

## FACT SHEET

Devils Lake Outlet  
ND-0026247

## MODIFICATION

The North Dakota Department of Health received a letter on May 12, 2006, from the North Dakota State Water Commission (SWC) requesting a modification to North Dakota Pollutant Discharge Elimination System (NDPDES) permit ND-0026247. Included with the request was a March 22, 2006, document titled *Sources and Processes Affecting Dissolved Sulfate Concentrations in the Upper Sheyenne River*, which presents trends and recent water quality monitoring data in the upper Sheyenne River. This monitoring indicates that natural background sulfate concentrations in the river are increasing. The modification request was to remove the time frame (specific months per year) the outlet could be operated, remove or revise the total suspended solids (TSS) limit in the permit and increase the 300 milligrams per liter (mg/l) instream sulfate limit at the Bremen site. According to state and federal rules, only the conditions subject to modification are reopened in the permit when it is modified (CFR 122.62 Modification or Revocation and Reissuance of Permits).

## BACKGROUND

The NDPDES permit for the Devils Lake Outlet is for a intermittent discharge from West Bay of Devils Lake (also known as Round Lake) to the Sheyenne River, a Class IA stream. The discharge from the diversion system enters the Sheyenne in the SW ¼ of the SE ¼, Section 8, Township 151N, Range 68W.

**Request # 1.** Modify the operation time frame of the Devils Lake Outlet Permit.

The current permit has established that the outlet will operate only during the open-water season (non-ice conditions). Specifically, the permit only allows discharges during the months of May through November. The permit restricts any discharge from occurring when flows in the Sheyenne River exceed 600 cubic feet per second (cfs) at the upstream (Flora) gage station and under ice conditions.

Based on the above, the Department of Health proposes to remove any reference to specific months when the outlet can be operated. The reference “which includes the months of May through November” will be removed from the permit. Actual outlet operation is dependent on the water quality of West Bay and the water quality and volume of the base flow in the Sheyenne River. The permit still limits the operation of the outlet to the open-water season, non-ice conditions.

**Request # 2.** Remove or revise the Total Suspended Solids (TSS) limit in the permit.

The current permit includes a 100 mg/l limitation for TSS applicable to the discharge from the outlet. The limitation was included to ensure that the system is designed, operated and maintained to minimize contribution of suspended solids to the Sheyenne River. The

Department has reconsidered the technical basis for the current numeric limit and is proposing that the limit for TSS be revised in response to the modification request.

The modification to the TSS limit is being proposed for the following reasons: currently there are no TSS stream standards for Class IA streams in North Dakota; numeric TSS limits are typically applied to industrial applications such as mining operations, not water-to-water transfers and; the purpose and method for controlling TSS at this facility is more typical of discharges regulated through Best management Practices (BMPs).

The department will replace the numeric TSS limit in the Devils Lake outlet permit with a best management practice (BMP) requirements for the control of TSS. The permittee will still be required to sample for TSS at the outlet structure. In addition, best management practices will continue to be implemented as part of the operation and maintenance of the system to minimize any adverse effects on the Sheyenne River due to the contribution of sediment.

**Request # 3.** Modify the 300 mg/l instream sulfate limit at Bremen.

North Dakota's water quality standard for sulfate is 450 mg/l in the Sheyenne River and 250 mg/l in the Red River. The Sheyenne River is designated in the *Standards of Quality for Waters of the State* as suitable for the propagation or support of fish and other aquatic biota. It is also designated suitable for agricultural uses, including irrigation. Valley City is the first municipality downstream to use the Sheyenne River as a source for water supply. The *Standards of Quality for Waters of the State* designates the Sheyenne River as suitable for drinking and culinary purposes after treatment to a level approved by the department.

The current permit has an instream limit for sulfate of 300 mg/l at the gage station downstream of the outlet structure (Bremen). As noted above, the water quality standard on the Sheyenne River for sulfate is 450 mg/l. Information submitted with the modification request presents trends and recent water quality monitoring in the upper Sheyenne River. Recent monitoring shows increasing trends in the background sulfate levels in the upper Sheyenne River and identifies probable sources of the sulfate.

Beginning in 2000, a major upward shift in sulfate concentrations occurred in the upper reaches of the Sheyenne River. Sulfate concentrations at Harvey and Warwick for the years 2000 through 2004 are almost double those for the period of 1992 through 1999. This became apparent following start-up of the project in 2005, when background sulfate concentrations in the Sheyenne River at the upstream gage station (Flora) exceeded 300 parts per million more than 90 percent of the time.

Various soils in the Upper Sheyenne River basin, particularly along the south branch and western portions of the main branch, have large natural sulfate reserves. Wet conditions since 1993 have caused high water tables, which in turn have greatly increased evaporation from local soils that have sulfatic salts. Evaporation has caused upward movement and deposition of sulfatic salts near the surface. High water tables have increased seepage of salt-laden water from stream bank soils of the river and its tributaries. High water tables have also caused soils

bordering water bodies to discharge sulfate more quickly to surface waters following storm events.

