich sediment was removed from the lake. In addition, approximately 2600 feet of eroding shoreline was repaired and stabilized. These two actions will result in a smaller internal load of phosphorus and increased clarity of the lake due to a reduction in suspended sediment.

In the spring of 1998, a one-half mile section of Ravine Lake's shoreline was fenced to keep cattle from watering in the lake. A 100 foot buffer strip was planted with trees between the pasture and the lake. The Beadle County Conservation District collected samples for fecal coliform analysis following rain events from June through October of 1998. Three in-lake sites were sampled after five rainfall events and none of the sample results were above the 400 colonies per 100 ml standard.

VII. *Post-Implementation Monitoring:*

The Ravine Lake 319 implementation project finished in the fall of 1998. The data used in developing this TMDL is from 1991 and earlier. In order to determine if the TMDL is being satisfied, more current data is required. A post-implementation watershed or lake assessment may be conducted sometime after three to five years to determine if Ravine Lake is meeting all of its beneficial uses. It is believed that the improvements of the implementation activities have not had enough time to fully manifest in improvements in water quality. Ravine Lake will be included in the South Dakota Statewide Lake Assessment and will be sampled on a 3-year rotating basis. In addition, the City of Huron will submit weekly fecal coliform samples from the swimming area during the summer months.

VIII. *Public Participation:*

- ***Summary of Public Review***

The water quality assessment was initiated after requests from the Beadle County Conservation District and the City of Huron were made to SD DENR. The Beadle County Conservation District was the sponsor of the project. Public meetings were held throughout the Diagnostic/Feasibility study period, as well as during the project implementation.

- ***Project Information and Education Efforts***

The following table summarizes the efforts taken to gain public education, review and comment during TMDL development:

Public Meetings/Personal Contact	*Articles/Fact Sheets*	*Document Distribution*
Pre-project meeting		Beadle Conservation District

Funding meeting Mid-project meeting Near-end project meeting Final project meeting		Beadle County City of Huron Lake and Riverfront Committee Beadle County Sportsmens Club NRCS
Electronic Media	***Mailings***	***Public Comments Received***
March, 1999 TMDL Summary advertised on department website	Interested parties Stakeholders Daily Newspapers	Comments received during project meetings and review of the draft report and findings were considered.

IX. Supporting Development Documents (attached):

South Dakota Department of Environment and Natural Resources, Pierre, South Dakota. Diagnostic\Feasibility Study Report, Ravine Lake, Beadle County, South Dakota. July, 1990.

South Dakota Department of Environment and Natural Resources, Pierre, South Dakota. AGNPS Modeling of the Ravine Lake Watershed, Huron, South Dakota. July, 1988.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 500
DENVER, CO 80202-2466

APR 13 1999

Ref: Ref: 8EPR-EP

Nettie Myers, Secretary
Department of Environment and Natural Resources
Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

Re: TMDL Approvals
Lake Bryon
Elm Lake
Lake Faulkton
Lake Hendricks
Lake Hiddenwood
Lake Madison/Brant
McCook Lake
Ravine Lake
Redfield Lake
Swan Lake

Dear Ms. Myers:

We have completed our review of the total maximum daily loads (TMDLs) as submitted by your office for the subject waterbodies. In accordance with the Clean Water Act (33 U.S.C. 1251 et. seq.), we approve all aspects of the TMDLs as developed for these water quality limited waterbodies as described in Section 303(d)(1). We acknowledge that these particular TMDLs for the various lakes are based primarily on a voluntary and incentive-based approach to implementation.

Based on our review, we feel the separate TMDL elements listed in the enclosed checklists adequately address the pollutants of concern, taking into consideration seasonal variation and a margin of safety.

For years, the State has sponsored an extensive clean lakes program. Through the lakes assessment and monitoring efforts associated with this program, priority waterbodies have been identified for clean up. It is reasonable that these same priority waters have been a focus of the Section 319 nonpoint source projects as well as one of the priorities under the State's Section 303(d) TMDL efforts.

In the course of developing TMDLs for impaired waters, EPA has recognized that not all impairments are linked to water chemistry alone. Rather, EPA recognizes that "*Section 303(d) requires the States to identify all impaired waters regardless of whether the impairment is due to toxic pollutants, other chemical, heat, habitat, or other problems.*" (see 57 Fed. Reg.

