

Statement of Basis

PERMITTEE: **Lower Brule Rural Water**

FACILITY: **Lower Brule Lagoon System**

PERMIT NUMBER: **SD-0020800**

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PERMIT TYPE: Minor Municipal (Renewal)
Indian Country

FACILITY LOCATION: East 1/2 of Section 15, Township 107 N, Range 73 W,
approximate latitude 44.071667° N, longitude
99.573611° W

DISCHARGE POINT: Outfall 001: Approximately Latitude 44.069019° N,
Longitude 99.565878° W in Lyman County, South Dakota.

Background Information

This statement of basis is for the renewal of the NPDES permit (SD-0020800) authorizing a discharge from the Lower Brule Lagoon System. The previous permit was issued in 2007, with an effective date of October 1, 2007, and an expiration date of September 30, 2012. In a letter of December 27, 2012, the permit was administratively extended. The lagoon system is located on the Lower Brule Reservation and is thus in “Indian country” as defined at 18 U.S.C. 1151. The boundary of the Lower Brule Reservation is located in the middle of the Missouri River. The other half of the river is located on the Crow Creek Reservation. The EPA has not approved the Tribes or the State of South Dakota to implement the CWA NPDES program in Indian country within the State of South Dakota. The EPA directly implements the Clean Water Act (CWA) NPDES program on Indian country lands within the State of South Dakota.

The lagoon system is located on the bank of the Missouri River (Lake Sharpe) in the E 1/2 of Section 15, T 107 N, R 73 W, in Lyman County, South Dakota. The lagoon system was expanded from a small, 2-cell primary lagoon system to a 3-cell secondary lagoon system in 2001. The Indian Health Service (IHS) was involved in the expansion of the lagoon system. The middle dike of the 2-cell lagoon system was removed to form one cell, which became the 1st cell of the 3-cell lagoon system. According to IHS, the total area of the 3 cells at the high water mark is 32.5 acres. The 3 cells of the lagoon system are in a line running from the northwest to the southeast. The 1st cell is at the NW end, the 2nd cell is in the

middle and the 3rd cell is at the SE end. Influent normally goes to cell #1, but can be routed to cell #2. The only discharge point is from cell #3, with the outfall line going through the dike that parallels the river and is closest to the river. There is no flow measuring device on the outfall line or following the outfall line. The discharge from the lagoon system normally is controlled and when a discharge occurs, it goes to the bank of the Missouri River just a few feet from the lagoon dike and flows down the bank into the river. In discussions with representatives of the IHS, this writer learned that there has been stream erosion of the bank along where the lagoon is located. There is concern that unless corrective measures are taken, the erosion in time will compromise the lagoon system. Based on a satellite image of 2012, it appears to be about 50-60 yards from the outfall to the edge of the river. The satellite image is shown below in Figure 1.

Figure 1 - Lower Brule Lagoon System, Lower Brule, South Dakota



The lagoon system serves a population of approximately 700 people. In addition to the normal municipal sewage, the lagoon system receives the wastewater from the Lower Brule water treatment plant (WTP), which utilizes the membrane microfiltration filtration process. According to the WTP operator, the volume of wastewater discharged to the lagoon system averages about 35,000 gpd. Wastewater is pumped to the lagoon system. Typically most of the wastewater from this type of WTP consist of filter “backwash” to remove solids that have been filtered out. Usually the only chemical that might be used in the backwash water would be low concentrations of chlorine. Periodically it is necessary to clean the membranes more thoroughly to remove growths, etc., from the membranes. This is done with chemical solutions. A lighter cleaning is typically done more frequently, usually using a chlorine solution of about 300 mg/L. A more thorough cleaning of the membranes is done as needed, using chemicals such as citric acid followed by a mixture of sodium hydroxide and sodium hypochloride. The operator of the water treatment plant has indicated that the wastewaters from the chemical cleaning operations are held in a holding tank until the chlorine dissipates to an acceptable level, then discharged to the lagoon system via a lift station. Even with a continuous discharge, the hydraulic detention time in the lagoon (>100 days) is more than adequate to allow for disipation of any chlorine in the wastewater from the WTP.

