Belle Fourche River Watershed Management and Project Implementation Plan Segment II

319 Watershed Project
February 11, 2005

Sponsored By:

Belle Fourche River Watershed Partnership

Submitted to:

South Dakota Department of
Environment and Natural Resources
Pierre, South Dakota 57501

NONPOINT SOURCE PIP SUMMARY SHEET

Begin here by typing in the year. Then tab or place your cursor in each gray shaded field as desired.
Federal Fiscal FY: 2005-2007 **Today's Date**: 01/05/2005

Select project type from the drop-down box below:
Project Type: WATERSHEDS

PROJECT TITLE: Belle Fourche River Watershed Management and Project Implementation Segment II

PROJECT SPONSOR

NAME: Belle Fourche River Watershed Partnership

ADDRESS: 1847 5th Avenue

ADDRESS:

CITY: Belle Fourche **STATE**: SD **ZIP**: 57717

PHONE: 605.892.4366 **EXT:**

FAX: **E-MAIL**: timreich@rushmore.com

PRIMARY CONTACT

NAME: Mr. Tim Reich **PHONE**: 605.892.4633 **EXT**:

SIGNATORY NAME: Tim Reich **PHONE:** **(OPTIONAL)**

STATE CONTACT PERSON:

NAME: Mr. Dennis Clarke

PHONE: 605.773.4254 **EXT**:

FAX: 605.773.4068

E-MAIL: Dennis.Clarke@state.sd.us

CATEGORY & FUNCTIONAL CATEGORY
Drop-down lists. Please select up to 4 categories below.

NPS Category and Percent

The primary category of pollution is intended to identify the principal or main pollutant(s) the project is attempting to correct. The selections are obtained from drop-down list associated with the data element.

NPS CATEGORY	Percent
AGRICULTURE	40
OTHER NPS POLLUTION	30
ANIMAL FEEDING OPERATIONS	20
URBAN RUNOFF/STORMWATER	10

NPS Functional Category

These activities are intended to identify the principal or main approach, remedy, or solution to achieve the objective of the project. Selections are obtained from the drop-down list associated with the data element.

NPS FUNCTIONAL CATEGORY OF ACTIVITY
BMP IMPLEMENTATION/DESIGN
RESTORATION/PROTECTION/PREVENTION
TECHNICAL ASSISTANCE
EDUCATION/INFORMATION PROGRAMS

WATERSHED NAME: Belle Fourche River Watershed

USGS HYDROLOGICAL UNIT CODE: 101202

LATITUDE/LONGITUDE

Use degrees and decimals only. Do not put in degrees, minutes, seconds. For example: put in **45.55** rather than 45 deg 30 min 30 sec.

PROJECT LOCATION **LATITUDE:** 45E **LONGITUDE:** -101W

WATERBODY TYPE

A name indicating the type of waterbody/watershed associated with the NPS project.

TMDL AND CLEAN LAKES INFORMATION

A field that identifies the relationship of the given nonpoint source project's funding to total maximum daily load (TMDL) activities.

NONPOINT SOURCE PIP SUMMARY SHEET

RIVERS/STREAMS
LAKES
RESERVOIRS
STREAMS

TMDL PRIORITY: HIGH

TMDL DEVELOPMENT?: YES

TMDL IMPLEMENTATION?: YES

CLEAN LAKES PROJECT?: NO

POLLUTANT TYPE

The name of the pollutant that the particular nonpoint source project is attempting to address. Selection of the pollutant is made from drop-down list.

Pollutants not listed in POLLUTANTS box if needed. Selection of the pollutant is made from the drop-down list.

POLLUTANTS:

PATHOGENS (COLIFORM)

Conductivity

Total Suspended Solids

ADDITIONAL POLLUTANTS:

Zinc

Cadmium

pH

Copper

Total Dissolved Solids

FUNDING

PLEASE TAB OUT OF THE FIELD AFTER ENTRY

FY§319(h) BUDGET FUNDS: $1,094,700

NON-FEDERAL MATCHING FUNDS: $390,800

OTHER FEDERAL FUNDS: $502,215

STATE FUNDS: $75,900

LOCAL FUNDS: $418,200

TOTAL BUDGET: $2,481,815

OTHER FUNDS: $0

STATE 319(h) FTE's FUNDED UNDER THIS GRANT: 0.00

GOALS AND PROJECT DESCRIPTION

NOTE: To add the GOALS and PROJECT DESCRIPTION just TAB to the shaded area and type or cut/paste text. You may type or cut/paste as much text as you like. The box will expand.

Narrative fields used to provide the anticipated benefits and goals of the project and the project description.

GOALS: The overall goal is to bring Belle Fourche River and Horse Creek into compliance for TSS within 10 years and to implement additional BMP recommendations from other TMDLs for waterbodies within the Watershed as they become available. A 55 percent reduction of TSS load reduction is required to bring the Belle Fourche River into compliance with water quality standards. A 41 percent reduction is required for Horse Creek. At this time, no TMDLs are complete for fecal coliforms. The goal of this project segment, as set forth in the Belle Fourche River Watershed TMDL study, is:

- Continue implementation of BMPs in the Watershed to reduce TSS (31 mg/L reduction below the Belle Fourche Reservoir, 4 mg/L reduction above the Belle Fourche River Reservoir).
- Conduct public education and outreach to stakeholders within the Belle Fourche River Watershed to show the importance of properly operating septic systems and continued implementation of BMPs recommended in the TMDL.
- Track the progress made toward reaching the goals of the TMDL to help ensure that the BMPs are effective and the proper BMPs are being implemented.

PROJECT DESCRIPTION: The Belle Fourche River Watershed Partnership is the project sponsor for this 2-year project with strong support from agricultural organizations, federal and state agencies, local governments, and South Dakota School of Mines and Technology. This project will continue implementation of the BMPs identified in the Total Maximum Daily Load (TMDL) report for the Belle Fourche River Watershed

PROJECT SUMMARY SHEET

PROJECT TITLE: Belle Fourche River Watershed Management and Project Implementation Plan Segment II

NAME AND ADDRESS OF LEAD PROJECT SPONSOR

Belle Fourche River Watershed Partnership
1839 5th Avenue
Belle Fourche, SD 57717

STATE CONTACT PERSON: Dennis Clarke
TITLE: Environmental Senior Scientist
EMAIL: dennis.clarke@state.sd.us
PHONE: 605.773.4254 **FAX:** 605.773.4068
STATE: SOUTH DAKOTA **WATERSHED**: Belle Fourche River Watershed
HYDROLOGIC UNIT CODE: 101202
HIGH PRIORITY WATERSHED (yes/no) YES

PROJECT TYPES: [ ] BASE [X] WATERSHED [ ] GROUNDWATER [ ] I&E

WATERBODY TYPES	NPS CATEGORY
[X] GROUNDWATER	[X] AGRICULTURE
[X] LAKES/RESERVOIRS	[ ] URBAN RUNOFF
[X] RIVERS	[ ] SILVICULTURE
[X] STREAMS	[ ] CONSTRUCTION
[X] WETLANDS	[ ]RESOURCE EXTRACTION
[ ] OTHER	[ ] HYDRAULIC MODIFICATION
	[ ] OTHER

Project Location: Latitude: 45 N **Longitude:** –101 W

SUMMARIZATION OF GOALS: The overall goal is to bring Belle Fourche River and Horse Creek into compliance for TSS within 10 years and to implement additional BMP recommendations from other TMDLs for waterbodies within the Watershed as they become available. A 55 percent reduction of TSS load reduction is required to bring the Belle Fourche River into compliance with water quality standards. A 41 percent reduction is required for Horse Creek. At this time, no TMDLs are complete for fecal coliforms. The goal of this project segment, as set forth in the Belle Fourche River Watershed TMDL study, is:

- Continue implementation of BMPs in the Watershed to reduce TSS (31 mg/L reduction below the Belle Fourche Reservoir, 4 mg/L reduction above the Belle Fourche River Reservoir).
- Conduct public education and outreach to stakeholders within the Belle Fourche River Watershed to show the importance of properly operating septic systems and continued implementation of BMPs recommended in the TMDL.
- Track the progress made toward reaching the goals of the TMDL to help ensure that the BMPs are effective and the proper BMPs are being implemented.

PROJECT DESCRIPTION: The Belle Fourche River Watershed Partnership is the project sponsor for this 2-year project, with strong support from agricultural organizations, federal and state agencies, local governments, and South Dakota School of Mines and Technology. This project will continue implementation of the BMPs identified in the TMDL report for the Belle Fourche River Watershed.

