STATEMENT OF BASIS

Applicant:	City of Clear Lake
Permit Number:	SD0020699
Contact Person:	The Honorable Gordon Lee, Mayor PO Box 107 Clear Lake, SD 57226-0107
Phone:	(605) 874-2121
Permit Type:	Minor Municipal - Renewal

DESCRIPTION

The city of Clear Lake operates a wastewater treatment facility (WWTF) located about ¼ mile east of the city in the Southeast ¼ of Section 23, Township 115 North, Range 49 West, in Deuel County, South Dakota (Latitude 44.751163°, Longitude -96.668542° – Navigational Quality GPS). The facility was originally constructed in 1955 and was upgraded in 1992 with the addition of the primary and secondary ponds and the conversion of an existing pond to a constructed wetland.

The facility consists primarily of a gravity flow collection system, with three area lift stations and one main lift station. The 7th Avenue lift station serves a portion of the northwest area of the city, the Golf Course lift station serves the southwest portion of the city, and the Fairgrounds lift station serves the Fairgrounds Addition in the northeast part of the city. The main lift station pumps wastewater to the WWTF, which is a two-cell stabilization pond system with a constructed wetland. The primary pond is 10.0 acres, the secondary cell is 4.0 acres and the constructed wetland is 5.7 acres. The main lift station can pump wastewater to the primary pond. There is also an overflow to the constructed wetland. However, use of the overflow pipe is considered a bypass, and must be reported. Normal operation of the system is in series and the discharge structure is located in the constructed wetland.

This wastewater treatment facility serves a population of 1,273 persons (2010 census), with an average design flow of 0.115 Million Gallons per Day (MGD). Gopher Sign Company (permit SDP000061), a metal finisher, and a truck wash are the only known industrial facilities to contribute wastewater to the WWTF.

RECEIVING WATERS

Any discharge from this facility will enter an unnamed tributary that flows less than ¼ mile to Hidewood Creek. The unnamed tributary is classified by the South Dakota Surface Water Quality Standards (SDSWQS), Administrative Rules of South Dakota (ARSD), Section 74:51:03:01 for the following beneficial uses:

(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

Hidewood Creek is classified by the SDSWQS, ARSD Section 74:51:03:01 and 74:51:03:07 for the following beneficial uses:

(6) Warmwater marginal fish life propagation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

Since the receiving waterbody has a minimum beneficial use classification of (9), the SDSWQS (ARSD Section 74:51:01:02.01) require that an analysis of the receiving stream be conducted to determine whether the waterbody deserves a higher beneficial use designation. The South Dakota Department of Environment and Natural Resources (SDDENR) has conducted an analysis for the unnamed tributary and Hidewood Creek near the discharge location. SDDENR personnel have determined that the beneficial use classifications for the unnamed tributary are appropriate and will remain unchanged. The point where the classification of Hidewood Creek changes to include warmwater marginal fish life propagation waters and limited contact recreation waters has been moved 1.5 miles upstream to the confluence with the unnamed tributary.

ANTIDEGRADATION

SDDENR has fulfilled the antidegradation review requirements for this permit. In accordance with South Dakota's Antidegradation Implementation Procedure and the SDSWQS, no further review is required. The results of SDDENR's review are included in Attachment 1.

MONITORING DATA

The city of Clear Lake has been submitting Discharge Monitoring Reports (DMRs) as required under the current permit. As shown in Attachment 2, during the current permit cycle this facility has had nine 30-day average and six daily maximum violations of ammonia, three violations of daily maximum pH, and two 30 day average and one daily maximum violation of total suspended solids. No discharge was reported for the months not included in the table. The proposed permit contains a construction schedule requiring the city to evaluate the system and complete upgrades to correct these violations.

INSPECTIONS

Personnel from SDDENR conducted a *Compliance Inspection* of the Clear Lake wastewater treatment facility on August 16, 2011. The following comments and corrective actions were made:

COMMENTS	REQUIRED CORRECTIVE ACTIONS
During this past spring, the city had numerous SSOs from manholes adjacent to the artificial wetland. The operator did not report the SSOs to DENR or sample the SSOs because the water was flowing into the artificial wetland.	All releases from manholes need to be reported to DENR as specified in the city's permit under section 3.8-Sanitary Sewer Overflows. This section requires that DENR be notified within the first business day of the facility becoming aware of the situation. A written report of the situation is also required. Sampling shall be conducted at the same or similar frequency and for the same parameters as required for the permitted outfalls. The results of the sampling shall be submitted with the written report. **Failure to notify DENR of SSOs is a violation of your SWD permit.**
The city's main lift station has an overflow pipe that leads to the artificial wetland. DENR was unaware of this overflow structure.	Any overflow from the lift station to the artificial wetland would bypass the stabilization ponds for treatment, and thus would need to be reported to DENR as required under Section 3.7-Bypass of Treatment Facilities of your SWD permit. Please submit a report explaining why the city needs this overflow pipe. If it is not possible to plug this pipe, the city will need to re-pipe it to flow into the stabilization pond. [The department received the report October 21, 2011 stating that the city had been looking into sources of I/I so the overflow could be removed.]

COMMENTS	REQUIRED CORRECTIVE ACTIONS
The city of Clear Lake has had numerous violations since the last inspection. The following are the effluent violations that have occurred since the last inspection on July 31, 2007. 1. June 2008: Exceeded the 30-day average limit for ammonia. 2. April 2009: Exceeded the 30-day average limit for Total Suspended Solids (TSS). 3. May 2009: Exceeded the daily maximum limit for pH. 4. April 2010: Exceeded the daily maximum limit for pH. 5. May 2010: Exceeded the daily maximum limit for pH. 6. June 2010: Exceeded the 30-day average and daily maximum limit for ammonia. 7. July 2010: • Exceeded the 30-day average limit for Five-day Biochemical Oxygen Demand (BOD_5). • Exceeded the 30-day average and daily maximum limit for ammonia. 8. October 2010: Exceeded the 30-day average limit for ammonia. 9. April 2011: Exceeded the 30-day average and daily maximum limit for ammonia. 10. June 2011: Exceeded the 30-day average and daily maximum limit for ammonia.	The city **must** look into modifications of its operation to allow for adequate treatment of the wastewater. The overflows and bypasses noted above may be contributing to the compliance problems. These violations are subject to a fine of up to $10,000 per day per violation. Please respond within 30 days to the department with the steps the city plans to take to resolve these violations. ***A similar comment was made in the previous inspection report.***

COMMENTS	REQUIRED CORRECTIVE ACTIONS
The city is having problems with excess flows, especially in the spring.	The city must continue to enforce ordinances regarding flows from sump pumps. The city is currently conducting a collection system study to identify inflow and infiltration sources. The city needs to continue its efforts to reduce the amount of flow into the system. Excess inflows into the system can result in unauthorized discharges from the collection system and the treatment facility and may be contributing to the effluent violations.
The operator does not calibrate the pH meter. The water superintendent calibrates the pH meter and keeps a pH calibration log.	The wastewater superintendent should become familiar with pH calibration, in case of an emergency and the water superintendent is unavailable. A copy of the pH calibration log should also be kept with the wastewater records.
The number of exceedances (No. EX) column is not being properly filled out on the DMR. The April 2011 DMR should have reported 4 ammonia exceedances, instead of 2, which was reported on the DMR.	If any of the calculated values exceed the permit limits, it must be marked as an exceedances on the DMR. Therefore if the city has multiple samples that exceed the daily limit or a 7-day average limit, each individual exceedances needs to be counted for in the number of exceedances column. If you have questions about filling out DMRs, please contact DENR for assistance.
The city did not sample for fecal coliforms in May 2009.	Fecal coliform sampling is required from May 1st – October 31st. Please make sure that the city is aware of permit conditions and takes fecal coliform samples when the city is required to. Sampling requirements apply **only** during an actual discharge.

COMMENTS	REQUIRED CORRECTIVE ACTIONS
The operator is correctly calculating the 7-day averages. However, 7-day averages have not been reported properly. ***This was mentioned in the previous inspection report.***	A 7-day average is based on a calendar week; Sunday – Saturday. During the last week of the month, the calendar week will often span the end of the current month and the beginning of the next month. This can result in confusion on how to properly report this 7-day average. In these cases, the 7-day average must be reported for the month where the week **ends** (i.e. – the month where the Saturday falls)**.** The March 2011 sample results should have been used to calculate 7-day average values for the April 2011 DMR and NR for "Not Required" should have been reported for the March Maximum 7-day average. The same scenario occurred in June 2011. The sample results from June should be used for 7-day average calculations on July 2011 DMRs and NR should have been reported on the June 2011 for maximum 7-day averages. The sample results for the months of March and June are still applicable in calculating the 30-day averages. If you have questions about filling out DMRs, please contact DENR for assistance.

