STATEMENT OF BASIS

Applicant:	Town of Chancellor
Permit Number:	SD0023639
Contact Person:	Dennis Wieker – President George Ihnen – Maintenance 240 Second Avenue PO Box 106 Chancellor, SD 57015
Phone:	(605) 647-8696 – President (605) 647-2333 – Maintenance
Permit Type:	Minor Municipal - Renewal

DESCRIPTION

The town of Chancellor operates a wastewater treatment facility located about ¼ mile southwest of the town in the Northwest ¼ of Section 28, Township 99 North, Range 52 West, in Turner County, South Dakota (Latitude 43.370361°, Longitude -96.996722°, Navigational Quality GPS).

The wastewater treatment facility consists of gravity flow aided by one main lift station and has an average design flow of 0.037 million gallons per day (MGD). The facility was constructed in 1959 and modified in 1990. The facility includes a two cell stabilization pond system operated in series, followed by an artificial wetland. The surface area of Cells #1 and #2 are 2.0 and 2.3 acres, respectively; the surface area of the wetland is 2.4 acres.

This wastewater treatment facility serves a population of 264 persons (2010 census), with no known industrial users contributing flow to the system.

RECEIVING WATERS

Any discharge from this facility will enter an unnamed tributary, which flows approximately 0.5 miles to Camp Creek, then approximately 2 miles to the Vermillion River.

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.

Camp Creek is classified by the South Dakota Surface Water Quality Standards (SDSWQS), Administrative Rules of South Dakota (ARSD), Section 74:51:03:01 and 74:51:03:25 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.

The Vermillion River is classified by the SDSWQS, ARSD Section 74:51:03:01 and 74:51:03:25 for the following beneficial uses:

(5) Warmwater semipermanent 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 the minimum fishery 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 of Camp Creek near the discharge location. SDDENR personnel have determined that the beneficial use classifications for the tributary are appropriate and will remain unchanged.

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 Chancellor has been submitting Discharge Monitoring Reports (DMRs) as required under the current permit. As shown in Attachment 2, this facility has had 15 violations of ammonia, and 1 violation of minimum pH during the current permit cycle. Because the city has struggled to meet ammonia limits, a compliance schedule has been incorporated into the proposed permit. No discharge was reported for the months not included in the table.

INSPECTIONS

Personnel from SDDENR conducted a *Compliance Inspection* of the Chancellor wastewater treatment facility on September 22, 2009. The following comments and corrective actions were made:

COMMENTS	REQUIRED CORRECTIVE ACTIONS
The town of Chancellor has experienced the following violations since the last on-site inspection in March 2005:	The town must take steps to ensure adequate treatment of the wastewater. For instance, the town's ammonia limits are most stringent

• May 2005: 30-day average Ammonia; • April 2006: 30-day average and daily maximum Ammonia; • April 2007: 30-day average and daily maximum Ammonia; • May 2007: 30-day average Ammonia; • May 2008: 30-day average and daily maximum Ammonia	during April – September; therefore, the operator should try to discharge during months when the town's ammonia limits are not as stringent, such as early spring or late fall. Failure to comply with the effluent limits contained in the permit can subject the town to enforcement action, including penalties of up to $10,000 per day per violation.
The April 2009 Discharge Monitoring Report (DMR) was reviewed. The Number of Exceedances column (No Ex.) was not completed, and ammonia values were reported as "N", even though samples were collected.	DMRs must be filled out in their entirety, including filling out the No Ex. column, regardless of whether a violation occurred or not. Also, ammonia sampling is required every discharge with a frequency of three times per week the first week of discharge, and once a week thereafter. If sample values are not available to report on DMRs, a letter to the Department must be submitted along with the DMR stating why samples were not available.

COMMENTS	RECOMMENDED CORRECTIVE ACTIONS
The operator mentioned he notices a muskrat every once in a while in the stabilization pond area; however, none were noted at the time of the inspection. The operator also mentioned muskrat dens are usually abundant within the artificial wetland; however, the reeds and cattails were too high to notice any dens during the inspection.	Continue efforts to eliminate rodents. They can do extensive damage in just a short period of time, resulting in operation and maintenance problems and major expenses for repairs. Also, please continue to contact your local Game, Fish, and Parks conservation officer for information on how to remove rodents from the stabilization pond area. Also, the operator mentioned trying to control the cattails within the artificial wetlands as a means for removing the muskrats.
Written 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 town may wish to consider establishing written emergency procedures.