FY	05.06.07	
319 FUNDS:	$1,094,700	
TOTAL PROJECT COST:	$2,481,815	**MATCH**: $884,900
319 FUNDED FULL TIME PERSONNEL:	1	

2.0 STATEMENT OF NEED

2.1 The Belle Fourche River Watershed Partnership developed and implemented an assessment project to determine Total Maximum Daily Load (TMDL) for the Belle Fourche River. The project started during April 2001. The draft TMDL was completed in December 2003. The South Dakota Department of Environment and Natural Resources (SD DENR) has posted the TMDL for public notice. The purpose of the preimplementation assessment was to (1) assess the current physical, chemical, and biological integrity of the Belle Fourche River and its tributaries; (2) determine the sources of total suspended solids in the Belle Fourche River Watershed; and (3) define management prescriptions for identified nonpoint source critical areas in the Watershed. The TMDL report includes two waterbodies: the Belle Fourche River and Horse Creek.

The Belle Fourche River is identified in the 1998, 2002, and 2004 South Dakota 303(d) Waterbody Lists as impaired due to elevated total suspended solids (TSS) concentrations. According to the 2002 South Dakota Report to Congress (the 305(b) Water Quality Assessment), the Belle Fourche River from the Wyoming border to the Cheyenne River, South Dakota, failed to support its assigned uses because of high TSS. In this report, agricultural activities were deemed a likely source of occasional impairment. This report also states that a natural source of TSS may originate from erosion of extensive exposed shale beds that lie along the river's course and tributaries. Table 2-1 presents a summary of impaired waterbodies within the Belle Fourche River Watershed.

Horse Creek was listed in the 1998 impaired Waterbody List for total dissolved solids (TDS), which was later determined to be a listing error. The Horse Creek listing was corrected in the 2002 report and instead listed for conductivity. During this assessment, approximately 10 percent of the samples collected from Horse Creek exceeded the water quality standard for TSS. The 2004 Waterbody List also includes Horse Creek for conductivity. For this reason, a TMDL report has been drafted for Horse Creek for both TSS and conductivity. This TMDL has been posted by the SD DENR for public notice along with the Belle Fourche River TMDL.

Implementation of the Best Management Practices (BMPs) suggested in the TMDL for the Belle Fourche River began in 2004. The first year of implementation included funding from local ranchers and farmers, the Belle Fourche River Watershed Partnership, Lawrence County, the Belle Fourche Irrigation District (BFID), Wyoming DEQ, National Resource Conservation Service (NRCS), Corps of Engineers, Bureau of Reclamation, and the U.S. Geological Survey. Two products of the implementation project were the Ten-Year Belle Fourche River Watershed Strategic Implementation Plan and the Five-Year Belle Fourche Irrigation District Water Conservation Plan. These two plans present the work that will be completed within the watershed during the next ten years. Within the reports the associated total suspended solids and nonused water savings are presented for each project that is planned. Some of the BMPs that were installed during this segment of the implementation include: one flow automation unit, replacing open irrigation ditches with pipeline, lining open irrigation ditches, installing pipelines to deliver water from the BFID system to the fields, installation of two irrigation sprinkler systems, and 3,000 acres of managed grazing. These BMPs resulted in an estimated 7 mg/L reduction in TSS.

2.2 The South Dakota portion of the Belle Fourche Watershed is shown in Figure 2-1. The ecoregions within the Watershed include: Black Hills Foothills, Black Hills Plateau, Black Hills Core Highlands, River Breaks, Semiarid Pierre Shale Plains, Dense Clay Prairie, and Missouri Plateau.

The Belle Fourche River is a tributary to the Cheyenne River. Within the Belle Fourche River watershed are nine stream segments on the State 303(d) list as impairment-related TMDL waters. These include Whitewood Creek (two listings), Strawberry Creek, Horse Creek, and Belle Fourche River (five segments).

The BMPs that will be installed during this segment of implementation are consistent with what is scheduled in the Ten-Year Belle Fourche River Watershed Strategic Implementation Plan and the Five-Year Belle Fourche Irrigation District Water Conservation Plan. The BMPs are described in Section 3 of this proposal. The planned BMPs will reduce the TSS in the Belle Fourche River below the Belle Fourche Reservoir by approximately 31 mg/L and 4 mg/L above the reservoir. This level of reduction is consistent with what is presented in the Ten-Year Belle Fourche River Watershed Strategic Implementation Plan.

Table 2-1. Summary of Belle Fourche River Watershed Exceedance Water Quality Data

Stream	WQM/ USGS	Beneficial Use	Impairment Parameter	Water Quality Criteria	Number of Samples	Percent of Exceedances	Geometric Mean of Exceedances
Belle Fourche River[a]	130	Warm-Water Permanent Fish Life	TSS (mg/L)	90[b]/158[c]	31	19%	947
		Immersion Recreation	Fecal Coliform (per/100mL)	200[b]/400[c]	11	36%	831
Belle Fourche River[d]	83	Warm-Water Permanent Fish Life	TSS (mg/L)	90[b]/158[c]	26	12%	534
Belle Fourche River[e]	81	Warm-Water Permanent Fish Life	TSS (mg/L)	90[b]/158[c]	27	11%	427
Belle Fourche River[f]	76	Warm-Water Permanent Fish Life	TSS (mg/L)	90[b]/158[c]	64	16%	626
Belle Fourche River[g]	21	Warm-Water Permanent Fish Life	TSS (mg/L)	90[b]/158[c]	26	15%	989
Horse Creek	6436760	Irrigation Waters	Coductivity (mohms/cm @ 25°C)	2,500[b]/4,375[c]	60	28%	5,251
Strawberry Creek	116	Cold-Water Permanent Fish Life	Zinc (mg/L)	*[h]	76	32%	900
		Cold-Water Permanent Fish Life	Cadmium (mg/L)	*[i]	76	25%	39.2
		Fish/Wildlife Prop. Rec. Stock Waters	TDS (mg/L)	2,500[b]/4,375[c]	75	39%	7,211
		Irrigation Waters	Coductivity (mohms/cm @ 25°C)	2,500[b]/4,375[c]	44	25%	7,192
		Cold-Water Permanent Fish Life	pH	6.5 – 8.8	74	18%	5.78
		Cold-Water Permanent Fish Life	Copper (mg/L)	*[j]	76	63%	438
Whitewood Creek[k]	123	Immersion Recreation	Fecal Coliform (per/100mL)	200[b]/400[c]	33	45%	999
Whitewood Creek[l]	85	Cold-Water Permanent Fish Life	Water Temperature (°F)	<65°F	29	10%	73.4
		Immersion Recreation	Fecal Coliform (per/100mL)	200[b]/400[c]	6	50%	785

(a) Wyoming border to near Fruitdale.
(b) 30-day average.
(c) Daily maximum
(d) Near Fruitdale to Whitewood Creek.
(e) Whitewood Creek to Willow Creek.
(f) Willow Creek to Alkali Creek.
(g) Alkali Creek to mouth.
(h) Zinc Concentration < $0.978 \times \exp(0.8473 \times (\ln(\text{hardness})) + 0.8604)$.
(i) Cadmium Concentration < $(1.136672-((\ln(\text{hardness})) \times 0.041838) \times \exp(1.128 \times (\ln(\text{hardness})) - 3.828)$.
(j) Copper Concentration < $0.960 \times \exp(0.9422 \times (\ln(\text{hardness})) - 1.464)$.
(k) Deadwood Creek to Spruce Gulch.
(l) Spruce Gulch to Sandy Creek.

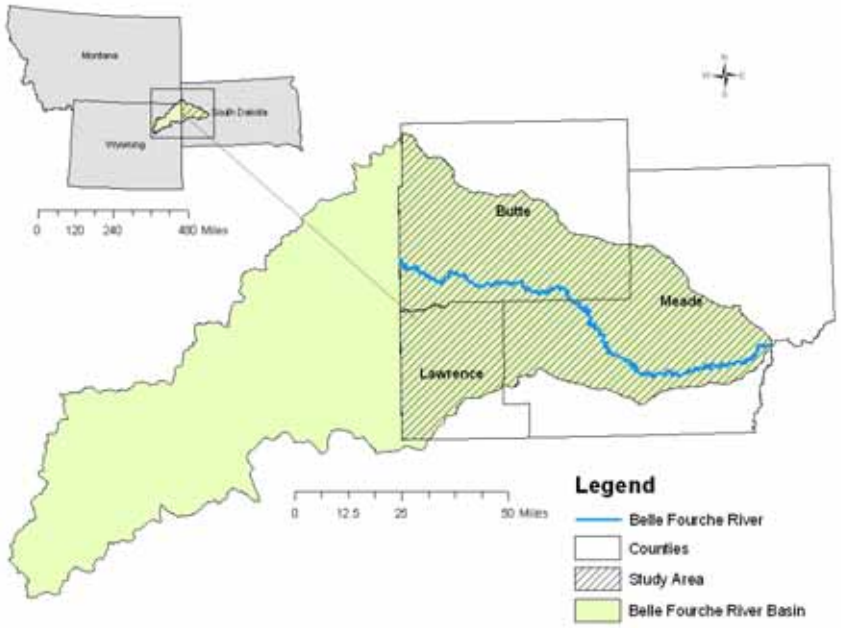

Figure 2-1. Location of the Belle Fourche River Watershed in Butte, Lawrence, and Meade Counties, South Dakota.