The previous permit required that there be no discharge until permission has been granted by the permit issuing authority. The following effluent limitations applied to the discharges:

Effluent Characteristic	Effluent Limitation		
	30-Day Average <i>a/</i>	7-Day Average <i>a/</i>	Daily Maximum <i>a/</i>
BOD ₅ , mg/L	30	45	N/A
Total Suspended Solids, mg/L <i>b/</i>	30	45	N/A
Total Residual Chlorine, ug/L <i>c/</i>	N/A	N/A	19
E. coli, cfu/100 mL	1000	N/A	2000
Total flow shall not exceed 91.3 million gallons per year			
The pH of the effluent shall not be less than 6.0 or greater than 9.0 in any single sample or analysis. <i>d/</i>			
The concentration of oil and grease in any single sample shall not exceed 10 mg/L nor shall there be any visible sheen in the receiving water or adjoining shoreline.			

a/ See Definitions, Part 1.1., for definition of terms.

b/ The Secondary Treatment Regulation (40 CFR Part 133) provides for higher effluent limitations for total suspended solids for waste stabilization ponds provided that: (1) Waste stabilization ponds are the principal process used for secondary treatment; (2) The operation and maintenance data indicate that the above effluent limitations on total suspended solids cannot be achieved; and, (3) The above effluent limitations on BOD₅ are being met.

The permit issuing authority may change the effluent limitations on total suspended solids to the higher limitations without going to public notice upon demonstration of the above criteria.

c/ The analysis for Total Residual Chlorine (TRC) shall be done with an approved procedure that has a method detection level of no greater than 100 ug/L. Any single measurement greater than 100 ug/L TRC will be considered a violation of this permit. For purposes of calculating averages and reporting on the DMR, analytical values less than 100 ug/L shall be considered zero. The concentration of total residual chlorine shall not exceed 19 ug/L in any grab sample.

d/ The Secondary Treatment Regulation (40 CFR Part 133.102(c)) has provisions for pH limitations outside the range of 6.0 -9.0 where it can be demonstrated that: (1) Inorganic chemicals are not added to the waste stream as part of the treatment process; and (2) contributions from industrial sources do not cause the pH of the effluent to be less than 6.0 or greater than 9.0. The permit issuing authority may change the effluent limitations on pH to outside the range of 6.0 - 9.0 without going to public notice upon demonstration of the above criteria.

The limitations on BOD₅, TSS, and pH were based on the federal secondary treatment regulation (40 CFR Part 133), the limitation on total residual chlorine (TRC) was based on EPA's recommended acute toxicity criterion for chlorine, thus protecting the aquatic life in the receiving waters from toxicity due to chlorine. According to the statement of basis for the previous permit the limitations on *E. coli* were

based on EPA’s recommended criterion for primary contact recreation that the geometric mean of *E. coli* not exceed 126 cfu/100 mL and an allowance for a mixing zone. The Mixing Zone Model for discharges to lakes/reservoirs (Reference: Mixing in Inland and Coastal Water, Fischer et.al.; pg. 328) was used to derive an effluent limitation that would give an *E. coli* concentration of 126 cfu/100 mL at the edge of the mixing zone. The effluent limitation was 1,000 cfu/100 mL as a 30 day geometric mean. The daily maximum effluent limitation was set at 2,000 cfu/100 mL. This is in basic agreement with EPA’s recommendation for the single sample maximum allowable density. The flow limitation was based on the design flow of 0.25 MGD and discharging 365 days per year ($0.25 \times 365 = 91.25$ million gallons per year).

Since the previous permit was issued in 2007, only two discharge has been reported to date. Those occurred in the third calendar quarter of 2009 and in the third quarter of 2011. All other DMRs were marked “No Discharge”. The monitoring values reported on the DMRs are given below.