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33040 for July 24, 1992). Further, EPA states that "*...in some situations water quality standards -- particularly designated uses and biocriteria -- can only be attained if nonchemical factors such as hydrology, channel morphology, and habitat are also addressed. EPA recognizes that it is appropriate to use the TMDL process to establish control measures for quantifiable non-chemical parameters that are preventing the attainment of water quality standards.*" (see Guidance for Water Quality-based Decisions: The TMDL Process; USEPA; EPA 440/4-91-001, April 1991; pg.4). We feel the State has developed TMDLs that are consistent with this guidance, taking a comprehensive view of the sources and causes of water quality impairment within each of the watersheds. For example, in several of the TMDLs, the State considered nonchemical factors such as lake depth and its relationship to the impaired uses. Further, we feel it is reasonable to use factors such as lake depth as surrogates to express the final endpoint of the TMDL.

Thank you for your submittal. If you have any questions concerning this approval, feel free to contact Bruce Zander of my staff at 303/312-6846.

Sincerely,

Max H. Dodson
Assistant Regional Administrator
Office of Ecosystems Protection and
Remediation

Enclosures

Enclosure

APPROVED TMDLS

Waterbody Name*	TMDL Parameter / Pollutant	Water Quality Goal/Endpoint	TMDL	Section 303(d)1 or (d)3 TMDL	Supporting Documentation
Lake Bryon*	phosphorus	TSI < 70	50% reduction in phosphorus loads	§303(d)(1)	Lake Assessment Project Report, (Lake Byron excerpt) (SD DENR, August 1996) Lake Assessment Project Report, Lake Byron, Beadle County, SD (SD DENR, December 1992) Section 319 Nonpoint Source Control Program Watershed Project Final Report, Lake Byron Watershed Project (Beadle CD, December 31, 1997) Lake Byron Watershed Project Section 319 Project Implementation Plan (SD DENR, July 1993)
	sediment	Decrease annual inlake sediment accumulation by 1200 tons/year	50% reduction in sediment loads	§303(d)(1)	
Elm Lake*	phosphorus	N:TDP ratio > 7.5 averaged over growing season	60% reduction in phosphorus loads	§303(d)(1)	Phase I Watershed Assessment Final Report, Elm Lake, Brown Country, South Dakota (SDDENR, September1998)
Lake Faulkton*	phosphorus	TSI < 90	35% reduction in phosphorus loads	§303(d)(1)	Lake Assessment Project, Lake Faulkton, Faulk County, South Dakota (SD DENR, 1996)
	sediment	Increased average lake depth by 6 feet over 15.5 acres	Remove 150,000 cubic yards of lake sediment	§303(d)(1)	
Lake Hendricks*	phosphorus	TSI < 65	50% reduction in phosphorus loads	§303(d)(1)	Diagnostic/Feasibility Study Report, Lake Hendricks/Deer Creek Watershed, Brookings County, South Dakota; Lincoln County, Minnesota (SD DENR, February 1993)
	sediment	Increased average lake depth by 6 feet over 100 acres	Remove 1 million cubic yards of lake sediment	§303(d)(1)	

Waterbody Name*	TMDL Parameter / Pollutant	Water Quality Goal/Endpoint	TMDL	Section 303(d)1 or (d)3 TMDL	Supporting Documentation
Lake Hiddenwood*	phosphorus	Decreased winter fish kills and increased visitor days	Maintenance of increased depth regime plus 2% decrease in phosphorus loads	§303(d)(1)	Lake Hiddenwood Restoration and Protection Project Preproposal (North Central RC&D; August 1993) Lake Hiddenwood Restoration and Protection Project Implementation Plan for FY 94 (1994) Preliminary Report; Hiddenwood Recreation Damsite and Reservoir, North Central RC&D (RC-050-WA), Walworth County, SD (USDA, SCS; August 1978)
	sediment	Increased depth corresponding to increasing volume by 53 acre-feet	Maintenance of increased depth regime plus 5% decrease in sediment loads	§303(d)(1)	
Lake Madison*	phosphorus	TSI < 50	50% reduction in phosphorus loads	§303(d)(1)	Phase I Watershed Assessment Final Report - Madison Lake/Brant Lake, Lake County South Dakota (SD DENR, October 1998)
Lake Brant*	phosphorus	TSI < 50	50% reduction in phosphorus loads	§303(d)(1)	
McCook Lake*	sediment	Increased average lake depth by 4.5 feet over 183 acres	Remove 1.7 million cubic yards of lake sediment	§303(d)(1)	Diagnostic/Feasibility Study Report McCook Lake, Union County, South Dakota (SD DENR, March 1990)
Ravine Lake*	phosphorus	TSI of <84	70% reduction in phosphorus loads	§303(d)(1)	Diagnostic\Feasibility Study Report, Ravine Lake, Beadle County, SD (SD DENR, July 1990) AGNPS Modeling of the Ravine Lake Watershed, Huron, SD (SD DENR, July 1988)
	fecal coliform	< 400/100 mL fecal coliform counts	< 400/100 mL fecal coliform counts	§303(d)(1)	
Redfield Lake*	phosphorus	TSI < 90	45% reduction in total phosphorus load	§303(d)(1)	Lake Assessment Project Report, Lake Redfield, Spink County, SD (SD DENR, May 1993)
	sediment	Increased average lake depth by 5 feet over 31 acres	Remove 250,000 cubic yards of lake sediment	§303(d)(1)	