2.3 The surface watershed area for the Belle Fourche River in South Dakota is approximately 2,103,040 acres in size and includes Hydraulic Units 10120201, 10120202, and 10120203. The city of Spearfish (population 8,606) is the largest municipality located in the Belle Fourche River Watershed. Other small communities in the watershed include Deadwood (population 1,380), Lead (population 3,027), Sturgis (population 4,442), Belle Fourche (population 4,565), Fruitdale (population 62), Nisland (population 204), and Newell (population 646).

2.4 Land use in the watersheds is primarily agricultural grazing with some cropland and a few urban and suburban areas. Wheat, alfalfa, native and tame grasses, and hay are the main crops. Within the Belle Fourche Irrigation District (BFID), some corn is grown as well. Some winter animal feeding areas are located in the watershed. Gold mining is conducted in some headwater areas of the Watershed. Some of the Watershed land is used for silviculture. Approximately 11 percent of the Watershed is U.S. Forest Service land, primarily the Black Hills National Forest, and 4 percent is Bureau of Land Management land.

Major soil associations found in the Watershed include Winler-Lismas, Pierre-Kyle, Grummit-Shale, Epsie, Midway-Penrose, Cabbart-Absher, Butche-Colby, Arvada-Stetter, Lohmiller-Glenberg-Haverson, Caputa-Satanta, Delphill-Assinniboine, Nunn-Satanta-Zigweid, Blackpipe-Savo-Manvel, Blackpipe-Assinniboine-Savo, Canyon-Lakoa-Maitland, Tilford-Nevee, St. Onge-Keith, Lohmiller-Glenberg, Winler-Lismas-Swanboy, Kyle-Pierre-Hisle, Samsil-Lismas-Pierre, Nevee-Vale-Tilford, Butche-Satanta-Boneek, Nunn-Kyle-Pierre, Barnum-Swint-St. Onge, Grummit-Snomo-Rock, Paunsaugunt-Rock, Lakoa-Maitland, and Citadel-Vanocker-Grizzly.

The average annual precipitation in the watershed is 15 to 29 inches, of which 70 percent usually is received from April through September. Tornadoes and severe thunderstorms strike occasionally. These storms are local, of short duration, and occasionally produce heavy rainfall events. The average seasonal snowfall ranges from 155 inches in the higher elevations in the western part of the Watershed to 23 inches per year in the eastern portion of the watershed. The average water allocation to the BFID is approximated 15 inches. The water added to the fields from irrigation nearly doubles the amount of water available for growing crops.

The landscape in the Watershed is characterized by prairie land with some mountains and stream channels in the west. Land elevation ranges from about 2,500 feet above mean sea level (MSL) to about 7,071 above MSL. The Black Hills are strongly sloping hills. There are somewhat less strongly sloping hills near the Cheyenne River.

2.5 The Belle Fourche River watershed within South Dakota encompasses over 2 million acres. TSS are contributed from natural, urban, agriculture, forest, and mining. The TMDL study identified the primary contributor of TSS impairment in the Belle Fourche River and Horse Creek as the natural bank sloughing, quantity of nonused irrigation water discharged to the natural waterways, and riparian habitat impairment. Stream entrenchment and bank failure are responsible for approximately 75 percent of the TSS in the Belle Fourche River system. Stream energy causes natural bank failure, particularly in the eastern portion of the Watershed. These areas are dominated by high banks composed of primarily clay soils that, when eroded, supply suspended solids to the channel. Increased quantities of water resulting from the nonused irrigation flows are the major driver causing the channel to incise, and result in additional bank failures and resultant suspended solids.

Irrigation and return flow nonused water are responsible for approximately 20 percent of the TSS in the Belle Fourche River system. Much of the irrigation in the Watershed is flood-type. This type of irrigation results in sediments being mobilized by three processes: (1) as the tail water/runoff crosses the field, (2) in the canals and laterals, and (3) in the intermittent streams carrying tail water/runoff to the perennial streams within the Watershed. Range erosion contributes the remaining 5 percent of the TSS load.

3.0 PROJECT DESCRIPTION

3.1 GOALS

The overall goal is to bring Belle Fourche River and Horse Creek into compliance for TSS within 10 years and to implement additional BMP recommendations from other TMDLs for waterbodies within the Watershed as they become available. A 55 percent reduction of TSS load reduction is required to bring the Belle Fourche River into compliance with water quality standards. A 41 percent reduction is required for Horse Creek. At this time, no

TMDLs are complete for fecal coliforms. The goal of this project segment, as set forth in the Belle Fourche River Watershed TMDL study, is:

- Continue implementation of BMPs in the Watershed to reduce TSS (31 mg/L reduction below the Belle Fourche Reservoir, 4 mg/L reduction above the Belle Fourche River Reservoir).
- Conduct public education and outreach to stakeholders within the Belle Fourche River Watershed to show the importance of properly operating septic systems and continued implementation of BMPs recommended in the TMDL.
- Track the progress made toward reaching the goals of the TMDL to help ensure that the BMPs are effective and the proper BMPs are being implemented.

3.2 OBJECTIVES AND TASKS

The strategy of the Belle Fourche River Watershed Implementation Plan is to progressively implement Best Management Practices (BMPs), such as water management and grazing management systems in the riparian areas, within the Belle Fourche Watershed to reduce total suspended solids in Horse Creek and the Belle Fourche River. This segment of the source reduction strategy will focus on BMPs to reduce the nonused irrigation water discharged to the local waterways from the irrigation water delivery and application as well as riparian vegetation improvement. Baseline and seasonal monitoring will be performed to measure improvement. The strategy will be reviewed yearly to measure overall success to determine adjustments and to obtain funding for the following project segment. Government and private funding will be used to fund BMPs. A final report will be produced for each 319 project segment completed.

Specifically, this project segment will fund the second and third years of implementation within the Belle Fourche Watershed to continue reducing the TSS. Additional projects and funding proposals will be submitted over the next 8 years to continue implementing BMPs that reduce TSS and fecal coliform concentrations to comply with water quality standards.

OBJECTIVE 1: Implement BMPs Recommended in the Belle Fourche River Watershed TMDL

The TMDL report recommends BMPs that focus on reducing the amount of nonused irrigation water discharged to the waterway from irrigation and riparian vegetation improvement. The nonused water reduction project includes water delivery as well as water application improvement. The reduction in TSS required to meet the standard is 55 percent. Reducing the amount of nonused water discharged to the local waterways by 12,000 acre-feet will reduce the TSS concentration by 37 percent. Riparian vegetation improvement contributes another 18-percent reduction. The following tasks outline this effort.

Whitewood Creek is listed on the 2004 303(d) list of impaired waterbodies for fecal coliform. The TMDL for this stream is not yet complete. However, one of the goals of this phase of the project is to begin to reduce human sources of fecal coliform in the Watershed.

Task 1 **Reduce Water Discharged to the Local Waterways From the Delivery and Application Systems by 4,600-acre feet (38 percent of total reduction of nonused irrigation water required)**

The Belle Fourche Irrigation District (BFID) maintains and operates irrigation facilities for the Bureau of Reclamation (BOR). The District has an active water conservation program. Historically, the program has included lining the canals, piping, and operational and maintenance procedures to conserve water. Irrigation significantly impacts the Belle Fourche River along with Horse Creek and other streams within the BFID's 51,000 acres. The impact comes primarily from the additional water added to the system during irrigation season. During the irrigation season (June–September), the average TSS concentration for sites USGS 06430500 (at the South Dakota Wyoming border) and United States Geological Survey (USGS) 06438000 (upstream of the Cheyenne River) is over 2.5 times the 12-month average. For the same sites, over 95 percent of the load occurs during the irrigation season. Approximately 36 percent of the water lost is attributed to transportation and operational

losses. Transportation losses include seepage and evaporation. Operational losses include overflow from the canals, laterals, and gates/valves into the adjacent waterways.