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, 2013.

Interim Effluent Limits

Effective immediately and lasting until **April 30, 2014**, 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.

Outfall 001 – Any discharge from the artificial wetland into the unnamed tributary of Camp Creek (Latitude 43.371611°, Longitude -96.998417°, Navigational Quality GPS).

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 6.5 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on the warmwater semiperminent fish life propagation waters classification of the Vermillion River and the SDSWQS (ARSD 74:51:01:48).

   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. 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 Camp Creek, the Vermillion River, 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 semipermanent fish life propagation waters classification of the Vermillion River, the SDSWQS (ARSD Section 74:51:01:48), the current permit limits, and BPJ. See Attachment 3 for more detail.

Month	**Ammonia Limit (as N)**	
	30-Day Average (mg/L)	**Daily Maximum (mg/L)**
January1- January 31	6.3	13.3
February 1 – February 29	5.8	12.7
March 1- March 31	2.4	8.6
April 1- April 30	1.8	6.4
May 1 – May 31	1.3	6.7
June 1 – June 30	1.1	6.7
July 1 – July 31	1.0	6.0
August 1 – August 31	1.0	6.7
September 1 – September 30	1.3	6.1
October 1 – October 31	2.2	6.7
November 1 – November 30	3.1	6.2
December 1- December 31	5.0	9.9

   The July, 30-day average ammonia limit was calculated as 0.9 mg/L. However, this limit was increased to 1.0 mg/L based on BPJ because of the inability of small wastewater treatment facilities to meet ammonia limits less than 1.0 mg/L.

4. 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* shall be monitored, but will not have a limit.

Final Effluent Limits

Effective **May 1, 2014**, 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 6.5 standard units or greater than 9.0 standard units in any single analysis and/or measurement. These limits are based on the warmwater semiperminent fish life propagation waters classification of the Vermillion River and the SDSWQS (ARSD 74:51:01:48).

   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 Camp Creek, the Vermillion River, 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 Vermillion River, the SDSWQS (ARSD Section 74:51:01:48), the current permit limits, and BPJ. See Attachment 3 for more detail.

Month	Ammonia Limit (as N)	
	30-Day Average (mg/L)	Daily Maximum (mg/L)
January1- January 31	6.3	13.3
February 1 – February 29	5.8	12.7
March 1- March 31	2.4	8.6
April 1- April 30	1.8	6.4
May 1 – May 31	1.3	6.7
June 1 – June 30	1.1	6.7
July 1 – July 31	1.0	6.0
August 1 – August 31	1.0	6.7
September 1 – September 30	1.3	6.1
October 1 – October 31	2.2	6.7
November 1 – November 30	3.1	6.2
December 1- December 31	5.0	9.9

The July, 30-day average ammonia limit was calculated as 0.8 mg/L. However, this limit was increased to 1.0 mg/L based on BPJ because of the inability of small wastewater treatment facilities to meet ammonia limits less than 1.0 mg/L.

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), and duration of discharge (days) shall be monitored, but will not have a limit.

SELF MONITORING 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 BOD_5, Total Suspended Solids, pH, temperature, fecal coliform, *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.**

As a minimum, upon the effective date of this permit, the following parameters shall be monitored 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	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]	Max 7-Day Average; 30-Day Average	Grab
Total Suspended Solids (TSS), mg/L	At least three per discharge[3]	Max 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 Geo Mean	Grab
E. coli, no./100 mL	At least three per discharge[3,8]	Daily Maximum; 30-Day Geo Mean	Grab

[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] 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] **Effective immediately and lasting through April 30, 2014,** fecal coliform 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 maximum limit still applies. ***This sampling protocol for fecal coliform only applies if the discharge occurs between May 1 and September 30.***

[8] **Effective immediately and lasting through the life of the permit,** *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 maximum limit still applies. ***This sampling protocol for* E. coli *only applies if the discharge occurs between May 1 and September 30.***

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.

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.

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. **Weekly** inspections are required during a discharge. The lift station 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.