Waterbody Name*	TMDL Parameter / Pollutant	Water Quality Goal/Endpoint	TMDL	Section 303(d)1 or (d)3 TMDL	Supporting Documentation
Swan Lake*	phosphorus	TSI < 65	60% reduction in phosphorus loads	§303(d)(1)	Diagnostic/Feasibility Study Swan Lake; Turner County, South Dakota (SD DENR, January 1993)
	sediment	TSI (secchi depth) < 65	50% increase in secchi depth	§303(d)(1)	

* An asterisk indicates the waterbody has been included on the State's Section 303(d) list of waterbodies in need of TMDLs.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Lake Bryon
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and sediment loading rate. These are reasonable indicators to use in expressing the TMDL targets since they are quantifiable and relate to the use impairments.
■ TMDL	X	The TMDLs are expressed in terms of annual phosphorus and sediment load reductions. This is a reasonable way to express the TMDL for lakes since it takes lakes a period of time to respond to pollutant reductions.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved, by a high level of detailed monitoring and assessment, by further educational efforts throughout the watershed, by conservative assumptions regarding no-till or minimum till acreage, application of additional nutrient BMPs, and stabilization of more shoreline than recommended through the assessment Study. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas, shoreline areas, and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Elm Lake
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ **TMDLs result in maintaining and attaining water quality standards**	X	The waterbody classification uses which are addressed by this TMDL are drinking water and recreation.
■ **Water Quality Standards Target**	X	Targets were established based on nitrogen:phosphorus ratios. This is a reasonable approach since it relates to the trophic status of the waterbody which, in turn, relates to the uses of concern.
■ **TMDL**	X	The TMDL is expressed in terms of annual phosphorus load reduction. This is a reasonable way to express the TMDL for lakes since it takes lakes a period of time to respond to pollutant reductions.
■ **Significant sources identified**	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ **Technical analysis**	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ **Margin of safety and Seasonality**	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ **Allocation**	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas, shoreline areas, and croplands.
■ **Public review**	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Since part of the Elm Lake watershed is in North Dakota, the state of North Dakota as well as local entities in that State have participated in the development of the TMDL and will be participating in the future through implementation of BMPks within the watershed. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Lake Faulkton
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Lake Hendricks
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by augmenting the watershed land use controls with in-lake dredging. The in-lake dredging will further reduce the amount of available nutrients into the lake because of increased depth as well as provide further aquatic life habitat. Additional margin of safety could be provided through addressing the failing wastewater on-site systems near the lake. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance. This TMDL involved cooperation between South Dakota and Minnesota since the watershed is in both states. Lincoln County, Minnesota participated in the process as a stakeholder.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Lake Hiddenwood
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on lake depth, fish kill frequency, and visitor-days. These are reasonable targets for the TMDL since they relate to the impaired uses of concern.
■ TMDL	X	The TMDL are expressed in terms of annual phosphorus load reduction and removal of lake sediment. Also, the TMDL relates to the depth and volume of the Lake. Lake depth has a particularly important factor related to both the recreational use and fisheries use of the Lake. The emphasis at this point in time is to protect the improvements already made in the Lake as well as adding more controls on pollutant sources as a margin of safety.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs. Additional BMPs include entrapment dams, construction of four agricultural waste systems, and cropland BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands as well as to the bottom lake sediment.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Lake Madison/Lake Brant
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ **TMDLs result in maintaining and attaining water quality standards**	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ **Water Quality Standards Target**	X	Targets were established based on trophic status. This is a reasonable approach since trophic status of the waterbody relates to the uses of concern.
■ **TMDL**	X	The TMDLs for each lake are expressed in terms of annual phosphorus load reduction. This is a reasonable way to express the TMDL for this lake since it takes a long period of time for a lake to respond to water quality controls, rather than on a daily basis.
■ **Significant sources identified**	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ **Technical analysis**	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ **Margin of safety and Seasonality**	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved, by increasing the target phosphorus reduction from 40% to 50%, and possibly by application of additional nonpoint source BMPs. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ **Allocation**	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ **Public review**	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: McCook Lake
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ **TMDLs result in maintaining and attaining water quality standards**	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ **Water Quality Standards Target**	X	Targets were established based on lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ **TMDL**	X	The TMDL is expressed in terms of removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ **Significant sources identified**	X	There are no contemporary sources of sediment (the pollutant of concern). Rather, the current lake sediment that has been deposited over the years is the primary cause of impairment within the lake.
■ **Technical analysis**	X	Monitoring, empirical relationships, and best professional judgement were used in identifying acceptable levels of sediment removal from the Lake. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ **Margin of safety and Seasonality**	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by removal of more sediment than calculated to support inlake uses. Seasonality was adequately considered by evaluating the changes in lake conditions over the year, but seasonality has proven to be of very little concern related to the development of the TMDL and application of appropriate water quality controls.
■ **Allocation**	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to lake bottom sediments.
■ **Public review**	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Ravine Lake
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and fecal coliform concentration. This is a reasonable approach since these factors relate to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and fecal coliform concentration. This is a reasonable way to express the TMDLs for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs and reflects the long response time of lakes of this type to pollutant controls within the watershed.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, AGNPS modeling, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs including the stabilization of more shoreline than calculated and removal of more lake sediments than calculated. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and croplands.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Redfield Lake
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and lake depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which, in turn, relates to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and removal of lake sediment. This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved, by application of additional nonpoint source BMPs, and by dredging more lake sediments than calculated. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as animal feeding areas and bottom sediments.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.