Approximately 64 percent of the water released from the reservoir is delivered to the field. Approximately 32 percent is used by crops, and the rest is lost through evaporation and nonused water discharged to adjacent waterways. This water also carries TSS picked up from the fields from flood-style irrigation. This task will increase the overall application efficiency on the irrigated fields from 50 percent to 56 percent through the use of sprinkler systems, pipelines, and water control structures. Full implementation of BMPs from the TMDL should reduce the amount of water discharged to the waterways by approximately 7,000 acre-feet of the 12,000 acre-feet targeted reduction discharged to the waterways.

Mini-center pivot systems were installed as demonstration projects around Vale, South Dakota, during the summer of 2002. Two adjacent fields were irrigated, one by flood irrigation and the other by the mini-pivot. The fields were nearly identical in size and soil types with the main difference being crop type. Monitoring was performed under the direction of Dr. Hal Werner, South Dakota State University Extension Irrigation Specialist. The mini-pivot used 9.5 million gallons (29.15 acre-feet) of water during the season, and the flood irrigation system used nearly 40 million gallons (122.74 acre-feet) of water. The flow measurements did not start until after June 12, 2002, missing a portion of the irrigation season. The pivot had some operational problems during the season as well; thus, the overall water use is not exact. The amount of runoff and soil moisture was not measured in the demonstration. However, it appears the potential for reducing the amount of nonused water discharged to the adjacent waterways through application efficiency improvements is great if more center pivots are installed within the project.

Irrigation scheduling is another method of increasing efficiency by controlling the rate, amount, and timing of irrigation water. Measurements of water flow, crop use rate, and soil measurements aid in scheduling.

Products:

1. Improved Irrigation Water Delivery.

   Reduce the amount of nonused irrigation water discharged to the surrounding water by 4,200 acre-feet. This will be accomplished by reducing nonused irrigation water from BFID's delivery system. The following is a breakdown of anticipated activities that will be completed to reach the milestone:

   a. Twenty-five flow automation units within the delivery system during the 2-year project (divided evenly over 2 years).

      The gate structures on the north and south canals are the current focus of the automation units to more closely control the level within the canals and laterals, thereby reducing the amount of nonused water discharged into the waterways. This activity would automate approximately every third gate structure on the canals.

      - Total Product Cost: $301,870 319 Cost: $251,870
      - Lead: BFID
      - Other Groups: BOR
      - Milestone: September 2005, 25 flow automation units (Milestone Table, Page 16)

   b. Develop and implement water card and a water order system for the BFID.

      - Total Product Cost: $125,650 319 Cost: $5,650
      - Lead: BFID
      - Other Groups: BOR
      - Milestone: December 2006, water card and water order system (Milestone Table, Page 16)

c. Twelve stage/flow measuring devices and appropriate equipment installed within the delivery system during the first year of the project.

These stage/flow measuring devices will be located at key locations throughout the delivery system to assist in maintaining water levels consistent with what the producers order for their fields, thereby reducing the amount of nonused water discharged into the waterways. Twelve real-time permanent monitoring stations that measure stage (all sites) and precipitation, temperature, and humidity (four sites) and pertinent equipment will be installed within the delivery system during the second year of the project. Data from these devices will be made available in real-time for the BFID office and for the gate house at the Belle Fourche Reservoir. This will allow the BFID project manager and water master to determine changes in canal levels instantaneously, thereby making it possible to modify operations more effectively and reducing the amount of nonused water discharged into the waterways. The producers will use the weather information.

- Total Product Cost: $275,610 319 Cost: $275,610
- Lead: BFID
- Other Groups: Consultant
- Milestone: December 2006, 12 portable and 12 real-time stage/flow measuring devices (Milestone Table, Page 16)

d. Develop a digital map of the Watershed.

A digital map of the Watershed will be created which will include ortho photography of the BFID, locations of the canals and laterals, locations of irrigation structures, and drawings and pictures of irrigation structures. The new ortho photography will have one foot pixels with a horizontal accuracy of ± 6.67 feet. The resolution of the new imagery will be more than ten times better than any imagery currently available, and the horizontal accuracy will be five times better. This improved accuracy will allow for more accurate and detailed modeling of the irrigation system. The improved photo resolution will improve the accuracy of the length of irrigation canals, laterals, and ditches, and enable small irrigation ditches to be identified that would not be visible on current imagery. This detailed facility information will be used in the future as a basis to develop an operational model of the canal systems that will aid the BFID personnel in more efficient operation of the irrigation system. It will also aid in identifying damaged or faulty structures for quicker and easier replacement.

The combination of better efficiency and quicker repairs to irrigation canals, laterals, and equipment will reduce the amount of nonused water discharged into the waterways.

- Total Product Cost: $163,500 319 Cost: $163,500
- Lead: BFID
- Other Groups: Consultant and South Dakota School of Mines and Technology (SDSM&T)
- Milestone: December 2006, one digital map (Milestone Table, Page 16)

e. Line open canals and laterals within the delivery system with a low permeability material during the 2-year project (3,200 feet divided evenly over 2 years).

The specific lining projects for 2005 have not been finalized by BFID. When finalized, these projects will be approved by the BOR. Water loss savings from canals and laterals increase the overall water in the system. The lining projects will reduce the water lost to seepage during transport.

- Activity Cost: $150,000 319 Cost: $0
- Lead Group: BFID
- Other Groups: BOR
- Milestone: September 2006, two miles lining open canals and laterals (Milestone Table, Page 16)

f. Replace open canals and laterals with pipelines within the delivery system during the two year project (4,000 feet divided evenly over 2 years).

BFID and the BOR have been spending approximately $40,000 per year on these projects. The specific projects for 2005 have not been finalized by BFID. When finalized, these projects will be approved by the BOR. Water loss savings from canals and laterals increase the overall water in the system. The pipeline projects reduce the water loss during transport. In addition, pipelines are not as sensitive to water level (pressure), thereby reducing the nonused water discharged into the waterways from the head gate structures.

- Activity Cost: $80,000 319 Cost: $0
- Lead Group: BFID
- Other Groups: BOR, Consultant, SDSM&T
- Milestone: September 2006, replace open canals and laterals with 4,000 feet of pipeline (Milestone Table, Page 16)

g. Study for alternative delivery of water from Keyhole Reservoir to the BFID's inlet canal (above Belle Fourche Reservoir).

The alternative delivery would seek to eliminate surges of water being released into the Belle Fourche River above the Belle Fourche Reservoir for the BFID. The elimination of these surges would greatly reduce both TSS and fecal coliform levels in the river caused by these artificial pulses. It would also reduce evaporation losses for water that BFID would receive from Keyhole Reservoir. It is possible that this saved water could be used for a rural water system before reaching the BFID.

- Activity Cost: $50,400 319 Cost: $50,400
- Lead Group: Consultant
- Other Groups: BFID, BOR, SDSM&T, Belle Fourche River Partnership (BFRP)
- Milestone: May 2006, alternative keyhole water delivery system (Milestone Table, Page 16)

h. Construction of a nonused water storage pond.

This storage pond would be used to store cancelled water orders that have been sent down the irrigation canal. Because of the 2- to 3- day water travel time, farmers must order water before they need it. After water orders are sent down the canal, conditions for the farmers sometimes change (rain), and farmers cancel their orders when the water is already in the canal. The nonused water storage pond would be used to store this water for later irrigation, thereby reducing the amount of nonused water discharged into the waterways.

- Activity Cost: $145,885 319 Cost: $120,885
- Lead Group: BFID
- Other Groups: Consultant, BOR, SDSM&T
- Milestone: August 2005, nonused water storage pond (Milestone Table, Page 16)

Product 1: 4,200-Acre-foot Reduction of Nonused Irrigation Water

- Total Product Cost: $1,292,915 319 Cost: $867,915
- Responsible Groups: BFID, BOR, BFRP, SDSM&T, Producers, Consultant

2. Improved Irrigation Application.

After reducing water transported to the field, the next place water use can be reduced is through more efficient application of transported waters; reduction in the amount of nonused irrigation water discharged to the surrounding streams by 400 acre-feet will be accomplished by reducing

nonused irrigation water from the producer's systems. The following is a breakdown of anticipated activities:

a. Install pipeline projects delivering water from the BFID system to the field during the 2-year project (divided evenly over 2 years).