Effluent Characteristic	30-Day Average	7-Day Average	Daily Maximum
BOD ₅ , mg/L in 2009	5.5	5	
BOD ₅ , mg/L in 2011	2.3	3	
TSS, mg/L in 2009	13.8	8	
TSS, mg/L in 2011	4.67	8	
TRC, ug/L in 2009			NA
TRC, ug/L in 2011			240 <u>a/</u>
<i>E. coli</i> , cfu/100 mL in 2009	247.6		2420
<i>E. coli</i> , cfu/100 mL in 2011	273.7		1638
pH, s.u. (max. & min.) in 2009	9.02 Min.		9.43 Max.
pH, s.u. (max. & min.) in 2011	9.08 Min.		9.51 Max.
Oil and Grease, mg/L in 2009	Not visible		
Oil and Grease, mg/L in 2011	Not visible		
Oil and Grease, visual in 2009	0		
Oil and Grease, visual in 2011	0		
Flow in 2009	Reported 32,400 gallons/day		
Flow in 2011	Reported 115.6 million gal./year <u>b/</u>		
No. Days Discharge in 2009	42		
No. Days Discharge in 2011	24		

a/ TRC = Total Residual Chlorine. This value appears to be a false positive as the permittee does not chlorinate the effluent. Color and/or colloidal matter in the effluent due to algae can result in false positive readings in the analysis for TRC.

b/ The value of 115.6 million gallons/year appears to be a calculation error. The laboratory data sheets list a discharge value of 220 gpm on all samples for the 2011 discharge. For 24 days of discharge that would give a total of 7.6 million gallons for the 24 days of discharge. 115.6 million gallons is equal to about 355 acre-feet, which far exceeds the total capacity of the lagoon system.

Assuming that the reported values for TRC and flow in 2011 are incorrect as explained in footnotes a/ and b/ above, the data indicate the discharges were in compliance with the effluent limitations with the exception of the pH values and the daily maximum values for *E. coli*.. This writer assumes that the high

pH values were due to the effects of algae on pH in the lagoon system. The discharge occurred during the summer and the lagoon system has very long holding times. If the high pH values occur in future discharges, the permittee will need to document that the requirements of 40 CFR Part 133.102(c) are being met in order to obtain a higher pH limitation. There are insufficient data to determine if additional control measures are necessary to meet the daily maximum limitation on *E. coli*. The laboratory data for the 2011 discharge showed only one sample had a concentration greater than 1,000 cfu/100 mL, but it was less than the daily maximum limitation of 2,000 cfu/100 mL.

Receiving Waters

The discharge from the lagoon system goes to the bank of the Missouri River and flows overland into the Missouri River (Lake Sharpe). Lake Sharpe was formed by the construction of the Big Bend Dam near Fort Thompson, SD, approximately 6 river miles downstream of the Lower Brule lagoon system. Lake Sharpe extends from the Big Bend Dam upstream to the Oahe Dam, a distance of approximately 80 river miles. The Lake Sharpe portion of the Missouri River is not free flowing. The capacity of Lake Sharpe is given as 1,910,000 acre-feet, approximately 622,000 million gallons. The USGS no longer has flow gaging stations on the portions of the Missouri River that have been impounded. Although the river is not free flowing, the minimum flow released from Lake Oahe to Lake Sharpe usually is at least several thousand cfs, but could be 1,200 cfs or less at times.