The following comments and recommendations were also made during the inspection:

COMMENTS	RECOMMENDED CORRECTIVE ACTIONS
The city is not collecting sufficient funds to cover the expenses for operating the wastewater utility. To effectively operate the utility, the annual revenues must meet or exceed the annual expenses.	The city should consider raising its rates to accomplish this. Financial and technical assistance to undertake a rate analysis may be available through the department or your local planning district. Contact the Water Resources Assistance Program at (605) 773-4216 or your local planning district for further information.

COMMENTS	RECOMMENDED CORRECTIVE ACTIONS
Emergency procedures have not been established in the case of a major storm event, a sewer main break, or a chemical release into the sewer system.	The city may wish to consider establishing written emergency procedures to ensure city staff is prepared to address emergencies that may arise during the operation of the wastewater collection and treatment system.
The gate in the fence around the wastewater treatment facility was unlocked.	The gate should remain locked to prevent the entrance of unauthorized persons into the wastewater treatment facility.
There is some weed growth on the pond dikes.	This unwanted vegetation needs to be eliminated to prevent dike damage from erosion and the root systems of these plants. This vegetation also tends to inhibit the air action on the ponds, which in turn inhibits the biological action necessary to treat the wastes and keep odors to a minimum. Once the weeds are eliminated, the pond site should be reseeded with an appropriate grass.
The 7th Avenue and Fairgrounds lift stations do not have a back-up source of power in the event of a power failure.	An alternative power source should be available for the lift stations in order to prevent flood damage to homes, collection system and to the lift station itself. These problems can arise either from electrical equipment malfunctions or a power outage, and could be quite costly to correct.
The operator mentioned problems with muskrats. A muskrat run caused an unauthorized discharge in March 2011. The operator has a permit to shoot the muskrats.	Burrowing rodents can do extensive damage in just a short period of time resulting in both operation and maintenance problems, and a major expense to the city for repairs. The city should continue with its efforts to eliminate burrowing rodents.
The city currently mows dikes on a regular basis; however the operator mentioned that the mowing frequency may be decreased.	The grass on the dike should be mowed on a regular basis to keep the grass from getting too high. High grass could attract rodents, which may damage the dike structure. High grass could also inhibit the wind action needed for the lagoons to treat wastewater properly.

EFFLUENT LIMITS

SDDENR is required by EPA and the federal Clean Water Act to review and revise its surface water quality standards at least every three years. On March 11, 2009, the South Dakota Board of Water Management approved SDDENR's latest triennial review of the South Dakota Surface Water Quality Standards. As part of this review, SDDENR added surface water quality standards for *Escherichia coli* (*E. coli*). ARSD Section 74:51:01:51 includes numeric criteria for both fecal coliform and *E. coli*. SDDENR intends to phase in the implementation of the *E. coli* standards.

During the reissuance of surface water discharge permits, permittees that are currently required to meet fecal coliform limits will be given time to meet the new *E. coli* limits. Therefore, interim limits for fecal coliform will be initially included in the proposed permit, with a requirement to meet the new *E. coli* limits by May 1, 2015.

Outfall 001 – Any discharge from the constructed wetland to the unnamed tributary of Hidewood Creek (Latitude 44.749702°, Longitude -96.671824°, Navigational Quality GPS).

Interim Effluent Limits

Effective immediately and lasting until **April 30, 2015**, the permittee shall comply with the interim effluent limits below.

No discharge shall occur from this facility until permission is granted by SDDENR. The permittee shall comply with the effluent limits specified below. This requirement is included in the permit because the discharge reaches a stream classified as a fishery. During any discharge, the permittee shall comply with the effluent limits specified below, which are based on the Secondary Treatment Standards (ARSD Section 74:52:06:03), the SDSWQS, Best Professional Judgment (BPJ), and the current permit limits.

1. The five-day Biochemical Oxygen Demand (BOD_5) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on the Secondary Treatment Standards.

2. The Total Suspended Solids (TSS) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on Secondary Treatment Standards.

   If analytical results for BOD_5 show compliance with the permit limits, the permittee may request the permit issuing authority to change the TSS permit limits to 90 mg/L (30-day average) and 135 mg/L (7-day average). This change shall be based on ARSD Section 74:52:06:04 and the SDDENR policy for discharges from stabilization ponds to waters classified for warmwater marginal fish life propagation. **The permit issuing authority may approve the change without additional public notice.**

3. The pH shall not be less than 6.0 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on the Secondary Treatment Standards.

   Note: SDDENR specifies that pH analyses are to be conducted within 15 minutes of sample collection with a pH meter. Therefore, the permittee must have the ability to conduct onsite pH analyses. The pH meter used must be capable of simultaneous calibration to two points on the pH scale that bracket the expected pH and are approximately three standard units apart. The pH meter must read to 0.01 standard units and be equipped with temperature compensation adjustment. Readings shall be reported to the nearest 0.1 standard units.

4. Fecal Coliform organisms from May 1 to September 30 shall not exceed a concentration of 1,000 per 100 milliliters as a geometric mean based on a minimum of five samples obtained during separate 24-hour periods for any 30-day period. *This limit is applicable only if five or more samples are taken and is only effective from May 1 to September 30.*

   In addition, fecal coliform organisms shall not exceed 2,000 per 100 milliliters in any one sample from May 1 to September 30. These limits are based on the limited contact recreation waters classification of Hidewood Creek and the SDSWQS (ARSD Section 74:51:01:51).

5. The ammonia-nitrogen concentration shall not exceed the limits specified in the table below. These limits are based on the warmwater marginal fish life propagation waters classification of the Hidewood Creek, the SDSWQS (ARSD Section 74:51:01:49), the current permit limits, and BPJ. See Attachment 3 for more detail.

Season	**Ammonia Limit (as N)**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**
November 1 – April 30	6.6	15.1
May 1 – October 31	3.2	13.5

6. No chemicals, such as chlorine, shall be used without prior written permission. This limit is based on BPJ.

Effluent water temperature (°C), flow rate (MGD), total flow (million gallons), duration of discharge (days), and *E. coli* (no./100mL) shall be monitored, but will not have a limit.

Final Effluent Limits

Effective **May 1, 2015**, and lasting through the life of the permit, the permittee shall comply with the final effluent limits below.

No discharge shall occur from this facility until permission is granted by SDDENR. The permittee shall comply with the effluent limits specified below. This requirement is included

in the permit because the discharge reaches a stream classified as a fishery. During any discharge, the permittee shall comply with the effluent limits specified below which are based on the Secondary Treatment Standards (ARSD Section 74:52:06:03), the SDSWQS, BPJ, and the current permit limits.

1. The five-day Biochemical Oxygen Demand (BOD_5) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on the Secondary Treatment Standards.

2. The Total Suspended Solids (TSS) concentration shall not exceed 30 mg/L (30-day average) or 45 mg/L (7-day average). These limits are based on Secondary Treatment Standards.

   If analytical results for BOD_5 show compliance with the permit limits, the permittee may request the permit issuing authority to change the TSS permit limits to 90 mg/L (30-day average) and 135 mg/L (7-day average). This change shall be based on ARSD Section 74:52:06:04 and the SDDENR policy for discharges from stabilization ponds to waters classified for warmwater marginal fish life propagation. **The permit issuing authority may approve the change without additional public notice.**

3. The pH shall not be less than 6.0 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on the Secondary Treatment Standards.

   Note: SDDENR specifies that pH analyses are to be conducted within 15 minutes of sample collection with a pH meter. Therefore, the permittee must have the ability to conduct onsite pH analyses. The pH meter used must be capable of simultaneous calibration to two points on the pH scale that bracket the expected pH and are approximately three standard units apart. The pH meter must read to 0.01 standard units and be equipped with temperature compensation adjustment.

4. The *Escherichia coli* (*E. coli*) organisms shall not exceed a concentration of 630 per 100 milliliters as a geometric mean based on a minimum of five samples obtained during separate 24-hour periods for any 30-day period. *This limit is only applicable if five or more samples are taken and is only effective from May 1 to September 30.*

   In addition, the *E. coli* organisms shall not exceed 1,178 per 100 milliliters in any one sample from May 1 to September 30. These limits are based on the limited-contact recreation beneficial use classification of Hidewood Creek and the SDSWQS (ARSD Section 74:51:01:51).

4. The ammonia-nitrogen concentration shall not exceed the limits specified in the table below. These limits are based on the warmwater marginal fish life propagation waters classification of the Hidewood Creek, the SDSWQS (ARSD Section 74:51:01:49), the current permit limits, and BPJ. See Attachment 3 for more detail.