   These projects are primarily on private land and increase the efficient transfer of water from the delivery system to the field.

   - Activity Cost: $240,000 319 Cost: $0
   - Lead Group: Natural Resource Conservation Service (NRCS)
   - Other Groups: Producers
   - Milestone: October 2006, pipeline projects delivering water from BFID to field (Milestone Table, Page 16)

b. Install four irrigation system sprinklers during the 2 year project (divided evenly over 2-years).

   - Activity Cost: $204,000 319 Cost: $0
   - Lead Group: NRCS
   - Other Group: Producer
   - Milestone: October 2006, install four irrigation system sprinklers (Milestone Table, Page 16)

Product 2: 400-Acre-feet Reduction of Nonused Irrigation Water

- Total Product Cost: $444,000 319 Cost: $0
- Responsible Groups: BFID, BOR, NRCS, SDSM&T, SDSU, Producers

Task 2 **Complete and Install Riparian Vegetation Improvements**

Implementation of riparian vegetation improvement projects has been demonstrated to reduce TSS up to 70 percent (see TMDL study). This reduction has been in areas where a large majority of the TSS is coming from the adjacent riparian area. In the Belle Fourche River Watershed, it is predicted that riparian vegetation improvement will reduce TSS concentrations by 18 percent. Types of BMPs include grazing exclusion or management plans. Plans that will be used to install the BMPs include: fencing, stream crossing, alternative water supplies, winter feeding systems, range management, no-till systems, and stream channel bank stabilization.

3. Grazing Management Units.

   Develop 5,000 acres of grazing management areas within the Watershed. This will include about 80,000 feet of cross fencing, 5 miles of pipeline, and 18 tanks for alternative water sources. The grazing management units will be installed during this two year project segment (divided evenly over 2 years).

Product 3: 5,000 Acres of Grazing Management Systems (25 Systems)

- Total Product Cost: $198,000 319 Cost: $0
- Lead Group: NRCS
- Other Group: Producers
- Milestone: December 2006, 5,000 acres of managed grazing (Milestone Table, Page 16)

OBJECTIVE 2: Conduct Public Education and Outreach to Stakeholders Within the Belle Fourche River Watershed

Informational meetings will be held quarterly to inform the public of project progress. Public participation and involvement will be encouraged. These meetings will provide an avenue for input from the residents in the area. Notification of meetings will be made to local agencies, mailings, and newspapers. In addition, a public Web page will be maintained to provide the public with the latest available data as well as an overview of the project and status of work activities.

Efficient use of irrigation water during transportation and application will add value for the producer and BFID. These improvements will also reduce the amount of nonused irrigation water discharged to the surrounding waterways. Water application BMPs, such as sprinkler systems, will allow the producer to more precisely adjust the rate of application to more closely follow the absorption rate of the soils, thereby increasing yield. Rate of application may be more valuable for the producers located in the clays. Rate of application will have a significant impact on reducing the amount of waste water discharged to the waterways.

Task 3 **Conduct an Education and Outreach Program**

4. Supplement existing outreach programs with information and support.

   The Cooperative Extension Service (CES), along with NRCS, have existing successful education programs. The target audience will be local producers, landowners, and stakeholders within the Watershed.

   a. Conduct public meetings.

      Eight public meetings will be held during the project (two per year). The function of these meetings is to update the status of the project for the producers, landowners, and stakeholders and to educate and encourage them to become involved with implementing BMPs.

      - Total Product Cost: $20,000 319 Cost: $0
      - Lead Group: BFRP
      - Other Group: Consultant
      - Milestone: October 2006, eight public meetings (Milestone Table, Page 16)

   b. BFRP bimonthly meetings.

      The purpose of these meetings is to provide the Partnership with the opportunity to update all individuals working on the project with the status of the implementation project.

      - Total Product Cost: $20,000 319 Cost: $0
      - Lead Group: BFRP
      - Other Group: All groups
      - Milestone: December 2006, twelve BFRP meetings (Milestone Table, Page 16)

   c. New Implementation Funds.

      Receive commitments for an additional $400,000 through new programs or additional interest in existing programs to be used in the continuation product segment. This will be accomplished by the consultant acting as an agent for the Belle Fourche Water Partnership. The agent will work part time (1,000 hours/year). The agent will be responsible for an outreach program to develop additional participation by the producers and other parties listed in the coordination plan. He will also be responsible to ensure all activities, reporting requirements, contractual requirements, and financial obligations associated with the project

are completed within the guidelines of the controlling documents. The contractor will be paid based on a performance-based contract.

- Total Product Cost: $124,000 319 Cost: $124,000
- Lead Group: Consultant
- Milestone: $400,000 new implementation money (Milestone Table, Page 16)

Product 4: Public and BFRP Meetings and $400,000 New Implementation Money.

- Total Product Cost: $164,000 319 Cost: $124,000
- Lead Group: Consultant
- Milestone: December 2006, Meetings and $400,000 New Implementation Money (Milestone Table, Page 16)

OBJECTIVE 3: Measure BMP Effectiveness

Significant water quality monitoring is being completed throughout the watershed by the USGS and the SD DENR. However, significant improvements will be made to the BFID which are not being monitored directly. This objective will monitor the effect of the BMPs on the water quality and quantity discharging into the downstream waterways.

Task 4 **Measuring Results of BMPs**

5. To analyze the effectiveness of newly installed BMPs it is necessary to assess the water quality immediately downstream of the BMPs as well as at WQM sites further downstream.

   The water quality samples taken immediately downstream of the new BMPs will allow the results of these BMPs to be seen more quickly, which will aid in the implementation of the most effective BMPs in the future. This task will provide funding for fifty water quality samples to be taken during this two year implementation segment. These samples will be taken downstream of newly implemented BMPs throughout the watershed with the main focus being within the BFID. The results of these samples will be presented in the annual reports. By measuring the effectiveness of BMPs, TSS concentrations will be reduced by an estimated 1 mg/L. Specifically, the parameters listed in Table 3-1, along with water quantity will be measured.

Product 5: Results of BMPs

- Total Product Cost: $21,400 319 Cost: $15,600
- Lead Group: SDSM&T
- Other Groups: BFID, Consultant
- Milestone: September 2006, measurement of BMP results (Milestone Table, Page 16)

Task 5 **Reports**

6. Several reports are required to be written during the project.

   The reports that will be written include midyear and annual GRTS reports, and a final project report. The format used will be provided by the DENR.

Product 6: Reports

- Total Product Cost: $43,685 319 Cost: $43,685
- Lead Group: Consultant
- Other Groups: BFID, BFRP, SDSM&T
- Milestone: Complete reports as scheduled (Milestone Table, Page 16)

Table 3-1. Parameters to be Measured for All Samples

Physical/Field Parameters	Chemical
Air temperature	Alkalinity
Discharge	Dissolved Ammonia as N
Dissolved oxygen	Ammonia, Unionized
Field pH	Bicarbonate
Specific conductance	Dissolved Calcium
Stage	Carbonate
Visual observations	Chloride
Water temperature	E Coli (nonirrigation)
Turbidity	Fecal Coliform Bacteria (nonirrigation)
	Dissolved Magnesium
	Nitrate + Nitrate as N
	Nitrogen, Total Kjeldahl (TKN)
	Dissolved Sodium
	Dissolved Sulfate
	Total Dissolved Phosphate
	Total Phosphate
	Total Solids
	Total Dissolved Solids
	Total Suspended Solids
	Total Volatile Suspended Solids
	Turbidity

3.3 SCHEDULE

The project milestone schedule is shown in Figure 3-1. The milestone schedule assumes approval before April 2005 and completion by June 2007.

3.4 PERMITS

No permits are anticipated for this effort. Prior to any new construction, the need for permits will be checked.

3.5 LEAD PROJECT SPONSOR

The Belle Fourche River Watershed Partnership (BFRWP) is the local sponsor for this implementation project. The partnership is registered with the IRS as a 501C nonprofit group. The leaders of the Partnership include the conservation districts within the Watershed and the Belle Fourche Irrigation District. The BFRWP has been the recipient of past 319 assessment and implementation grants for the Belle Fourche River TMDL.