Water Quality Standards

The Clean Water Act (CWA) generally assumes aquatic life and primary contact recreation uses for all United States surface water in the absence of a demonstration otherwise. The portion of the Missouri River where the discharge occurs has the Lower Brule Reservation on the west side of the river and the Crow Creek Reservation on the east side of the river. Neither the Lower Brule Sioux Tribe nor the Crow Creek Sioux Tribe has developed water quality standards. The Missouri River from the Big Bend Dam to the North Dakota border has been classified by the South Dakota Surface Water Quality Standards, South Dakota Administrative Rule (SDAR), Chapters 74:51:01 and 74:51:03 for the following beneficial uses:

1. Domestic water supply waters
2. Coldwater permanent fish life propagation waters
7. Immersion recreation waters
8. Limited contact recreation waters
9. Fish and wildlife propagation, recreation, and stock watering waters
10. Irrigation waters
11. Commerce and industry waters

Although the South Dakota water quality standards do not apply where the discharge occurs, the stream classification gives a good indication of existing and/or potential beneficial uses of this segment of the Missouri River. There is a good likelihood that most of those beneficial uses occur in at least portions of Lake Sharpe located within the boundaries of the two reservations. The water supply intake for the Lower Brule Water treatment Plant is located in Lake Sharpe approximately 0.75-1.0 mile upstream of the discharge from the Lower Brule lagoon system. A 2004 copy of "Lake Sharpe, Big Bend Dam, Boating and Recreation Guide" by the US Army Corps of Engineers, Omaha District lists 26 public recreation facilities located along Lake Sharpe. These facilities range from boat ramps to developed campgrounds. Four swimming beaches were listed. Three of them are located upstream of the Lower

Brule lagoon system and one of them is located downstream near the Big Bend Dam. It is this writer's understanding that there is very little swimming in Lake Sharpe in the general vicinity of the lagoon system.

It appears to be approximately 16 stream miles from the point of discharge to where the Missouri River is not located in Indian country. By the time the Missouri River leaves the Lower Brule Reservation it is highly unlikely the discharges from the Lower Brule lagoon system will cause a violation of the State of South Dakota's water quality standards for that portion of the Missouri River.

Water Quality Considerations

The pollutants of potential water quality concern in the treated effluent from a small municipal wastewater treatment system normally are pathogens, residual chlorine if the effluent is chlorinated, ammonia, and nutrients. Pathogens in the effluent from the Lower Brule lagoon system are a potential public health concern because of the potential for people to be exposed to the effluent before it is adequately diluted in Lake Sharpe. Therefore, the permit will have effluent limitations on *E. coli* based on the EPA's recommended criteria for primary contact recreation.

The presence of chlorine in the effluent is of potential concern because of toxicity of chlorine to aquatic life. However, since this facility presently does not chlorinate the effluent for disinfection purposes, chlorine toxicity presently is not of concern. As a safeguard, the permit will have a daily maximum limitation on total residual chlorine (TRC) of 19 ug/L, as was done in the previous permit. That value is based on the EPA's recommended acute toxicity criterion for chlorine for fresh water aquatic life. Monitoring for TRC is not required if not chlorinating and the permittee just reports "Not Chlorinating".

Because of the infrequent occurrences of the discharges from the lagoon system and the large amount of dilution provided by Lake Sharpe, the occurrence of ammonia toxicity problems due to the discharge is highly unlikely. However, the effluent concentrations of ammonia are unknown. Therefore, the permit will require effluent monitoring for ammonia to provide data on the actual concentrations being discharged.

In general, nutrients in municipal effluents are pollutants of concern. This permit will not contain any effluent limitations on nutrients, but will require some monitoring to obtain data on the concentrations and amounts of nutrients being discharged to Lake Sharpe from this facility.

This permit is written to protect the aquatic life and primary contact recreation uses.

Effluent Limitations

The effluent limitations in the renewal permit will be very similar to the previous permit with the following exceptions:

1. The permittee will not be required to obtain prior permission to discharge. That requirement is no longer being used by the EPA Region 8 in NPDES permits.

2. The permit will not have effluent limitation on the total volume of water that may be discharged during a year because none of the effluent limits are based on pollutant loading. If it becomes necessary to have pollutant loading based effluent limitations in the future, the permittee will have to be required to install the necessary flow monitoring equipment.
3. The effluent limitations on *E. coli* are given below and are based on EPA’s 2012 recommendations for primary contact recreation (“Recreational Water Quality Criteria”, Office of Water 820-F-12-058).