Season	Ammonia Limit (as N)	
	30-Day Average (mg/L)	Daily Maximum (mg/L)
November 1 – April 30	6.6	15.1
May 1 – October 31	3.2	13.5

5. No chemicals, such as chlorine, shall be used without prior written permission. This limit is based on BPJ.

Effluent water temperature (°C), flow rate (MGD), total flow (million gallons), and duration of discharge (days) shall be monitored, but will not have a limit.

SELF MONITORING REQUIREMENTS

Permission to Discharge Requirements

Prior to requesting permission to discharge, the permittee shall collect a grab sample from each lagoon cell that will be discharged and have the sample analyzed for five-day Biochemical Oxygen Demand, Total Suspended Solids, pH, temperature, fecal coliform (through April 30, 2015), *E. coli*, and ammonia-nitrogen. The results of the analyses, along with a request to discharge, shall be submitted to SDDENR. The request to discharge shall explain why a discharge is needed, when the discharge would start, the expected duration of the discharge, and the approximate volume of water to be discharged. The estimated flow condition of the receiving water shall also be reported (i.e. dry, low, normal, high). **No discharge shall occur until permission has been granted by SDDENR.**

Interim Self-Monitoring Requirements

Effective immediately and lasting through **April 30, 2015,** all discharges, sanitary sewer overflows, and unauthorized releases shall be monitored for the following parameters at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge.

Effluent Characteristic	Frequency	Reporting Values[1]	Sample Type[1]
Duration of Discharge, days	Monthly	Monthly Total[2]	Calculate
Total Flow, million gallons	Monthly	Monthly Total	Calculate
Flow Rate, MGD	At least three per discharge[3]	Daily Maximum; 30-Day Average	Instantaneous

[1] See Definitions.

[2] The date and time of the start and termination of each discharge shall also be reported in the comment section of the DMR.

[3] At the initiation of any discharge, three samples shall be taken the first week and one sample each week for the following three weeks. Samples shall be taken once per month thereafter, until the discharge is discontinued. If a discharge is less than one week in duration, a sample shall be taken at the beginning, middle, and end of the discharge. If a discharge becomes intermittent, due to losses from evaporation and percolation, the discharge shall

Effluent Characteristic	Frequency	Reporting Values[1]	Sample Type[1]
pH, standard units	At least three per discharge[3]	Daily Minimum; Daily Maximum	Instantaneous[4,5]
Water Temperature, °C	At least three per discharge[3]	Daily Maximum; 30-Day Average	Instantaneous[5,6]
Five-Day Biochemical Oxygen Demand (BOD_5), mg/L	At least three per discharge[3]	Maximum 7-Day Average; 30-Day Average	Grab
Total Suspended Solids (TSS), mg/L	At least three per discharge[3]	Maximum 7-Day Average; 30-Day Average	Grab
Ammonia-Nitrogen (as N), mg/L	At least three per discharge[3]	Daily Maximum; 30-Day Average	Grab[5]
Fecal Coliform, no./100 mL	At least three per discharge[3,7]	Daily Maximum; 30-Day Geometric Mean	Grab
E. coli, no./100 mL	At least three per discharge[3,7]	Daily Maximum; 30-Day Geometric Mean	Grab

be sampled once per week during any week that flow is noted. All of the samples collected during the 7-day or 30-day period are to be used in determining the averages. The permittee always has the option of collecting additional samples if appropriate.

[4] The pH shall be taken within 15 minutes of sample collection with a pH meter. The pH meter must be capable of simultaneous calibration to two points on the pH scale that bracket the expected pH and are approximately three standard units apart. The pH meter must read to 0.01 standard units and be equipped with temperature compensation adjustment. Readings shall be reported to the nearest 0.1 standard units.

[5] The pH and temperature of the effluent shall be determined when ammonia samples are collected.

[6] The water temperature of the effluent shall be taken as a field measurement. Measurement shall be made with a mercury-filled, or dial type thermometer, or a thermistor. Readings shall be reported to the nearest whole degree Celsius.

[7] Fecal coliform and *E.coli* levels shall be monitored in the discharge. If a minimum of five samples are collected in a calendar month, all of the samples collected are to be used in determining the geometric mean. Samples are to be collected at the same time as BOD_5, TSS, etc. If less than five samples are taken during any calendar month, the daily maximum shall be reported and the maximum limit still applies. ***This sampling protocol for fecal coliform and* E. coli *only applies if the discharge occurs between May 1 and September 30.***

Final Self-Monitoring Requirements

Effective **May 1, 2015,** and lasting through the life of the permit, all discharges, sanitary sewer overflows, and unauthorized releases shall be monitored for the following parameters at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge.

Effluent Characteristic	Frequency	Reporting Values[1]	Sample Type[1]
Duration of Discharge, days	Monthly	Monthly Total[2]	Calculate
Total Flow, million gallons	Monthly	Monthly Total	Calculate
Flow Rate, MGD	At least three per discharge[3]	Daily Maximum; 30-Day Average	Instantaneous
pH, standard units	At least three per discharge[3]	Daily Minimum; Daily Maximum	Instantaneous[4,5]
Water Temperature, °C[6]	At least three per discharge[3]	Daily Maximum; 30-Day Average	Instantaneous[5]
Five-Day Biochemical Oxygen Demand (BOD_5), mg/L	At least three per discharge[3]	Maximum 7-Day Average; 30-Day Average	Grab
Total Suspended Solids (TSS), mg/L	At least three per discharge[3]	Maximum 7-Day Average; 30-Day Average	Grab
Ammonia-Nitrogen (as N), mg/L	At least three per discharge[3]	Daily Maximum; 30-Day Average	Grab[5]

[1] See Definitions.

[2] The date and time of the start and termination of each discharge shall also be reported in the comment section of the DMR.

[3] At the initiation of any discharge, three samples shall be taken the first week and one sample each week for the following three weeks. Samples shall be taken once per month thereafter, until the discharge is discontinued. If a discharge is less than one week in duration, a sample shall be taken at the beginning, middle, and end of the discharge. If a discharge becomes intermittent, due to losses from evaporation and percolation, the discharge shall be sampled once per week during any week that flow is noted. All of the samples collected during the 7-day or 30-day period are to be used in determining the averages. The permittee always has the option of collecting additional samples if appropriate.

[4] pH shall be taken within 15 minutes of sample collection with a pH meter. The pH meter must be capable of simultaneous calibration to two points on the pH scale that bracket the expected pH and are approximately three standard units apart. The pH meter must read to 0.01 standard units and be equipped with temperature compensation adjustment. Readings shall be reported to the nearest 0.1 standard units.

[5] The pH and temperature of the effluent shall be determined when ammonia samples are collected.

[6] The water temperature of the effluent shall be taken as a field measurement. Measurement shall be made with a mercury-filled, or dial type thermometer, or a thermistor. Readings shall be reported to the nearest whole degree Celsius.

Effluent Characteristic	Frequency	Reporting Values[1]	Sample Type[1]
E. coli, no./100 mL	At least three per discharge[3,7]	Daily Maximum; 30-Day Geometric Mean	Grab

[7] *E. coli* levels shall be monitored in the discharge. If a minimum of five samples are collected in a calendar month, all of the samples collected are to be used in determining the geometric mean. Samples are to be collected at the same time as BOD_5, TSS, etc. If less than five samples are taken during any calendar month, the daily maximum shall be reported and the maximum limit still applies. ***This sampling protocol for* E. coli *only applies if the discharge occurs between May 1 and September 30.***

Reporting Requirements

Effluent monitoring results shall be summarized for each month and recorded on separate DMRs to be submitted to SDDENR on a **quarterly** basis. If no discharge occurs during a month, it shall be stated as such on the DMR.

Inspection Requirements

Monitoring shall consist of **monthly** inspections of the facility and the outfall to verify that proper operation and maintenance procedures are being practiced and whether or not there is a discharge occurring from this facility. **Daily** inspections are required during a discharge. The lift stations shall be inspected on at least a **weekly** basis, although **daily** inspections are recommended. Documentation of each of these visits shall be kept in a notebook to be reviewed by SDDENR or EPA personnel when an inspection occurs.

CONSTRUCTION SCHEDULE

The permittee shall comply with the following construction schedule:

1. The city of Clear Lake shall contract an engineer to conduct a Capacity, Management, Operation, and Maintenance study determining the effectiveness of the system, and identifying needed operational or treatment system changes as described in Section 3.8 of the proposed permit. The study shall be submitted to SDDENR by **June 1, 2013.**

2. Submit plans and specifications or updated Operation and Maintenance manual for the recommended alterative to SDDENR for review and approval by **December 1, 2013.**

3. Submit written quarterly updates to SDDENR detailing the progress of the project, with the first update due **march 28, 2013**.