Task Name	Amount
Belle Fourche River Watershed Management and Project Implementation Plan Phase II	
Objective 1. Implement BMPs Recommended in the Belle Fourche River Watershed TMDL	
Reduce Water Discharged to Local Waterways	
Improved Irrigation Delivery	
25 Flow Automation Units	**25 units**
Water Card and Water Order System	**1 system**
12 portable and 12 real-time stage/flow measuring devices	**24 stage / flow devices**
Digital Map	**1 Digital Map**
Line open canals and laterals	**3,200 feet lining**
Replace open canals and laterals with pipelines	**4000 feet pipeline**
Alternative Keyhole Water Delivery Study	**1 alternative delivery study**
Nonused Water Storage Pond	**1 pond**
Improved Irrigation Application	
Pipeline projects delivering water to fields or pastures	**20 projects**
Install Four Irrigation Sprinkler Systems	**4 sprinkler systems**
Riparian Vegetation Improvements	
Grazing Management Units	**25 grazing units**
Objective 2. Conduct Education and Outreach	
Public Meetings	**8 public meetings**
BFRP Meetings	**12 BFRP meetings**
New Implementation Money	**$200,000 additional money**
Objective 3. Measure BMP Effectiveness	
Measuring results of BMPs	**50 samples**
Complete Reports as Scheduled	**4 GRTS & 1 Final**
Tracking TMDL Progress	**11 USGS Monitoring Sites**

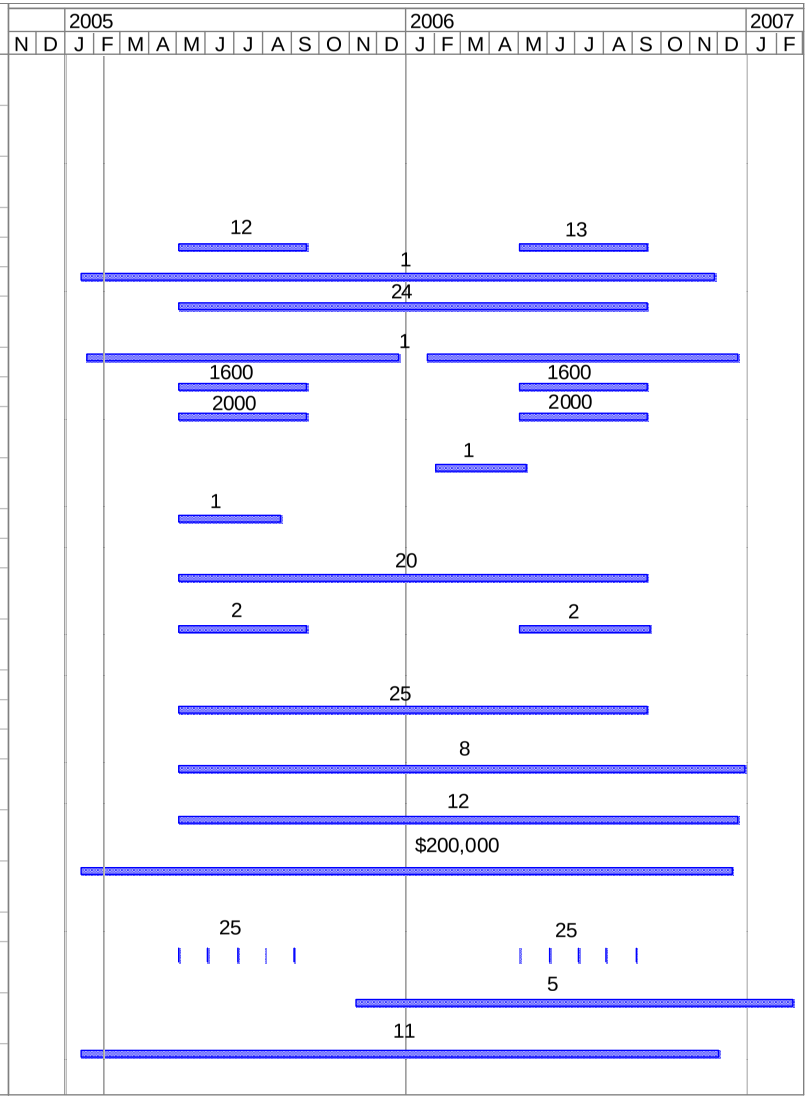

Figure 3-1. Milestone Table.

3.6 OPERATION AND MAINTENANCE QUALITY ASSURANCE

The Natural Resource Conservation Service; Farm Service Agency; and the Butte, Meade, and Elk Creek Conservation District, District Supervisors, and the US Bureau of Reclamation will be responsible for ensuring best management practices cost-shared with the Environmental Protection Agency (EPA) 319 and South Dakota consolidated funds will be implemented, and all systems operated and maintained properly for the duration of each contract. Compliance for BMPs implemented with 319 funds will follow the same rules and regulations as the Natural Resource Conservation Service's Environmental Quality Incentive Program (EQIP). These rules are found in Section 515.113 of the EQIP Program Manual. Landowners and operators who do not maintain practices funded by this project for the length of the agreed contract will be required to repay all cost-share funds and any liquidated damages incurred. Conservation district personnel supported by the agent acting on behalf of the Belle Fourche River Watershed Partnership (BFRWP) will be responsible for landowner contacts, developing a landowner/producer mailing list, keeping records, submitting vouchers and reports, and recording cash and in-kind match. Where BOR funds are used, the BOR will be responsible for ensuring the BMPs are operated and maintained properly for the life of the contract (see also Section 5.5).

4.0 COORDINATION PLAN

4.1 PARTICIPATING GROUPS AND AGENCIES

The BFRWP has been working together for over 6 years. The Partnership has completed monitoring and evaluation work and submitted a TMDL study for approval for the Watershed. Some of the BMPs recommended in the TMDL have been implemented. The following groups/agencies have been participating and will continue to participate in the Belle Fourche River Watershed implementation project:

- **Butte County Conservation District** – Voting member of the BFRWP, financial support and EQIP funding.
- **Belle Fourche Irrigation District (BFID)** – Voting member of the BFRWP, implements many BMPs, financial support and match funding.
- **Belle Fourche River Watershed Partnership** – Local project sponsor.
- **Elk Creek Conservation District** – Voting member of the BFRWP, financial support and EQIP funding.
- **Lawrence County** – Local support, funding.
- **Lawrence County Conservation District** – Voting member of the BFRWP, financial support and EQIP funding.
- **South Dakota Association of Conservation Districts** – New active participant of BFRWP, full-time effort under the 319 grant program titled *303 (d) Watershed Planning and Assistance Project*.
- **South Dakota Conservation Commission** – Local support and technical assistance.
- **South Dakota Department of Agriculture** – Technical assistance.
- **South Dakota Department of Environment and Natural Resources (SD DENR)** – Active participation in BFRWP, GIS services for BFID, technical support and financial support.
- **South Dakota Game Fish and Parks** – Technical assistance.
- **South Dakota Grassland Coalition** – Grassland management project.
- **South Dakota School of Mines and Technology (SDSM&T)** – Active participant in BFWP, technical support through Dr. Kenner and graduate students. SDSM&T performed the initial TMDL study.
- **US Army Corps of Engineers (COE)** – Local support.
- **US Bureau of Reclamation (BOR)** – Active participation in BFRWP, provide technical support through drawings and designs as requested by BFID, provides financial support, sponsors South Dakota State University (SDSU) Water Conservation Demonstrations and Bridging the Head gate initiative.
- **US Environmental Protection Agency (EPA)** – Provides 319 and 106 funding and technical guidance.
- **US Geological Survey (USGS)** – Active participant in BFRWP, field work, and technical and financial support.

- **US Fish and Wildlife Service (USFWS) –** Participant in BFRWP, technical support, and potential financial support.
- **US Natural Resource Conservation Service (NRCS) –** Field work and lead agency for the river basin study to identify critical areas of nonpoint source pollution to the surface waters in the watershed.
- **Wyoming Department of Environmental Quality (WY DEQ) –** Local support and financial support for flow measurements at the South Dakota-Wyoming state line.

4.2 LETTERS OF SUPPORT

Letters of support have been supplied by local organizations to the DENR supporting the Belle Fourche River Watershed Assessment Project for this project.

4.3 COORDINATION WITH OTHER PROGRAMS

This project will continue to coordinate activities with state, federal, and local government agencies through frequent personal communication and monthly partnership meetings. South Dakota Game, Fish, and Parks; NRCS; local organizations; and local government agencies will provide input and involvement in this assessment.

4.4 SIMILAR ACTIVITIES IN WATERSHED

All identified programs within the Belle Fourche River Watershed are included in the funding table. Additional partners and programs may be identified during the coordination segment.