SCHEDULE OF COMPLIANCE

Based on past facility performance SDDENR believes the permittee will continue to struggle to meet ammonia limits with the current treatment system. Therefore, in accordance with ARSD §§74:51:01:28 and 74:52:03:22-23, a compliance schedule has been incorporated into the proposed permit. This schedule shall allow the permittee a reasonable period of time to evaluate the discharge, develop a plan for achieving compliance, and implement measures to assure compliance. The permittee shall achieve compliance with the permit limits specified for Outfall 001, in accordance with the following schedule:

1. Submit a Facility Plan that, at a minimum, includes the following elements:
   a. An evaluation of a treatment system, equipment, or process modifications necessary to achieve compliance with parameters or requirements listed in the permit.
   b. If necessary, selection of alternative for type of treatment system, process modifications, or equipment needed to meet the limits and requirements set forth in the permit.
   c. The Facility Plan submittal date shall be on or before: ……..…..…..**October 01, 2012**

2. Submit a progress report on design of the treatment system and/or process modifications described in the Facility Plan by:…….…...…...…….…...…... **February 01, 2013**

3. Complete design of the treatment system and/or process modifications described in the Facility Plan and submit the design by: ……..…….. **September 01, 2013**

4. Submit quarterly progress reports on construction of treatment systems, process modifications, equipment acquisition, or other items specified in the Facility Plan beginning: ……...…….**September 01, 2013**

5. Start construction of treatment system, process modifications, or equipment acquisition, if necessary, by: …….……...…….....…..**July 01, 2014**

6. Complete construction and startup of treatment system, process modifications, or equipment installation, and achieve full compliance with permit limits and requirements set forth in the permit by:……...……...**October 1, 2014**

SLUDGE

Based on the city of Chancellor'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 Chancellor is required to submit to SDDENR a sludge disposal plan for review and approval **prior** to the removal and disposal of sludge.

DRAINAGE ISSUES

Turner County has the authority to regulate drainage. Chancellor 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 Chancellor's geographic area.

COUNTY	GROUP	SPECIES	CERTAINTY OF OCCURRENCE
Turner	Bird	Crane, Whooping	POSSIBLE
	Fish	Shiner, Topeka	KNOWN

This information was accessible at the following US Fish and Wildlife Service website as of December 7, 2011: 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 Jonathan Hill, Natural Resources Project Engineer for the Surface Water Quality Program, at (605) 773-3351.

December 12, 2011

ATTACHMENT 1

Antidegradation Review

Permit Type:	**Minor Municipal - Renewal**	Applicant:	**City of Chancellor**
Date Received:	**02/05/2010**	Permit #:	**SD0020023639**
County:	**Turner**	Legal Description:	**NW ¼ of Sec 28, T 99 North, R 52 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: **Camp Creek: 6,8,9,10 and the Vermillion River: 5,8,9,10**

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: This permit does not authorize an increase in effluent limits.

*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: _____

Jonathan Hill	December 12, 2012
Reviewer	Date
Kelli D. Buscher, P.E.	December 12, 2012
Team Leader	Date

ATTACHMENT 2

Monitoring Data

	BOD, 5-day		Coliform, fecal general		Flow		Nitrogen, ammonia total (as N)		pH		Total Suspended Solids		Water Temperature	
	30-DAY AVG	7-DAY AVG	30-DAY GEO	DAILY MAX	30-DAY AVG	DAILY MAX	30-DAY AVG	DAILY MAX	DAILY MIN	DAILY MAX	30-DAY AVG	7-DAY AVG	30-DAY AVG	DAILY MAX
Limit	30 mg/L	45 mg/L	1000 #/100mL	2000 #/100mL	N/A Mgal/d	N/A Mgal/d	Varies mg/L	Varies mg/L	6.5 SU	9 SU	90 mg/L	135 mg/L	N/A deg C	
04/30/2006	13.75	15.67	NR	NR	0.28	0.69	**7.1**	**8.27**	7.9	8.38	18	21.67	12.9	13.3
10/31/2006	9	10	NR	NR	0.04	0.05	0.55	0.68	7.43	7.72	4	6	5.01	6.67
11/30/2006	13	20	NR	NR	0.17	0.24	0.69	0.94	7.39	7.56	8	12	5.01	5.56
04/30/2007	3.67	9	NR	NR	0.15	0.24	**4.9**	**9.5**	7.5	8.2	4.7	15	11.9	16.6
05/31/2007	4	4	10	10	0.11	0.11	**6.93**	6.93	7.5	7.5	6	6	16.6	16.6
10/31/2007	5.58	14	NR	NR	10.6	12	0.15	0.83	7.54	8.07	14.41	46	10.6	12
05/31/2008	17.6	23.6	278	710	0.27	0.78	**1.61**	2.99	7.31	8.35	29.6	42	13.7	16.6
04/30/2009	20.2	31	NR	NR	0.27	0.36	NS	NS	7.36	9.0	32.2	64	10.1	12.7
10/31/2009	6.5	2.3	NR	NR	0.2	0.28	0.52	0.72	7.59	8.59	49.7	41	4.5	7.2
03/31/2010	8.25	10	NR	NR	0.08	0.1	**8.83**	**9.2**	7.18	7.84	9	9.66	5.27	8.88
04/30/2010	19	19	NR	NR	0.1	0.1	**2.19**	2.19	8.57	8.57	8.57	8.57	11	11
06/30/2010	11	13	500	810	0.38	0.59	1.01	2.67	**6.44**	7.34	16	20	21.9	24.4
08/31/2010	20	33	497.5	1,400	0.36	0.79	0.05	0.06	7.6	8.3	40.5	76	27	27
11/30/2010	6.7	10	NR	NR	0.32	0.43	1.16	2.36	7.8	8.1	19.7	23	6.5	12.2
03/31/2011	5.6	5.6	NR	NR	0.15	0.78	**9.23**	**11.3**	7.21	7.4	7.31	7.31	5.16	5.5
04/30/2011	8.3	15	NR	NR	0.24	0.28	1	1.3	7.6	8.3	22.6	22.6	17.9	19.4
05/31/2011	5	5	BD	BD	0.25	0.17	**1.5**	2.1	7.7	7.7	5.5	5.5	22.7	25.5
06/30/2011	5	6	NS	NS	0.17	0.17	**1.5**	2.12	7.7	7.7	5.5	8	22.7	25.5