Effluent Characteristics	30-Day Average	Daily Maximum
<i>E. coli</i> , cfu/100 mL <u>a/</u>	126 <u>b/</u>	410 <u>c/</u>

a/ Limitations apply May 1 through September 30

b/ 30-Day Geometric Mean

c/ Not to be exceeded in any sample

The 30-day geometric mean limitation will not require a minimum of five samples but instead will be based on the geometric mean from the total number of samples collected during the 30-day period. The permittee may collect more samples than the weekly samples specified in the self-monitoring requirements. The maximum limitation in any sample will be 410/100 mL. The above effluent limitations apply at the end of the discharge pipe and no allowance was given for a mixing zone when determining the effluent limitations. The limitations on *E. coli* will only apply May 1 through September 30 of each year. Primary contact recreation is not likely to occur in the area affected by the discharge area during the period of October 1 through April 30. The EPA does not have recommended water quality criteria for secondary contact recreation, therefore the permit will have no effluent limitations on *E. coli* from October 1 through April 30. By managing the lagoon so that discharges occur only during the appropriate times from October 1 through April 30 period, the permittee should be able to meet all the effluent limitations in the permit.

The effluent limitations and the basis for the effluent limitations are given below:

Effluent Characteristic	Effluent Limitation			Basis <u>e/</u>
	30-Day Average <u>a/</u>	7-Day Average <u>a/</u>	Daily Maximum <u>a/</u>	
BOD ₅ , mg/L	30	45	N/A	40 CFR 133
Total Suspended Solids, mg/L	30	45	N/A	40 CFR 133
Total Residual Chlorine, ug/L <u>b/</u>	N/A	N/A	19 <u>b/</u>	WQ
<i>E. coli</i> , cfu/100 mL <u>f/</u>	126 <u>c/</u>	N/A	410 <u>d/</u>	WQ
The pH of the effluent shall not be less than 6.0 or greater than 9.0 in any single sample or analysis.				40 CFR 133
The concentration of oil and grease in any single sample shall not exceed 10 mg/L nor shall there be any visible sheen in the receiving water or adjoining shoreline.				BPJ

a/ See Definitions, Part 1.1., for definition of terms.

- b/ The limit on total residual chlorine applies when chlorination occurs. If not chlorinating during the reporting period, report “**Not Chlorinating**”.
- c/ 30-Day geometric mean.
- d/ Not to be exceeded in any sample.
- e/ The basis for the effluent limitations: 40 CFR 133 = federal Secondary Treatment Regulation; WQ = water quality considerations as described in the section on Water Quality Considerations; BPJ = the EPA Region 8 best professional judgement value for this pollutant.
- f/ Limitations apply May 1 through September 30.

Self-Monitoring Requirements

The self-monitoring requirements are given in Part 1.3.2 of the permit. There are some changes in the self-monitoring requirements from the previous permit. **Pre-discharge sampling to be used in requesting permission to discharge is not required in this permit.** Because the discharges have been intermittent and expected to remain intermittent, the frequency of monitoring is based on intermittent discharges. Sampling is required on the first day of the discharge and at weekly intervals for all parameters except total residual chlorine, which shall be daily if chlorinating. Because the facility does not include flow measuring equipment (e.g., Parshall flume, weirs, etc.) the permittee will be required to report the starting and ending dates of each discharge, and the approximate volume of water discharged each reporting period shall be reported. An estimate of the volume of water discharged may be made by how far the discharge valve is open (giving an estimate of the rate of discharge) and the number of days the discharge occurred. (e.g., the estimated rate of discharge is 200 gallons per minute and the discharge occurred for 20 days. The estimated volume of water discharges is 200 gpm x 20 days x 1440 minutes/day = 5,760,000 gallons.)