4. If necessary, begin construction of the treatment system by **July 1, 2014**.

5. Finish the planned treatment system upgrades or operation and maintenance changes by **January 1, 2015**.

The milestones must be completed by the date specified. The permittee shall submit to the SDDENR a written notice of compliance or noncompliance with each milestone by the date specified above. If the permittee is not in compliance with the milestone, the notice shall include

the cause of any noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

SLUDGE

Based on the city of Clear Lake's permit application, SDDENR does not anticipate sludge will be removed or disposed of during the life of the permit. Therefore, the proposed Surface Water Discharge permit shall not contain sludge disposal requirements. However, if sludge disposal is necessary, the city of Clear Lake is required to submit to SDDENR a sludge disposal plan for review and approval **prior** to the removal and disposal of sludge.

DRAINAGE ISSUES

Deuel County has the authority to regulate drainage. Clear Lake is responsible for getting any necessary drainage permits from the county **prior** to discharging.

ENDANGERED SPECIES

This is a renewal of an existing permit. No listed endangered species are expected to be impacted by activities related to this permit. However, the table below shows the species that may be present in the city of Clear Lake's geographic area.

COUNTY	GROUP	SPECIES	CERTAINTY OF OCCURRENCE
Deuel	Fish	Shiner, Topeka	Known

This information was accessible at the following US Fish and Wildlife Service website as of March 12, 2012: http://www.fws.gov/southdakotafieldoffice/SpeciesByCounty.pdf

PERMIT EXPIRATION

A five-year permit is recommended.

PERMIT CONTACT

Any questions pertaining to this statement of basis can be directed to Anthony Mueske, Engineer II for the Surface Water Quality Program, at (605) 773-3351.

October 17, 2012

ATTACHMENT 1

Antidegradation Review

Permit Type: **Minor Municipal - Renewal** Applicant: **City of Clear Lake**
Date Received: **February 20, 2009** Permit #: **SD0020699**
County: **Deuel** Legal Description: **SE ¼ S 23, T115 N, R49 W**
Receiving Stream: **Unnamed tributary** Classification: **9, 10**
If the discharge affects a downstream waterbody with a higher use classification, list its name and uses: **Hidewood Creek 6, 8, 9, 10**

APPLICABILITY

1. Is the permit or the stream segment exempt from the antidegradation review process under ARSD 74:51:01? Yes ☒ No ☐ If no, go to question #2. If yes, check those reasons why the review is not required:

   ☐ Existing facility covered under a surface water discharge permit is operating at or below design flows and pollutant loadings;
   ☐ *Existing effluent quality from a surface water discharge permitted facility is in compliance with all discharge permit limits;
   ☐ *Existing surface water discharge permittee was discharging to the current stream segment prior to March 27, 1973, and the quality and quantity of the discharge has not degraded the water quality of that segment as it existed on March 27, 1973;
   ☐ *The existing surface water discharge permittee, with DENR approval, has upgraded or built new wastewater treatment facilities between March 27, 1973, and July 1, 1988;
   ☐ The existing surface water discharge permittee discharges to a receiving water assigned only the beneficial uses of (9) and (10); the discharge is not expected to contain toxic pollutants in concentrations that may cause an impact to the receiving stream; and DENR has documented that the stream cannot attain a higher use classification. This exemption does not apply to discharges that may cause impacts to downstream segments that are of higher quality;
   ☐ Receiving water meets Tier 1 waters criteria. Any permitted discharge must meet water quality standards;
   ☐ The permitted discharge will be authorized by a Section 404 Corps of Engineers Permit, will undergo a similar review process in the issuance of that permit, and will be issued a 401 certification by the department, indicating compliance with the state's antidegradation provisions; or
   ☒ Other: The proposed permit includes a construction schedule for the facility to improve treatment.

   *An antidegradation review is not required where the proposal is to maintain or improve the existing effluent levels and conditions. Proposals for increased effluent levels, in these categories of activities are subject to review.

No further review required.

ANTIDEGRADATION REVIEW SUMMARY

2. The outcome of the review is:

- ☒ A formal antidegradation review was not required for reasons stated in this worksheet. Any permitted discharge must ensure water quality standards will not be violated.
- ☐ The review has determined that degradation of water quality should not be allowed. Any permitted discharge would have to meet effluent limits or conditions that would not result in any degradation estimated through appropriate modeling techniques based on ambient water quality in the receiving stream, or pursue an alternative to discharging to the waterbody.
- ☐ The review has determined that the discharge will cause an insignificant change in water quality in the receiving stream. The appropriate agency may proceed with permit issuance with the appropriate conditions to ensure water quality standards are met.
- ☐ The review has determined, with public input, that the permitted discharge is allowed to discharge effluent at concentrations determined through a total maximum daily load (TMDL). The TMDL will determine the appropriate effluent limits based on the upstream ambient water quality and the water quality standard(s) of the receiving stream.
- ☐ The review has determined that the discharge is allowed. However, the full assimilative capacity of the receiving stream cannot be used in developing the permit effluent limits or conditions. In this case, a TMDL must be completed based on the upstream ambient water quality and the assimilative capacity allowed by the antidegradation review.
- ☐ Other: _____

3. Describe any other requirements to implement antidegradation or any special conditions That are required as a result of this antidegradation review: _____

Anthony Mueske — April 16, 2012
Reviewer — Date

Kelli D. Buscher, P.E. — April 16, 2012
Team Leader — Date

ATTACHMENT 2

Monitoring Data

End Date	BOD, 5-day, 20 °C		Chlorine, total residual	Coliform, fecal general		Duration of discharge	Flow	Flow rate		Nitrogen, ammonia total (as N)	
	30 Day Avg	Max 7 day Avg	Daily Max	30 Day Geo	Daily Max	Mo Total	Mo Total	30 Day Avg	Daily Max	30 Day Avg	Daily Max
Limit	30 mg/L	45 mg/L	0.019 mg/L	1000 #/100mL	2000 #/100mL	N/A d	N/A Mgal/mo	N/A Mgal/d	N/A Mgal/d	varies, mg/L	
10/31/2004	2	2	NR	NR	NR	20	21.2	1.06	1.4	0.11	0.21
11/30/2004	2.5	2.5	NR	NR	NR	30	12	0.4	0.6	0.21	0.23
12/31/2004	4	4	NR	NR	NR	7	0.42	0.06	0.06	0.15	0.15
06/30/2005	4.16	2.66	NR	115.24	410	30	37.5	1.25	1.58	1.25	2.39
07/31/2005	26	26	NR	0	1,000	11	1.98	0.18	0.18	**2.45**	2.45
04/30/2006	27	27	NR	NR	NR	7	10.22	1.46	1.7	0.57	0.73
05/31/2006	9.75	21	NR	0	10	31	26.97	0.87	1.26	0.6	1.26
06/30/2006	5	5	NR	0	70	13	0.39	0.03	0.03	1.52	1.52
04/30/2007	12.5	16	NR	NR	NR	20	23	1.15	1.46	**8.49**	**15**
05/31/2007	3	3	NR	NR	50	30	0.3	0.01	0.01	0.44	0.44
06/30/2007	6	6	NR	NR	280	30	0.18	0.01	0.01	0.62	0.62
07/31/2007	6	6	NR	NR	1,200	3	0.01	0	0	0.45	0.45
11/30/2007	2.2	3	NR	NR	NR	13	2.99	0.23	0.59	2.51	4.1
05/31/2008	6.4	8.33	NR	11	20	20	32.2	1.61	2.17	0.59	1.35
06/30/2008	6.5	8	NR	NR	10	30	27.3	0.91	0.91	**2.46**	3.44
07/31/2008	4	4	NR	NR	40	14	0.01	0	0	2.06	2.06
04/30/2009	17.66	17.66	NR	NR	NR	4	8.76	2.19	2.5	0.12	0.12
05/31/2009	9	15	NR	NS	NS	30	11.1	0.37	0.57	0.21	0.47
11/30/2009	3.71	6	NR	NR	NR	30	0	701*	1,297*	7.37	11.1
04/30/2010	13	14	NR	NR	NR	19	23.94	1.26	2.17	3.21	7
05/31/2010	14	16	NR	NR	260	30	8.1	0.27	0.22	1.18	2.09
06/30/2010	13	13	NR	NR	1,100	30	9.6	0.32	0.32	**5.32**	**5.32**
07/31/2010	32	32	NR	NR	330	28	4.03	0.14	0.14	**4.09**	**4.09**
10/31/2010	9.66	14	NS	NR	NR	25	23.29	0.93	1.9	**4.61**	6.7
11/30/2010	3	3	NS	NR	NR	15	4.5	0.3	0.3	7.74	7.74
03/31/2011	18	18	NR	NR	NR	4	8.4	2.1	2.5	7.28	8.13
04/30/2011	11.33	16	NR	NR	NR	30	339.9	1.11	1.58	**10.43**	**10.6**
05/31/2011	6	6	NR	110	110	30	19.52	0.65	0.65	1.39	1.39

End Date	BOD, 5-day, 20 °C		Chlorine, total residual	Coliform, fecal general		Duration of discharge	Flow	Flow rate		Nitrogen, ammonia total (as N)	
	30 Day Avg	Max 7 day Avg	Daily Max	30 Day Geo	Daily Max	Mo Total	Mo Total	30 Day Avg	Daily Max	30 Day Avg	Daily Max
Limit	30 mg/L	45 mg/L	0.019 mg/L	1000 #/100mL	2000 #/100mL	N/A d	N/A Mgal/mo	N/A Mgal/d	N/A Mgal/d	varies, mg/L	
06/30/2011	6	6	NR	170	170	30	13.2	0.44	0.44	**5.51**	**5.51**
07/31/2011	22	22	NR	NR	500	25	4	0.16	0.16	**4.68**	**4.68**

NR is Not Required. No sample was required for this parameter during the monitoring period.
NS is No Sample. No sample is available for these parameters.
Violations are bolded, shaded, and larger font.