BD is Below Detection. Pollutant concentrations were too small to be measured.
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
Chancellor Treatment Facility

in Vermillion River
near
Chancellor, South Dakota

Prepared by

South Dakota Department of Environment and Natural Resources

2011

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 Chancellor's wastewater treatment facility (WWTF). These limits will ensure the surface water quality standards for Camp Creek near Chancellor are maintained and protected.

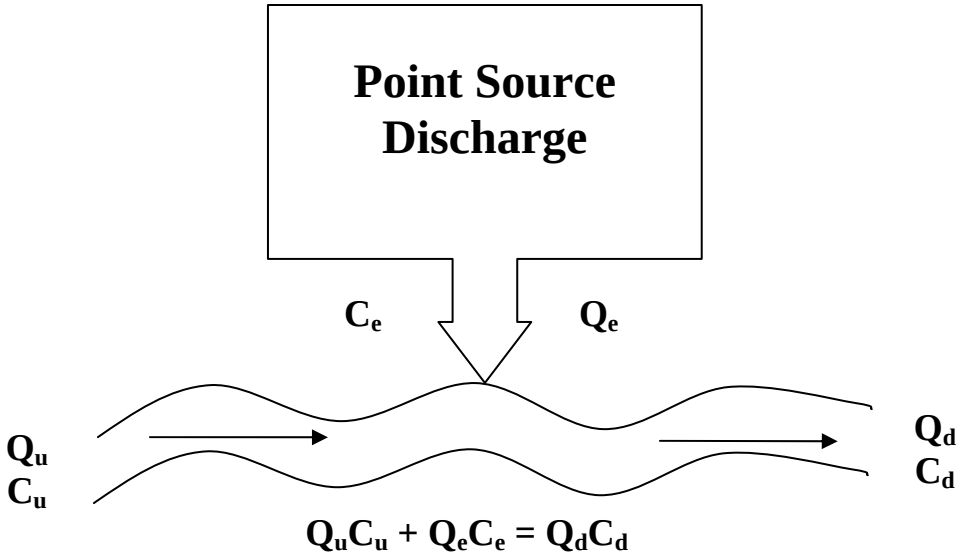
Developing the ammonia limits for Chancellor is a matter of determining the maximum level of ammonia that can be present in Camp Creek without causing the applicable South Dakota Surface Water Quality Standards (SDSWQS) for ammonia to be exceeded.