5.0 EVALUATION AND MONITORING PLAN

5.1 QUALITY CONTROL AND ASSURANCE

The collection of all field data will be performed in accordance with the SD DENR's Standard Operating Procedures for Field Samplers, Tributary and In-Lake Sampling Techniques. A minimum of 10 percent (1 sample) of all samples collected will be quality assurance/quality control (QA/QC) samples. QA/QC samples will consist of field duplicates or field replicate samples.

5.2 MONITORING PROGRESS AGAINST PLAN

BASINS and **HSPF** were used to model the Belle Fourche Watershed when the TMDL was developed. To develop the TMDL and to determine the necessary load reductions, several BMPs were modeled in these programs to reduce TSS concentrations in the streams within the Belle Fourche Watershed. The key sources of TSS were found to be range erosion, irrigation and on-farm waste, free cattle access to streams, riparian degradation, natural geologic processes, hydraulic alteration by irrigation, and reduced stream miles. The following steps will be used to determine the progress made to achieving the goals of the TMDL plan:

1. Monitor Present Progress Against Plan in Mid-Year and Annual Reports (Load Reductions Reported Annually).

   Evaluation of project success in reaching the project objectives and goals will be accomplished by measuring:

   - The scheduled versus the actual milestone completion dates.
   - Comparisons of flow rates and chemistry for irrigation water application, delivery, and riparian BMPs.
   - Measurement of reduction in nonused water from BFID discharged into streams.
   - Development of a sustainable watershed implementation project measured in part by the participation and approval of additional grants money for BMP implementation.

   Project monitoring will be received by the BFRWP in quarterly meetings to report progress toward the goals and objectives.

2. Monitor Water Quality Improvement.

The flow impact on the macro watershed will be analyzed using the following United State Geological Survey (USGS) stations:

- USGS 06428500 (Belle Fourche River at South Dakota-Wyoming state line)
- USGS 06434505 (Inlet Canal)
- USGS 06436000 (Belle Fourche River near Fruitdale, South Dakota)
- USGS 06437000 (Belle Fourche River near Sturgis, South Dakota)
- USGS 06438000 (Belle Fourche River near Elm Springs, South Dakota)
- USGS 06436760 (Horse Creek above Vale, South Dakota)
- USGS 06436198 (Whitewood Creek above Vale, South Dakota)
- USGS 06430500 (Redwater Creek at South Dakota-Wyoming state line)
- USGS 06429997 (Murray Ditch at South Dakota-Wyoming state line)
- USGS 06430532 (Crow Creek near Beulah, South Dakota)
- USGS 06431500 (Spearfish Creek at Spearfish, South Dakota).

These are long-term flow measurement sites operated, funded, and maintained by USGS. The projects to reduce the amount of unused water discharging to the waterways within the irrigation district should be detectable at the Belle Fourche River sites near Sturgis and near Elm Springs as well as at the Horse Creek site above Vale. The other sites recommended will allow a water mass balance to be calculated, adding to the precision of the analysis. Turbidity, specific conductance, temperature, and pH will be measured on a continuous basis at Horse Creek above Vail to provide baseline data to measure water quality improvements as a result of the nonused water reduction projects BMPs implemented within the Horse Creek Watershed.

SD DENR, under the surface water quality program, has 21 monitoring stations within the Watershed. Comparisons over time can be performed to measuring the large-scale changes in water quality.

Tracking progress towards meeting the TMDL goals of reducing TSS in the Belle Fourche River and Horse Creek.

- Collection, analysis, and statistical evaluation of water quality samples taken from long-term watershed monitoring sites. The following is a breakdown of anticipated activities;

  Continuous flow for sites identified above (2 years).
  - Cost: $274,315 319 Cost: $0
  - Lead Group: USGS

- Continuous chemistry at Horse Creek above Vail, South Dakota, to determine the daily and weekly chemical variability, to provide a better understanding of the system, and to compare chemical changes over time (2 years).
  - Cost: $21,050 319 Cost: $21,050
  - Lead Group: USGS

- Perform statistical analysis of flow and chemistry monitoring sties to evaluate changes from BMPs.
  - Cost: $22,450 319 Cost: $22,450
  - Lead Group: Consultant

- Track progress toward meeting the TMDL.
  - Total Product Cost: $317,815 319 Cost: $43,500
  - Lead Group: USGS
  - Other Groups: BFID, BOR, Lawrence County, SD DENR, US Army Corp of Engineers, Consultant
  - Milestone: February 2007, progress made toward TMDL goal (land reductions reported annually)
    (Milestone Table, Page 16)

5.3 DATA

The data will be provided to SD DENR for use in their electronic database. The data and analysis for this project will be documented in a final report. The BFRWP will review and submit the final report to SD DENR for entry into STORET database.

5.4 MODELS

Models used for the Belle Fourche Watershed TMDL were **HSPF** and **FLUX**. **FLUX** will be run with the updated information from the sampling program to help detect changes. A hydraulic model of the irrigation district's delivery system will continue to be developed.

5.5 LONG-TERM OPERATION AND MAINTENANCE (O&M) FUNDING

The long-term O&M funding for irrigating will be funded and maintained by the Belle Fourche Irrigation District. Proper management of stream riparian habitat will be managed and supported financially in part by the NRCS and EQIP funding (see also Section 3.6).

6.0 BUDGET

Table 6-1 identifies the funding sources for this project. Table 6-2 identifies the cash flow for the project. It also summarizes the 319 funds, other federal funds, and nonfederal funds. Tables 6-3 and 6-4 present the budget for the 319 funds.

The 319 part of the project is proposed as a fixed-price effort. The contract will be with the consultant. The consultant will act as an agent on behalf of the Belle Fourche River Watershed Partnership and will administer contracts and perform the project management and administrative functions for the Partnership (USGS $21,050 continuous monitoring contract needs to be with the Belle Fourche Water Partnership). The estimate of 319 funds includes: personnel, office supplies, travel, equipment, and administrative costs. Transportation for the SDSM&T student will be provided by BFRWP and is shown in the cost-share table. The expenses for the non-319 money will be the responsibility of the funding party.

7.0 PUBLIC INVOLVEMENT

Communications with the major stakeholders in this project is critical to success. A sustainable communication plan will be developed and implemented to solicit advice on project implementation, to communicate progress, and to celebrate successes. The detail plan is presented under Objectives and Tasks.

8.0 THREATENED AND ENDANGERED SPECIES

The following endangered species are identified by the South Dakota Game, Fish and Parks as located within and/or migrating through the Lawrence, Butte, and Meade Counties: bald eagles, whooping crane, least tern, black-tailed prairie dog, and the black-footed ferret. The implementation of this project is not expected to impact any of these species.

The procedure that will be followed to ensure that threatened and endangered species are not adversely affected by project activities is based on three main premises:

- The managed grazing systems, planned and implemented, will promote the restoration or preservation of critical grassland habitat,

Table 6-1. Cash Flow Table (Calendar Year)

Segment II Budget	2005	2006	2007
319 Funds	$574,645	$490,555	$29,500
Other Funds			
NRCS EQIP	$125,600	$125,600	
COE	$6,150	6,500	
BOR	$40,580	40,750	
USGS	$76,360	80,675	
Subtotal	**$248,690**	**$253,525**	
State and Local Match			
Producer/Landowner	$195,400	$195,400	
BFRP	$22,900	$22,900	
SD DENR (Water Rights)	$30,750	$32,500	
Lawrence County	$6,150	$6,500	
BFID	$193,375	$166,375	
WY DEQ	$6,150	$6,500	
Subtotal	**$454,725**	**$430,175**	
Total Budget	**$1,278,060**	**$1,174,255**	**$29,500**
Total			**$2,481,815**

- It is anticipated that many of the grazing systems planned and implemented will be within areas with compliance plans in place.
- Involvement of NRCS and the USFWS in planning and construction grazing systems ensures personnel trained with mitigating threatened and endangered species will be involved with the design and implementation of project BMPs.

Species most likely to be encountered during the project and the procedure to be followed relative to each follows.

8.1 BALD EAGLE

The bald eagle is a threatened species with a known certainty of occurrence in all three counties. According to the USFWS, bald eagles are presently known to nest in the flood plain forest along the Missouri River in Yankton, Bon Homme, Union, and Gregory Counties; along the James River in Brown, Spink, Sanborn, and Hutchinson Counties; and in forested areas in Meade, Charles Mix, and Brown Counties of South Dakota.

The 319-funded activities will be very low intensity and widely dispersed over the landscape. The activities will not significantly increase or expand the level of human activity. Activities that disturb possible nesting sites or reduce food sources are not anticipated. Therefore, EPA-funded activities are expected to have no effect on the bald eagle and no consultation with the USFWS is planned.