End Date	pH		Solids, total suspended		Temperature, water °C	
	Daily Min	Daily Max	30 Day Avg	Max 7 day Avg	30 Day Avg	Daily Max
Limit	6 SU	9 SU	30 mg/L	45 mg/L	N/A °C	N/A °C
10/31/2004	7.99	8.41	1.8	2	9.1	12
11/30/2004	8.12	8.46	1.5	1.5	5.75	6.5
12/31/2004	8.35	8.35	4	4	5	5
06/30/2005	7.83	8.42	2.83	2.33	19.33	25
07/31/2005	7.15	7.15	19	19	24	24
04/30/2006	8.83	8.9	**49**	**49**	10	13
05/31/2006	7.58	8.62	13.25	31	13	15
06/30/2006	8.32	8.32	1	1	16	16
04/30/2007	8.03	8.59	17.6	23	8.3	15
05/31/2007	8.2	8.2	3	3	18	18
06/30/2007	7.65	7.65	4	4	22	22
07/31/2007	8.89	8.89	7	7	20	20
11/30/2007	8.52	8.8	3	3	4.4	6
05/31/2008	8.05	8.44	10	14	12.6	15
06/30/2008	8.21	8.3	6.5	8	17.5	18
07/31/2008	8.13	8.13	8	8	20	20
04/30/2009	8.81	8.53	**32.66**	32.66	8.33	9
05/31/2009	7.51	**9.16**	12.3	28	13	14

End Date	pH		Solids, total suspended		Temperature, water °C	
	Daily Min	Daily Max	30 Day Avg	Max 7 day Avg	30 Day Avg	Daily Max
Limit	6 SU	9 SU	30 mg/L	45 mg/L	N/A °C	N/A °C
11/30/2009	7.34	8.43	6.71	18	5.28	8
04/30/2010	7.29	**9.32**	29.8	45	11.8	14
05/31/2010	7.17	**9.03**	19.5	27	13.5	18
06/30/2010	7.37	7.37	10	10	21	21
07/31/2010	6.34	6.34	16	16	23	23
10/31/2010	7.71	8.09	11	16	11.3	6.7
11/30/2010	8.49	8.49	3	3	3	3
03/31/2011	8.13	8.37	13.3	13.3	3.3	4
04/30/2011	8.4	8.69	11	14	6.3	6.3
05/31/2011	7.42	7.42	6	6	15	15
06/30/2011	7.24	7.24	5	5	18	18
07/31/2011	7.1	7.1	11	11	32	32

NR is Not Required. No sample was required for this parameter during the monitoring period.
NS is No Sample. No sample is available for these parameters.
Violations are bolded, shaded, and larger font.

ATTACHMENT 3

Ammonia Limits Development
for the
Clear Lake Treatment Facility

in Hidewood Creek
near
Clear Lake, South Dakota

Prepared by

South Dakota Department of Environment and Natural Resources

2012

INTRODUCTION

Under Section 303(c) of the federal Clean Water Act, states have been required to develop water quality standards to protect public health and enhance water quality. In accordance with the Clean Water Act, the state of South Dakota has assigned beneficial uses to all waters of the state and developed water quality criteria to protect those uses. South Dakota's surface water quality standards and assigned beneficial uses are found in the Administrative Rules of South Dakota (ARSD) Article 74:51.

To ensure the protection of the state's surface water quality standards, the Clean Water Act authorized a permitting program for point source discharges of pollutants. The U.S. Environmental Protection Agency delegated this permitting program to the South Dakota Department of Environment and Natural Resources on December 30, 1993.

The department issues Surface Water Discharge permits containing, at a minimum, technology-based effluent limits. However, these limits are not always adequate to protect South Dakota's water quality. In those cases, the Department of Environment and Natural Resources develops water quality-based effluent limits. In accordance with the procedures and requirements outlined below, water quality-based effluent limits for ammonia will be developed for the City of Clear Lake's wastewater treatment facility (WWTF). These limits will ensure the surface water quality standards for Hidewood Creek near Clear Lake are maintained and protected.

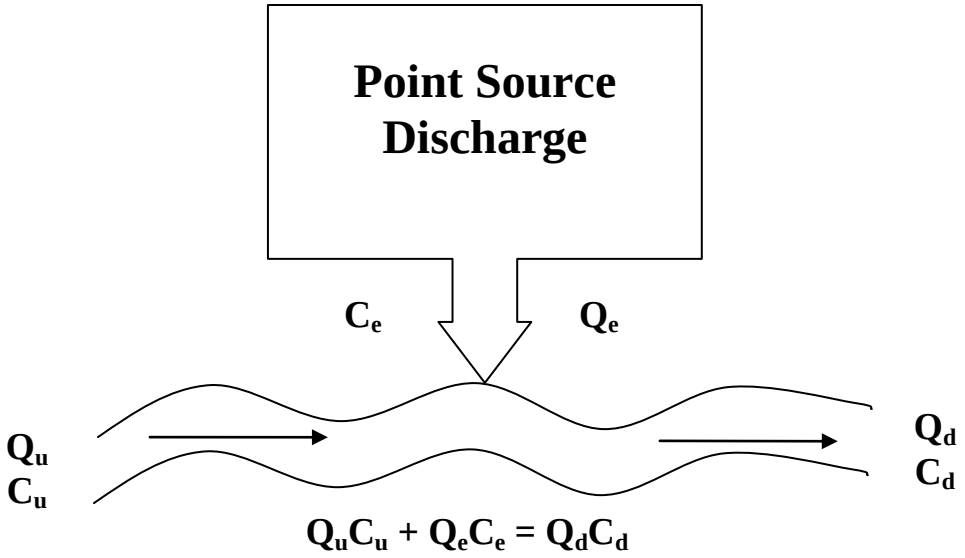
Developing the ammonia limits for the City of Clear Lake is a matter of determining the maximum level of ammonia that can be present in Hidewood Creek without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) for ammonia to be exceeded.

The effluent limits for ammonia are developed for critical conditions to be conservative, thereby assuring water quality standards are maintained under less critical conditions. Critical conditions are those at which the surface water quality standards are most likely to be violated. Critical conditions can be defined by several factors, including, but not limited to the following:

- stream flow (e.g., high, low);
- storm event occurrence and intensity;
- ambient water quality conditions (e.g., pH, temperature, etc.);
- diurnal variations in water column conditions;
- temporal occurrence of pollutant loadings from natural and human-induced activities;
- the presence or absence of salmonids; and
- the presence or absence of early life stages of aquatic life.

The following mass balance equation will be used to determine the ammonia limits for the City of Clear Lake:

Figure 1



Where,

- $\mathbf{Q_u}$ = Receiving stream flow, in cubic feet per second (cfs);
- $\mathbf{C_u}$ = Ambient upstream ammonia concentration, in milligrams per liter (mg/L);
- $\mathbf{Q_e}$ = Effluent discharge flow rate, in cfs;
- $\mathbf{C_e}$ = Water quality based effluent limit for ammonia in mg/L;
- $\mathbf{Q_d}$ = Downstream flow (equal to $Q_u + Q_e$), in cfs; and
- $\mathbf{C_d}$ = Allowable instream ammonia concentration (based on the SD Surface Water Quality Standards), in mg/L.

Using the mass balance equation and the following information, the water quality-based effluent limits for ammonia can be determined for the City of Clear Lake's discharge into Hidewood Creek.

GEOGRAPHICAL EXTENT

Hidewood Creek is located in the Upper Big Sioux River Basin in the eastern portion of the state. The Upper Big Sioux River Basin drains approximately 161 square miles of land, which is comprised largely of cropland. Figure 2 shows Hidewood Creek near Clear Lake.