In addition, the natural distribution of sulfate in the Upper Sheyenne basin relates to the large and common variations in sulfate location and soil placement in North Dakota. The south branch of the Sheyenne River is bordered by saline soils, and sulfate concentrations in the south branch of the Sheyenne River at Harvey are nearly double those downstream at Warwick. The north branch of the Sheyenne River appears to be fresher with a lower concentration of sulfate. Water chemistry measurements collected by the U.S. Geological Survey in September of 2005 confirm that sulfate concentrations of the Sheyenne River are highest in the south branch, decreasing in concentration as the water travels downstream. Based on the recent data, sulfate concentrations in the Sheyenne River at the outlet appear to be naturally occurring and higher than those at Warwick. Influx of fresh groundwater between the outlet and the Warwick gage dilutes the higher sulfate concentrations upstream and limits their downstream effects.

There is substantial evidence that natural and historical sulfate concentrations at the Flora and Bremen gages are significantly higher than those at Warwick. As a result, the natural freshening of the river between Bremen and Warwick is substantial enough that greater sulfate concentrations at Bremen could be sustained without causing concentrations significantly above 300 mg/l at Warwick.

Based on available information, the Department of Health proposes to modify the instream sulfate limit. Any discharge from this project will still be managed so as not to exceed the 300 mg/l sulfate limit when natural background sulfate concentrations in the river are less than 260 mg/l. When the ambient concentration of sulfate in the river is equal to or greater than 260 mg/l, then a concentration not to exceed 15 percent above this level is allowed. However, the discharge from the outlet shall not cause the sulfate concentration at Bremen to exceed 450 mg/l.

#### **REVISED EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

The effluent limitations in the permit for the Devils Lake Outlet are dependent on conditions in the Sheyenne River. The Sheyenne River must be monitored both upstream (Flora) and downstream (Bremen) of the outlet's discharge ("insertion point") and at the outlet itself to determine compliance with the effluent limitations contained in this permit. The outlet discharge compliance monitoring is conducted at the canal terminal structure.

Managing the flow rate of this discharge is critical for maintaining the desired downstream quality and for operating within the channel capacity of the river. The operator has control over the flow rate and will adjust the flow in response to changes in river and lake conditions. The permit identifies three flow limitations (Part IA, Effluent Limitations and Monitoring Requirements, Subparts 3a-c) of which the most limiting must be adhered to when managing the discharge.

Subparts 3a and 3b remain the same in the Devils Lake Outlet permit; however, subpart 3c will be removed. Subpart 4 will be modified or changed to the following:

4. When the ambient concentration of sulfate in the river at Bremen ( $C_{Bb}$ ) is equal to or greater than 260 mg/l, then a concentration not to exceed 15 percent above this calculated level at Bremen ( $C_{Bb}$ ) is allowed. However, the concentration at Bremen shall not exceed 450 mg/l. The following equation will be used for compliance with the sulfate concentration at Bremen.

$$C_{Bb} = \frac{Q_B C_B - Q_O C_O}{Q_B - Q_O}$$

Where:  $Q_B$  = measured flow in cfs at Bremen  
 $C_B$  = measured sulfate at Bremen  
 $Q_O$  = outlet discharge in cfs  
 $C_O$  = measured sulfate of outlet water  
 $C_{Bb}$  = sulfate concentration at Bremen without outlet water

During periods of outlet operation, the 7-day sulfate concentration measured in samples from the downstream location (Bremen) shall not exceed the applicable criteria as dictated by ambient conditions in the Sheyenne River. The criteria shall be as follows:

- a. 300 mg/l when the background concentration ( $C_{Bb}$ ) is < 260 mg/l
- b.  $1.15 \times C_{Bb}$  when the background concentration ( $C_{Bb}$ ) is  $\geq 260$  mg/l and  $\leq 390$  mg/l
- c. 450 mg/l when the background concentration ( $C_{Bb}$ ) is > 390 mg/l

This calculation must be used to determine the maximum discharge flow rate from the outlet that can occur without violating the flow restriction. The calculated limit/value will require that the discharge be adjusted in response to changing conditions in the Sheyenne River and changes in sulfate levels in Devils Lake.

The minimum compliance monitoring requirements for the outlet, upstream and downstream stations during outlet operation will remain the same and are specified below:

<u>Parameter</u>	<u>Monitoring Requirements</u>	
	<u>Measurement Frequency</u>	<u>Sample Type</u>
Flow	Continuous	Recorder
Specific Conductance	Continuous	Recorder
Sulfate	Weekly	Grab
pH	Weekly	Grab
TSS	Weekly	Grab

### **ANTIDEGRADATION**

Based on the established antidegradation policy, it was determined that a formal review was not required since the changes proposed will not constitute a significant effect on the river or the beneficial uses of the water.

References

North Dakota State Water Commission. March 22, 2006. *Sources and Processes Affecting Dissolved Sulfate Concentrations in the Upper Sheyenne River.*

GB:RK

May 24, 2006