The analyses for pH and total residual chlorine (if chlorinating) shall be performed within 15 minutes after the samples are collected. Monitoring for total residual chlorine is not required if not chlorinating. If monitoring is required, the analysis for total residual chlorine shall be conducted using a mini-spectrophotometer (e.g. the Hach Pocket Colorimeter II) using an analytical method equivalent to EPA Method 330.5 DPD-Spectrophotometric. The method achieves a method detection limit of less than 50 µg/L.

In the calculation of average Total Residual Chlorine concentrations, those analytical results that are less than the method detection limit shall be considered to be zero for calculation purposes. If all individual analytical results that would be used in the calculations are below the method detection limit, then “< 50 µg/L” shall be reported on the quarterly DMR. Otherwise, report the calculated value.

On the first day of the discharge grab samples are to be collected and analyzed for total nitrogen and total phosphorus. The definitions are given in the permit in footnotes f/ and g/ for Part 1.3.2. The EPA is giving increased emphasis to nutrients in the nations streams and the monitoring requirements for total nitrogen and total phosphorus are to provide information on the concentrations being discharged. The States of Colorado and Montana are already requiring in their permits the monitoring for nutrients.

All discharge samples are to be collected at the end of the outfall line that goes through the dike.

Inspection Requirements

Part 1.3.3 of the permit contains inspection requirements. The basic purpose of these requirements is to have the permittee conduct routine inspections of the lagoon system to check for problems or potential problems and take the appropriate corrective actions to correct or prevent the problems from occurring.

Endangered Species Act (ESA) Requirements

Section 7(a) of the Endangered Species Act requires federal agencies to ensure that any actions authorized, funded or carried out by an agency are not likely to jeopardize the continued existence of any federally-listed endangered or threatened species or adversely modify or destroy critical habitat of such species. Federally listed threatened, endangered and candidate species found in Lyman County, South Dakota include:

<u>Species</u>	<u>Status</u>
Whooping crane (<i>Grus americana</i>)	E
Piping Plover (<i>Charadrius melodus</i>)	T
Least tern (<i>Sterna antillarum</i>)	E
Red knot (<i>Calidris canutus rufa</i>)	T
Sprague's pipit (<i>Anthus spragueii</i>)	C
Pallid sturgeon (<i>Scaphirhynchus albus</i>)	E
Black-footed Ferret (<i>Mustela nigripes</i>)	E
Northern Long-Eared Bat (<i>Myotis septentrionalis</i>)	T

T = Threatened E = Endangered C = Candidate

It does not appear that discharges from the Lower Brule lagoon system will result in significant impact to any endangered species or critical habitats. This permit renewal is not likely to adversely affect any of the species listed by the U. S. Fish and Wildlife Service under the Endangered Species or critical habitats of the Missouri River (Lake Sharpe).

National Historic Preservation Act (NHPA) Requirements

Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f) requires that federal agencies consider the effects of federal undertakings on historic properties. The EPA has evaluated its planned reissuance of the NPDES permit for the Lower Brule lagoon system to assess this action's potential effects on any listed or eligible historic properties or cultural resources. This correspondence is typically conducted with the Tribal Historic Preservation Office (THPO).

The EPA does not anticipate any impacts on listed/eligible historic or cultural properties because this permit is a renewal and will not be associated with any new ground disturbances or changes to the volume or point of discharge. During the public comment period, the EPA will notify the Tribal Historic Preservation Offices (THPOs) of the Lower Brule Sioux Tribe of the planned issuance of this NPDES permit and request their input on potential effects on historic properties and EPA's preliminary determination in this regard.

Miscellaneous

The effective date and the expiration date of the permit will be determined at the time of permit issuance. The intention is to renew the permit for a period of approximately five years, but not to exceed five years.

Permit drafted by Robert Shankland, SEE, Wastewater Unit, 8P-W-WW
Permit reviewed by Colleen Rathbone, Chief, Wastewater Unit, 8P-W-WW