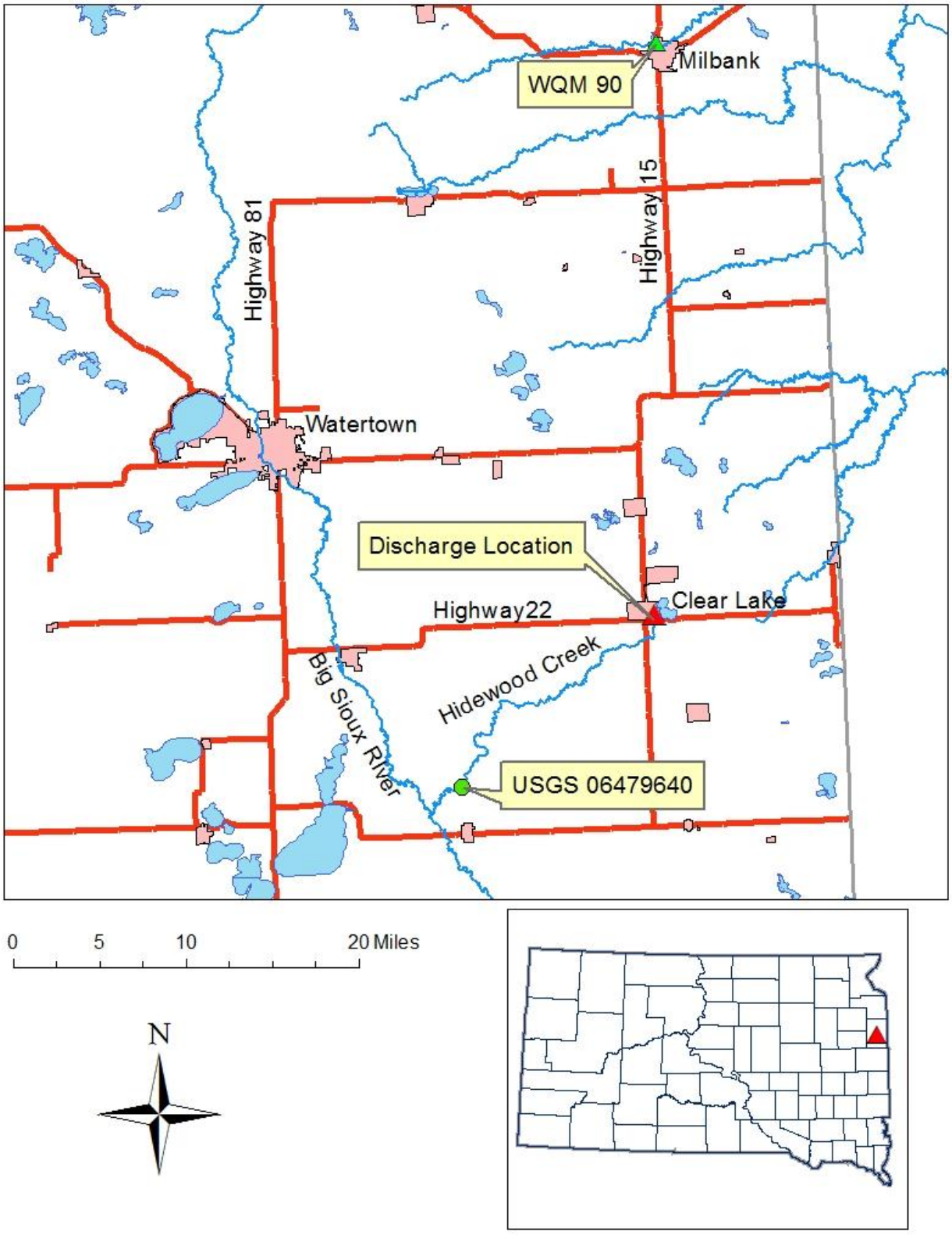


Figure 2: Big Sioux River Watershed

Past experience has shown that, due to the decay and transformation of organic pollutants such as ammonia, most adverse effects are generally exhibited within 10 miles of pollutant loading. While this rule of thumb can certainly vary depending on the source of the pollutant, fate and transport characteristics, hydrologic conditions, and other factors, it has generally held true in past instances. Therefore, the development of the ammonia limits for the City of Clear Lake's discharge into Hidewood Creek will be relatively narrow in spatial extent.

ALLOWABLE INSTREAM AMMONIA CONCENTRATION (C_d)

South Dakota Surface Water Quality Standards

The SDSWQS specify the beneficial uses assigned to specific water bodies. The SDSWQS also contain specific narrative and numeric criteria that must be met to ensure the protection of each beneficial use. Hidewood Creek is classified for the following beneficial uses:

(6) Warmwater marginal fish life propagation waters;
(8) Limited-contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters; and
(10) Irrigation waters.

Waterbodies designated in the SDSWQS with the beneficial use classification of either coldwater permanent or coldwater marginal fish life propagation are suitable for supporting salmonids. Waterbodies with the beneficial use classifications of warmwater permanent, warmwater semipermanent, or warmwater marginal fish life propagation will likely not have salmonids. The presence or absence of early life stages can be assumed based on the beneficial uses assigned to the receiving stream.

Salmonids are not expected to be present in Hidewood Creek. Early life stages are expected to be present from May – October based on the SDSWQS (ARSD Section 74:51:01:49).

Allowable Instream Ammonia Levels

Based on the beneficial uses of Hidewood Creek, the following equations can be used determine the total allowable ammonia concentration in the receiving stream (SDSWQS, ARSD Chapter 74:51:01, Appendix A):

Equation 1: Daily Maximum (Salmonids present)

$$Cd = \frac{0.275}{(1+10^{(7.204-pH)})} + \frac{39.0}{(1+10^{(pH-7.204)})}$$

Equation 2: Daily Maximum (Salmonids NOT present)

$$Cd = \frac{0.411}{(1+10^{(7.204-pH)})} + \frac{58.4}{(1+10^{(pH-7.204)})}$$

Equation 3: 30-day Average (Early Life Stages Present)

$$Cd = \left[\frac{0.0577}{(1+10^{(7.688-pH)})} + \frac{2.487}{(1+10^{(pH-7.688)})} \right] \times MIN\left(2.85, 1.45 \times 10^{0.028(25-T)}\right)$$

Equation 4: 30-day Average (Early Life Stages Absent)

$$Cd = \left[\frac{0.0577}{(1+10^{(7.688-pH)})} + \frac{2.487}{(1+10^{(pH-7.688)})} \right] \times [1.45 \times 10^{0.028((25-MAX(T,7))}]$$

pH = the pH of the water quality sample in standard units
T = the water temperature of the sample in degrees Centigrade
MIN = use either 2.85 or the value of $1.45^{0.028*(25-T)}$, whichever is the smaller value
MAX = use either the water temperature (T) for the sample, or 7, whichever is the greater value

To develop the ammonia limits for the City of Clear Lake, equations 2, 3, and 4 will be used to determine the instream ammonia concentration, C_d, allowed in Hidewood Creek. C_d will be expressed as both 30-day average and daily maximum concentrations. The seasons have been determined based on the presence or absence of early life stages.

Instream Water Quality Monitoring

The department maintains a statewide network of fixed monitoring stations to gain a historic record of water quality for various streams around the state. This water quality monitoring (WQM) network consists of 151 monitoring stations, which are sampled at monthly, quarterly, or seasonal intervals. The goal of this sampling is to collect reliable water quality data that reflects actual stream conditions; to collect data to determine the effectiveness of controls on point and nonpoint sources of pollution; and to collect data to evaluate the appropriateness of current beneficial use designations.

There are no WQM sites located on Hidewood Creek. The nearest WQM site is on the Big Sioux River. However, the South Fork Whetstone River has a WQM site in the same region, and has similar characteristics to Hidewood Creek. A description of the station is listed below. Figure 2 denotes the location of WQM 90.

WQM 90	Located at the bridge five blocks east of Highway 15 and one block off Main Street. The site is above the Milbank wastewater treatment facility and below Lake Farley.

Ambient temperature, pH, and ammonia data at WQM 90 were obtained to represent instream conditions. The water quality information obtained from WQM 90 is presented in Attachment 4. The pH and temperature data are summarized in Table 1 below.

-Calculation of Allowable Instream Ammonia Concentration (C_d)

The SDSWQS specify the total ammonia concentration that is allowed at a given pH and temperature. The 50th percentile of the pH and temperature at WQM 90 was determined to ensure the ammonia standards are maintained during critical conditions. This information was used to calculate the allowable instream ammonia concentrations for each season. 50th percentile water quality data was used based on Best Professional Judgement, since there is no WQM site on Hidewood Creek. The 50th percentile data is expected to be protective of Hidewood Creek. Table 1 summarizes the allowable instream ammonia (C_d) for Hidewood Creek.