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 Chancellor:

Figure 1



Where,

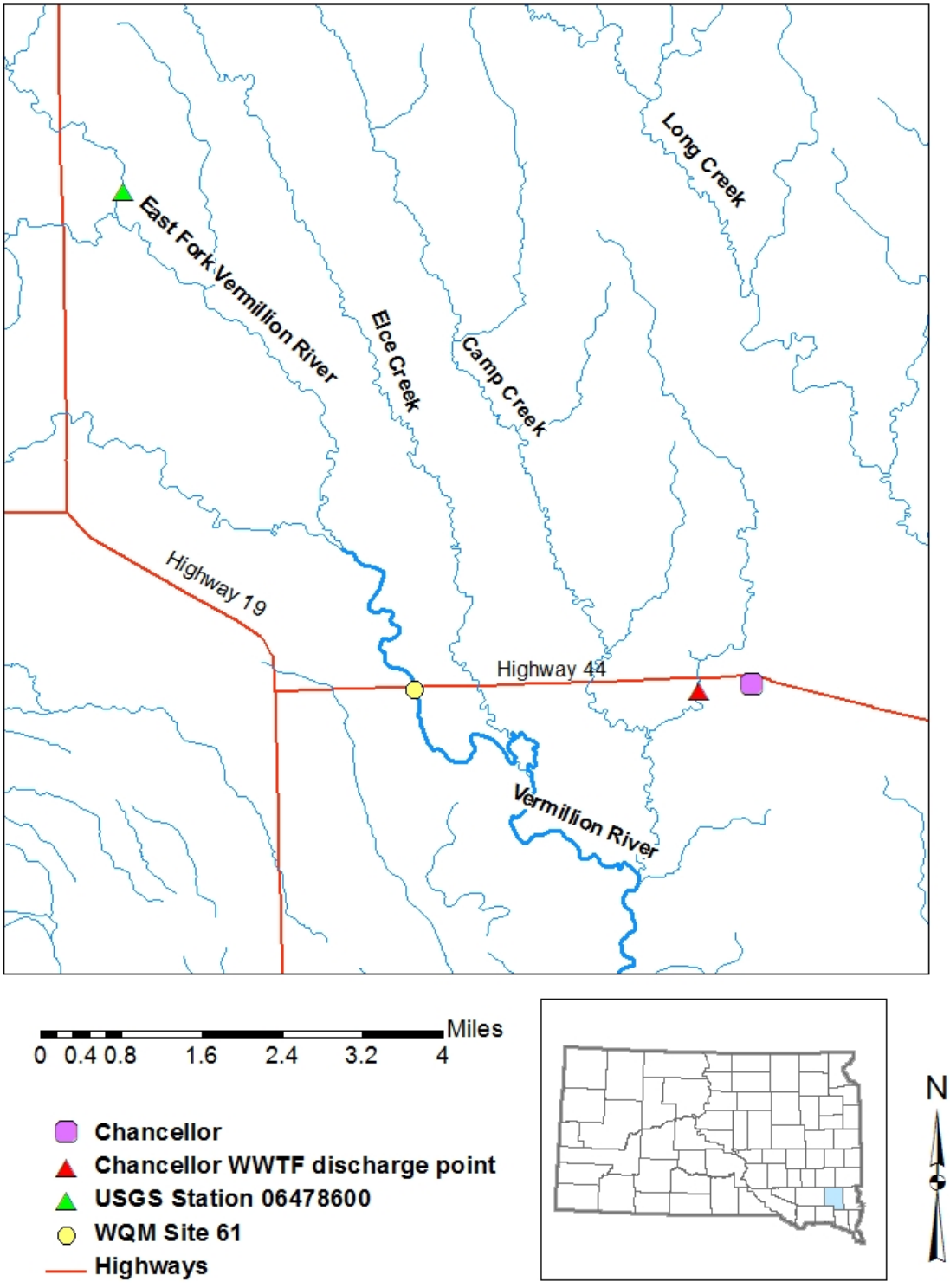
- Q_u = Receiving stream flow, in cubic feet per second (cfs);
- C_u = Ambient upstream ammonia concentration, in milligrams per liter (mg/L);
- Q_e = Effluent discharge flow rate, in cfs;
- C_e = Water quality based effluent limit for ammonia in mg/L;
- Q_d = Downstream flow (equal to $Q_u + Q_e$), in cfs; and
- 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 Chancellor WWTF's discharge into Camp Creek.

GEOGRAPHICAL EXTENT

Camp Creek is located in the Vermillion River Basin in the eastern portion of the state. The Vermillion River drains approximately 2,240 square miles of land, which is comprised largely of cropland. Figure 2 shows Camp Creek and the Vermillion River near Chancellor, along with the WQM and USGS stations used in calculating the proposed limits.