■ TMDL Checklist ■

EPA Region VIII

State/Tribe: South Dakota
Waterbody Name: Swan Lake
Point Source-control TMDL: Nonpoint Source-control TMDL: X (check one or both)
Date Received: March 30, 1999 Date Review completed: April 9, 1999 BAZ

Review Criteria (All criteria must be met for approval.)	Approved (check if yes)	Comments
■ TMDLs result in maintaining and attaining water quality standards	X	The waterbody classification uses which are addressed by this TMDL are aquatic life and recreation.
■ Water Quality Standards Target	X	Targets were established based on trophic status and secchi depth. This is a reasonable approach since it relates to the trophic status of the waterbody as well as the physical nature of the lake which is, in turn, related to the uses of concern.
■ TMDL	X	The TMDL is expressed in terms of annual phosphorus load reduction and increase in clarity (e.g., secchi depth). This is a reasonable way to express the TMDL for this lake since it provides an effective surrogate reflective of both the aquatic life and recreational needs.
■ Significant sources identified	X	Significant sources were adequately identified in a categorical and/or individual source-by-source basis. All sources that need to be addressed through controls were identified (including the removal of lake bottom sediment, if needed.)
■ Technical analysis	X	Monitoring, empirical relationships, and best professional judgement were used in identifying pollutant sources and causes and in identifying acceptable levels of pollutant control, and in identifying appropriate levels of control. This level of technical analysis is reasonable and appropriate because of the character of the pollutants, the type of land use practices, and watershed type.
■ Margin of safety and Seasonality	X	An appropriate margin of safety is included by performing ongoing monitoring to assure water quality goals are achieved and by application of additional nonpoint source BMPs including selective dredging, bank stabilization, and elimination of inflow from Turkey Ridge Creek. Seasonality was adequately considered by evaluating the cumulative impacts of the various seasons on water quality and by tailoring the BMPs to seasonal needs.
■ Allocation	X	All the allocation for the TMDL was a "load allocation" attributed to nonpoint sources. Allocation was attributed to such sources as land uses in the Turkey Ridge Creek sub-watershed and in-lake sediments.
■ Public review	X	Public review and participation was conducted through meetings, electronic media, and mailings. The extent of public review is acceptable. Further, the review process sponsored by the State was adequate for purposes of developing a TMDL that will be implemented because of public acceptance.