Table 1: Allowable Instream Total Ammonia Concentrations for Hidewood Creek

Season	Temperature (°C)	pH (s.u.)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
May 1 – October 31	17.20	7.92	2.29	9.76
November 1 – April 30	3.00	7.86	4.79	10.90

AMBIENT AMMONIA CONCENTRATION (C_u)

The ammonia data at WQM 90 was reviewed to estimate the ambient water quality in Hidewood Creek. The 50th percentile of the ammonia data was determined to ensure the ammonia standards are maintained during critical conditions. The ammonia data from WQM 90 is presented in Attachment 4. Table 2 below summarizes the 50th percentile ammonia data for each season. This data represents the ambient ammonia concentration for Hidewood Creek (C_u).

Table 2: Ambient Ammonia Data for Hidewood Creek

Season	Ammonia (mg/L)
May 1 – October 31	0.02
November 1 – April 30	0.02

EFFLUENT DISCHARGE FLOW RATE (Q_e)

The effluent discharge flow rate, Q_e, can be determined in several different ways. If effluent data is available for the discharger, the 50th or 80th percentile of the daily flow can be used. The effluent design flow rate of the wastewater treatment facility may be used as the expected effluent flow rate in the absence of actual discharge data. Alternatively, for stabilization pond systems, it may be appropriate to develop an effluent flow rate based on expected performance.

For the purposes of developing ammonia limits for the City of Clear Lake, 2.59 cfs was used for Q_e based on the 80th percentile of the reported effluent flow to ensure the ammonia standards are maintained during critical conditions. See Attachment 5 for more details.

Table 3 below summarizes the effluent flow rate used in these calculations.

RECEIVING STREAM FLOW (Q_u)

The United States Geological Survey (USGS) maintains hundreds of flow monitoring sites in South Dakota. The receiving stream flow rate, Q_u, is determined from an analysis of stream flow data available, incorporating the flow considerations required by *South Dakota's Mixing Zone and Dilution Implementation Procedures*.

Critical conditions for ammonia presumably occur when stream flows are relatively low. Therefore, the ammonia limits will be developed for low stream flow conditions. Should it be determined that water quality standards are violated at other flow conditions, the permit would be reopened and new limits would be developed.

ARSD Section 74:51:01:30 specifies that surface water quality standards apply to low quality fishery waters when flows meet or exceed the minimum 7-day average low flow that can be expected to occur once every 5 years (7Q5), or 1.0 cfs, whichever is greater. The 7Q5 is therefore the minimum, or critical, flow for which the SDSWQS must be maintained, although all Surface Water Discharge permit limits remain in force below this minimum flow.

The seasonal 7Q5 flows were determined using data retrieved from the USGS gauging station 06479640 and the computer model *Hydrotec* (log pearson type III). A description of the station is listed below. Figure 2 denotes the location of the USGS gauging station.

06479640 Hidewood Creek located near Estelline. Latitude 44.630556°, Longitude -96.890556° NAD27, Hamlin County, South Dakota, Hydrologic Unit 10170202.

Analysis of the flow to determine a 7Q5 requires at least 75% of the sample to be greater than zero to give meaningful results. The available data set does not meet this requirement, so 1.0 cfs is used. The data covered the period from October 1, 1968 through September 30, 1985.

South Dakota's water quality standards allow a zone of mixing for discharges. In accordance with the SDSWQS, chronic water quality criteria must be met at the end of the mixing zone; the acute criteria must be met at all times within the mixing zone. The mixing zone is therefore a limited portion of a water body where mixing of the effluent and receiving stream is in progress, but not complete. In some cases, the discharge will not completely mix with the entire receiving stream. There are many factors that influence the rate of mixing in a stream. A few of these factors are the flow and velocity of the receiving stream, the flow and velocity of the effluent, the slope of the stream, and other stream characteristics.

The *South Dakota Mixing Zone and Dilution Implementation Procedures* outlines an approach for modeling the mixing zone. Using these procedures, the 7Q5 is adjusted to account for the allowable ratio of flow available in the receiving stream. This adjusted flow represents the receiving stream flow rate (Q_u).

Table 3 summarizes the flow data and the determination of Q_u for Hidewood Creek.

Table 3: Critical Low Flow Values for Hidewood Creek

Season	7Q5 Low Flow (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q5	Allowable Ratio of 7Q5	Critical Low Flow Q_u (cfs)
May 1 – October 31	1.00	2.59	2.59	1.00	1.00
November 1 – April 30	1.00	2.59	2.59	1.00	1.00

DOWNSTREAM FLOW RATE (Q_d)

The downstream flow rate, Q_d, is simply the sum of the upstream flow rate (Q_u) and the effluent flow rate (Q_e). The downstream flow rate used for the calculation of the ammonia limits for the City of Clear Lake's discharge into Hidewood Creek is summarized in Table 4 below.

CALCULATION OF AMMONIA LIMIT (C_e)

Each of the variables determined above is summarized in Table 4. Using the mass balance equation, the ammonia limits for the City of Clear Lake's discharge into Hidewood Creek can be calculated as follows:

$$Ce = \frac{(Qd * Cd) - (Qu * Cu)}{Qe}$$

The water quality-based effluent limits for ammonia for the City of Clear Lake's discharge into Hidewood Creek are presented in Table 4.

Table 4: Variables Calculated for Mass Balance Equation

Season	C_u, mg/L	C_d, mg/L		Q_d, cfs	Q_e, cfs	C_e, mg/L	
		30-day Average	Daily Maximum			30-Day Average	Daily Maximum
May 1 – October 31	0.02	2.29	9.76	3.59	2.59	3.2	13.5
November 1 – April 30	0.02	4.79	10.90	3.59	2.59	6.6	15.1

The City of Clear Lake's current permit contains ammonia limits. The current effluent limits were compared to the limits calculated using the information presented above. A comparison of the two limits is presented in Table 5 below.

The calculated limits are designed to be protective of the stream. In addition, the city is being asked to re-evaluate the system to improve ammonia treatment. For these reasons, the calculated

limits shall be proposed to be used in the permit. The shaded values in Table 5 indicate the limits that will be proposed for the City of Clear Lake.

Table 5: Comparison of Current and Proposed Effluent Limits

Month	Current Effluent Limits		Calculated Effluent Limits	
	30-Day Average (mg/L)	Daily Maximum (mg/L)	30-Day Average (mg/L)	Daily Maximum (mg/L)
January 1 – January 31	22.1	38.9	6.6	15.1
February 1 – February 29	22.1	38.9	6.6	15.1
March 1 – March 31	22.1	38.9	6.6	15.1
April 1 – April 30	4.7	8.3	6.6	15.1
May 1 – May 31	4.7	8.3	3.2	13.5
June 1 – June 30	2.1	4.0	3.2	13.5
July 1 – July 31	2.1	4.0	3.2	13.5
August 1 – August 31	2.1	4.0	3.2	13.5
September 1 – September 30	2.1	4.0	3.2	13.5
October 1 – October 31	3.7	8.3	3.2	13.5
November 1 – November 30	22.1	38.9	6.6	15.1
December 1 – December 31	22.1	38.9	6.6	15.1

ATTACHMENT 4

Water Quality Data

WQM 90 Reduced Data

ELS Present

Sample Date	Ammonia, mg/L	Adjusted Ammonia	pH	Temperature, °C
09/20/1978			7.3	14.4
09/20/1978			8.2	
10/17/1978			8.4	8.2
10/17/1978			8.5	
05/15/1979			8.4	13.3
05/15/1979			8.5	
06/12/1979			8.8	17.2
06/12/1979			8.8	
07/10/1979				22.2
07/10/1979			8.6	
08/14/1979			8	18.9
08/14/1979			8	
09/11/1979			7.7	21.1
09/11/1979			8.2	
10/10/1979			7.6	6.7
10/10/1979			7.8	
05/15/1980			7.8	14.4
05/15/1980			8.1	
06/10/1980			8.3	21.7
06/10/1980			8.4	
07/15/1980			7.4	25.6
07/15/1980			7.7	
08/13/1980			7.2	21.1
08/13/1980			7.7	
09/11/1980			7.8	16.7
09/11/1980			7	
10/14/1980			7.2	7.8
10/14/1980			7.5	
06/17/1982			7.4	20.0
06/17/1982			7.6	
08/11/1982			7.4	17.2
08/11/1982			7.7	
05/11/1983			8.1	14.4
05/11/1983			8	