Table 6-2. Belle Fourche River Watershed Implementation Funding Sources 2004

Total Budget	EPA 319	Producer	BFRP	SD DENR Water Rights	Lawrence County	BFID	WY DEQ	NRCS EQIP	COE	BOR	USGS	Line Item Total	Product Total
Objective 1. Implement BMPs Recommended in the Belle Fourche River Watershed TMDL													
Reduce Nonused Water													
Product 1. Improve Irrigation Delivery	**$ 867,915**					**$ 350,000**				**$ 75,000**		**$ 1,292,915**	**$1,292,915**
25 Flow Automation Units	$ 251,870					$ 50,000						$ 301,870	
Water Card and Water Order System	$ 5,650					$ 120,000						$ 125,650	
12 portable and 12 real-time stage/flow measuring devices	$ 275,610											$ 275,610	
Digital Map	$ 163,500											$ 163,500	
Line open canals and laterals						$ 75,000				$ 75,000		$ 150,000	
Replace open canals and laterals with pipelines						$ 80,000						$ 80,000	
Alternative Keyhole Water Delivery Study	$ 50,400											$ 50,400	
Nonused Water Storage Pond	$ 120,885					$ 25,000						$ 145,885	
Product 2. Improved Irrigation Application		**$ 322,800**						**$ 121,200**				**$ 444,000**	**$ 444,000**
Pipeline projects delivering water from BFID to fields		$ 180,000						$ 60,000				$ 240,000	
Install Four Irrigation SprinklerSystems		$ 142,800						$ 61,200				$ 204,000	
Product 3. Riparian Vegetation Improvements		**$ 68,000**						**$ 130,000**				**$ 198,000**	**$ 198,000**
Grazing Management Units		$ 68,000						$ 130,000				$ 198,000	
Objective 2. Product 4. Conduct Education and Outreach	**$ 124,000**		**$ 40,000**									**$ 164,000**	**$ 164,000**
Public Meetings	$ -		$ 20,000									$ 20,000	
BFRP Meetings	$ -		$ 20,000									$ 20,000	
New Implementation Money	$ 124,000											$ 124,000	
Objective 3. Measure BMP Effectiveness													
Product 5. Measuring Results of BMPs	**$ 15,600**		**$ 5,800**									**$ 21,400**	**$ 21,400**
Product 6. Reports	**$ 43,685**											**$ 43,685**	**$ 43,685**
Tracking TMDL Progress	**$ 43,500**			**$ 63,250**	**$ 12,650**	**$ 9,750**	**$ 12,650**		**$ 12,650**	**$ 6,330**	**$ 157,035**	**$ 317,815**	**$ 317,815**
Product Total By Source	$1,094,700	$ 390,800	$ 45,800	$ 63,250	$ 12,650	$ 359,750	$ 12,650	$ 251,200	$ 12,650	$ 81,330	$ 157,035	$ 2,481,815	$2,481,815

Table 6-3. Budget 319 Funds

	Consultant	SDSM&T	USGS	BFID	Totals
Objective 1. Implement BMPs Recommended in the Belle Fourche River Watershed TMDL					
Reduce Nonused Water					
Improve Irrigation Delivery	$418,465	$104,250		$345,200	$867,915
Riparian Vegetation Improvements					
Objective 2. Conduct Education and Outreach					
Public Meetings					
BFRP Meetings					
New Implementation Money	$124,000				$124,000
Objective 3. Tracking Progress Towards Meeting TMDL through Water Quality Monitoring					
Measuring Results of BMPs	$15,600				$15,600
Reports	$38,435	$5,250			$43,685
Tracking TMDL Progress	$22,450		$21,050		$43,500
Total	**$618,950**	**$109,500**	**$21,050**	**$345,200**	**$1,094,700**

Table 6-4. 319 Funds

Category	Total Cost
Equipment and Supplies	$454,700
Salary and Fringe	
Travel	
Consultant	$618,950
USGS	$21,050
Total	**$1,094,700**

8.2 WHOPPING CRANE

The whooping crane is an endangered species with a known certainty of occurrence in all three counties. They are often found in South Dakota during spring and fall migrations. Migration through the state occurs from mid- to late-April and mid- to late-October. Although a variety of habitats are used during migration, a wetland is always used for night roosting and frequently for foraging. While migrating, whooping cranes roost in wide, shallow, open water areas, including marshes, flooded crop fields, artificial ponds, reservoirs, and rivers. Roosting sites must also be isolated from human disturbances.

The EPA-funded monitoring activities will be of low intensity, widely dispersed over the landscape, and will not significantly increase or expand the level of human activity. In addition, if any cranes are observed at any project work site, "all mechanical activities at the site will be suspended until the bird(s) leave the site under their own volition" (Section 8.1). Thus the EPA-funded activities are expected to have no effect on the whooping crane and no consultation with the USFWS is planned.

8.3 LEAST TERN

The least tern is listed as an endangered species with a "known" certainty of occurrence in Meade County. This species historically bred in isolated areas along the Missouri, Mississippi, Ohio, Red, and Rio Grande river systems. The least tern is a local summer resident of the Missouri and Cheyenne Rivers in South Dakota. They can be found migrating through virtually all of South Dakota with the exception of the Black Hills. Least terns usually nest on open expanses of sand or small pebble beaches along shorelines, riverbanks, sandbars, and islands. Least terns typically select nesting sites that are well drained and away from the water line, usually near a small ridge or piece of driftwood. Their food source consists almost entirely of small fish, and feeding requires shallow water areas with an abundance of fish near the nesting area.

Major losses and alterations of habitat occur from shoreline, bank, and channel modification from construction of locks, dams, dikes, levees, and reservoirs. Flooding can prevent or destroy nesting and can be a byproduct of habitat alteration. Habitat losses can also result from increased development, recreational uses, natural erosion, human and domestic pet disturbances or harassment, and trampling by cattle. Pollution that effects fish populations can impact terns.

The 319-funded monitoring activities will be of low intensity, widely dispersed over the landscape, confined to a few isolated stream channel areas, and will not significantly increase or expand the level of human activity. Activities that disturb possible nesting sites or reduce food sources are not anticipated. If any least terns are observed near any project work site, "all mechanical activities at the site will be suspended until the bird(s) leave the site under their own volition" (PIP section 8.2). Therefore, EPA-funded activities are expected to have no effect on the least tern and no consultation with the USFWS is planned.

8.4 BLACK-TAILED PRAIRIE DOG

The black-tailed prairie dog is listed as a "Candidate" species with a "known" certainty of occurrence in all three counties. Black-tailed prairie dog colonies are almost exclusively located in grassland habitat because their primary diet consists of vegetation.

The 319-funded activities will be widely dispersed over the landscape and not related to black-tailed prairie dog habitat. The activities will not significantly increase or expand the level of human activity. Activities that disturb or reduce food sources are not anticipated. Therefore, EPA-funded activities are expected to have no effect on the black-tailed prairie dog and no consultation with the USFWS is planned.

8.5 BLACK-FOOTED FERRET

The black-footed ferret is an endangered species with a "possible" certainty of occurrence in all three counties. This species is a member of the weasel family. It feeds primarily on prairie dogs and uses their burrows for denning and shelter. Their historic range included Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota,

Oklahoma, South Dakota, Texas, Utah, Wyoming, Alberta, and Saskatchewan. The South Dakota population that disappeared in the wild in 1974 was thought to be the last remaining population. However, a captive propagation program was started with individuals from a Meeteetse, Wyoming population that was discovered in 1981. Reintroductions have since occurred in Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. The South Dakota sites include the Conata Basin, Badlands National Park, and Cheyenne River Sioux tribal land in Dewey and Ziebach Counties.

Primary threats to the black-footed ferret include predation, disease, and loss of habitat. The ferrets can be affected by predators such as coyotes, golden eagles, great-horned owls, prairie falcons, badgers, bobcats, and foxes. Canine distemper will kill ferrets and sylvatic plague can eliminate entire prairie dog towns. In South Dakota, sylvatic plague currently poses the biggest threat to ferret populations. However, poisoning of prairie dogs and converting native prairie to cropland are main threats to ferret habitat.

The existence of black-footed ferrets (BFF) is directly linked to the presence of prairie dogs. The sponsor will address the BFF by complying with the South Dakota Prairie Dog Management Plan. If any actions are planned that may adversely effect the survival of a native or introduced population of black-footed ferrets the sponsor will consult with the US Fish and Wildlife Service.