Sample Date	Ammonia, mg/L	Adjusted Ammonia	pH	Temperature, °C
06/16/1983			8.7	13.9
06/16/1983			8.5	
05/16/1984			7.6	15.0
05/16/1984			8	
07/10/1984			7.7	23.0
07/10/1984			8	
10/10/1984			7.8	16.0
10/10/1984			7.3	
05/15/1985			7.8	13.0
05/15/1985			8.1	
06/10/1985			7.8	17.0
06/10/1985			7.9	
10/16/1985			7.6	7.0
10/16/1985			8	
05/13/1986			7.7	20.0
05/13/1986			7.8	
06/10/1986			7.3	21.0
06/10/1986			7.9	
07/21/1986			7.7	24.0
07/21/1986			8	
08/12/1986			7.7	22.0
08/12/1986			7.9	
09/08/1986			7.8	16.0
09/08/1986			8.1	
10/15/1986			7.6	6.1
10/15/1986			7.9	
05/12/1987			7.5	16.7
05/12/1987			8.2	
06/08/1987			7.5	21.0
06/08/1987			8	
05/11/1988			7.9	15.6
05/11/1988			7.8	
07/16/1991			8	26.1
07/15/1992			8.4	21.1
07/14/1993			8	19.4
07/11/1994			7.3	24.4
10/18/1994			8.1	14.4
07/11/1995				25.6

Sample Date	Ammonia, mg/L	Adjusted Ammonia	pH	Temperature, °C
07/11/1995			7.4	
10/16/1995				11.7
10/16/1995			8.1	
10/21/1996			8.4	8.3
10/21/1996	0.02	0.02		
07/16/1997			8.5	26.7
07/16/1997	0.04	0.04		
10/20/1997			7.3	11.1
10/20/1997	1	1		
07/20/1998			8.1	31.7
07/20/1998	0.03	0.03		
10/20/1998			7.9	8.9
10/20/1998	0.39	0.39		
07/12/2001			6.9	25.5
07/12/2001	Non-detect	0.02		
07/14/2004			7.5	29.0
07/14/2004	Non-detect	0.02		
07/14/2005			8	31.0
07/14/2005	Non-detect	0.02		
07/13/2006	<0.02	0.02	8	25.0
07/12/2007	<0.02	0.02	8.2	23.0
10/11/2007	<0.02	0.02	8.6	12.0
07/10/2008	0.08	0.08	8.2	27.0
10/09/2008	0.13	0.13	8.5	12.8
05/07/2009	<0.05	0.02	8.3	17.0
05/11/2010	<0.05	0.02	8.6	8.3
50th percentile		0.0	7.9	17.2
80th percentile		0.1	8.3	24.1
average		0.1	7.9	18.0

ELS Absent

Sample Date	Ammonia, mg/L	Adjusted Ammonia	pH	Temperature, °C
11/14/1978			7.6	0.0
11/14/1978			7.7	
01/17/1979			7.2	0.0
01/17/1979			7.6	
02/20/1979			7.4	0.0

Sample Date	Ammonia, mg/L	Adjusted Ammonia	pH	Temperature, °C
02/20/1979			7.4	
04/24/1979			8.1	12.2
04/24/1979			7.8	
11/14/1979			7.7	0.6
11/14/1979			8.2	
12/12/1979			8	0.0
12/12/1979			7.9	
01/14/1980			7.1	0.0
01/14/1980			7.7	
04/23/1980			8.1	15.6
04/23/1980			8.2	
12/09/1980			7.2	0.0
12/09/1980			7.4	
01/14/1981			7.4	-2.2
01/14/1981			7.3	
04/15/1982			7.5	12.2
04/15/1982			8	
03/17/1983			7.3	0.0
03/17/1983			7.7	
04/19/1983			8.2	7.8
04/19/1983			8.2	
11/13/1984			7.7	4.0
11/13/1984			8.1	
12/11/1984			7.8	0.0
12/11/1984			8	
04/15/1985			8.1	16.0
04/15/1985			8.3	
03/11/1986			6.2	1.0
03/11/1986			7.6	
04/15/1986			6	3.0
04/15/1986			7.9	
01/13/1987			7.3	1.7
01/13/1987			7.8	
02/10/1987			7.6	0.6
02/10/1987			8.1	
03/05/1987			7.7	3.3
03/05/1987			8	
04/13/1987			7.8	8.9

Sample Date	Ammonia, mg/L	Adjusted Ammonia	pH	Temperature, °C
04/13/1987			8.1	
11/17/1987			7.2	3.3
11/17/1987			7.7	
04/12/1988			8.2	13.3
04/12/1988			8.2	
04/18/1989			8.3	7.8
04/14/1993			7.5	4.4
04/18/1994			7.4	15.0
01/10/1995				-2.2
01/10/1995			8.1	
04/17/1995				1.1
04/17/1995			7.6	
01/22/1996			7.9	0.0
01/22/1996	0.11	0.11		
04/16/1996			8	7.2
04/16/1996	0.04	0.04		
04/16/1997			7.9	6.1
04/16/1997	0.03	0.03		
01/20/1998			7.9	0.6
01/20/1998	non-detect	0.02		
04/20/1998			8.1	15.6
04/20/1998	non-detect	0.02		
01/13/1999			8.5	1.6
01/13/1999	Non-detect	0.02		
04/14/1999			8.1	8.9
04/14/1999	Non-detect	0.02		
01/10/2000			7.7	0.0
01/10/2000	0.02	0.02		
04/12/2000			8	2.2
04/12/2000	0.23	0.23		
04/09/2001			7.7	1.7
04/09/2001	0.24	0.24		
01/10/2002			7.6	3.9
01/10/2002	Non-detect	0.02		
04/08/2002			8.1	1.7
04/08/2002	Non-detect	0.02		
04/09/2003			9	11.0
04/09/2003	Non-detect	0.02		

Sample Date	Ammonia, mg/L	Adjusted Ammonia	pH	Temperature, °C
04/13/2005			8.2	16.0
04/13/2005	0.04	0.04		
04/12/2006			8.3	10.0
04/12/2006	Non-detect	0.02		
04/18/2007	<0.02	0.02	8.2	12.0
01/10/2008	0.16	0.16	8.3	1.5
04/16/2008	0.16	0.16	7.9	8.5
02/12/2009	0.27	0.27	8.2	2.7
11/05/2009	<0.05	0.02	7.9	4.8
02/18/2010	0.17	0.17	7.6	0.6
11/16/2010	<0.05	0.02	8.3	4.1
50th percentile		0.0	7.9	3.0
80th percentile		0.2	8.2	10.0
average		0.1	7.8	4.9

ATTACHMENT 5

Point Source Dischargers Flow Rate

Raw and Reduced Effluent Flow Data

DMR Received Date	Flow rate		Flow rate	
	30 Day Avg	Daily Max	30 Day Avg	Daily Max
	N/A Mgal/d	N/A Mgal/d	cfs	cfs
10/31/2004	1.06	1.40	1.64	2.17
11/30/2004	0.40	0.60	0.62	0.93
12/31/2004	0.06	0.06	0.09	0.09
06/30/2005	1.25	1.58	1.93	2.44
07/31/2005	0.18	0.18	0.28	0.28
04/30/2006	1.46	1.70	2.26	2.63
05/31/2006	0.87	1.26	1.35	1.95
06/30/2006	0.03	0.03	0.05	0.05
04/30/2007	1.15	1.46	1.78	2.26
05/31/2007	0.01	0.01	0.02	0.02
06/30/2007	0.01	0.01	0.02	0.02
07/31/2007	0*	0*	*	*
11/30/2007	0.23	0.59	0.36	0.91
05/31/2008	1.61	2.17	2.49	3.36
06/30/2008	0.91	0.91	1.41	1.41
07/31/2008	0*	0*	*	*
04/30/2009	2.19	2.50	3.39	3.87
05/31/2009	0.37	0.57	0.57	0.88
11/30/2009	701*	1,297*	*	*
04/30/2010	1.26	2.17	1.95	3.36
05/31/2010	0.27	0.22	0.42	0.34
06/30/2010	0.32	0.32	0.50	0.50
07/31/2010	0.14	0.14	0.22	0.22
10/31/2010	0.93	1.90	1.44	2.94
11/30/2010	0.30	0.30	0.46	0.46
03/31/2011	2.10	2.50	3.25	3.87
04/30/2011	1.11	1.58	1.72	2.44
05/31/2011	0.65	0.65	1.01	1.01
06/30/2011	0.44	0.44	0.68	0.68
07/31/2011	0.16	0.16	0.25	0.25
50th	0.44	0.60	0.68	0.93
80th	1.23	**1.68**	1.90	**2.59**
average	0.72	0.94	1.12	1.46

The 80th percentile of the daily maximum flows was chosen to represent the majority of expected flows from the plant. Starred flows were not used in the calculations, as they are not representative of actual facility flows. 1.68 MGD is equivalent to 2.59 cfs.