Figure 2: the Vermillion 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 Chancellor WWTF's discharge into Camp 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. The Vermillion River is classified for the following beneficial uses:

(5) Warmwater semipermanent 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 the Vermillion River. Early life stages are expected to be present from March 1 – October 31, based on the SDSWQS (ARSD Section 74:51:01:48).

Allowable Instream Ammonia Levels

Based on the beneficial uses of the Vermillion River, 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 Chancellor wastewater treatment facility, equations 2, 3, and 4 will be used to determine the instream ammonia concentration, C_d, allowed in the Vermillion River. C_d will be expressed as both 30-day average and daily maximum concentrations. The months 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.

Water quality samples are collected at a WQM station on the Vermillion River. A description of the station is listed below. Figure 2 denotes the location of WQM 61.

WQM 61 **On the Vermillion River, east-west SD Hwy 44 bridge 3 miles west of Chancellor**

Ambient temperature, pH, and ammonia data at WQM 61 were obtained to represent instream conditions. The water quality information obtained from WQM 61 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 80th percentile of the pH and temperature at WQM 61 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 month. Table 1 summarizes the allowable instream ammonia (C_d) for the Vermillion River. Table 2 summarized the allowable instream ammonia (C_d) for Camp Creek.

Table 1: Allowable Instream Total Ammonia Concentrations for the Vermillion River

Month	Temperature (°C)	pH (s.u.)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January	1.20	8.04	3.73	7.79
February	1.00	8.03	3.78	7.94
March (ELS present)	9.10	8.20	1.78	5.68
April (ELS present)	15.88	8.40	1.18	3.88
May (ELS present)	22.20	8.40	0.79	3.88
June (ELS present)	25.10	8.40	0.65	3.88
July (ELS present)	28.60	8.45	0.47	3.50
August (ELS present)	27.20	8.40	0.57	3.88
September (ELS present)	22.00	8.42	0.77	3.75
October (ELS present)	14.00	8.40	1.29	3.88
November	8.40	8.44	1.80	3.62
December	1.32	8.20	2.91	5.73

Table 2: Allowable Instream Total Ammonia Concentrations for Camp Creek

Month	Temperature (°C)	pH (s.u.)	C_d, Allowable Total Ammonia (mg/L)	
			30-Day Average	Daily Maximum
January	1.20	8.04	3.73	7.79
February	1.00	8.03	3.78	7.94
March	9.10	8.20	2.53	5.68
April	15.88	8.40	1.18	3.88
May (ELS present)	22.20	8.40	0.79	3.88
June (ELS present)	25.10	8.40	0.65	3.88
July (ELS present)	28.60	8.45	0.47	3.50
August (ELS present)	27.20	8.40	0.57	3.88
September (ELS present)	22.00	8.42	0.77	3.75
October (ELS present)	14.00	8.40	1.29	3.88
November	8.40	8.44	1.80	3.62
December	1.32	8.20	2.91	5.73

Because the allowable ammonia concentration is more stringent in the Vermillion River for the 30-day average in March, the WQBEL was developed to protect the Vermillion River, thereby also protecting the beneficial uses of Camp Creek.

AMBIENT AMMONIA CONCENTRATION (C_u)

The ammonia data at WQM 61 was reviewed to determine the ambient water quality in the Vermillion River. The 80th percentile of the ammonia data was determined to ensure the ammonia standards are maintained during critical conditions. The ammonia data from WQM 61 is presented in Attachment 4. Table 3 below summarizes the 80th percentile ammonia data for each month. This data represents the ambient ammonia concentration for the Vermillion River (C_u).

Table 3: Ambient Ammonia Data for the Vermillion River

Month	Ammonia (mg/L)
January	0.3
February	0.56
March	0.89
April	0.132
May	0.05
June	0.076
July	0.056
August	0.048
September	0.05
October	0.05
November	0.05
December	0.116

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 Chancellor WWTF, 1.36 cfs was used for Q_e based on the average daily maximum flow reported from April 1, 2001 through June 31, 2011 to ensure the ammonia standards are maintained during critical conditions. See Attachment 5 for more details.

Table 4 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 and the computer model *Aquarious* (log Pearson Type III analysis and log normal). A description of the station is listed below. Figure 2 denotes the location of USGS gauging station 06478600. Both the log Pearson type III and the log normal models determined the critical low flow for each season to be less than 1.0 cfs; therefore 1.0 cfs will be used in these calculations.

USGS 06478600 located on the East Fork Vermillion River near Parker, SD

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 4 and Attachment 6 summarize the flow data and the determination of Q_u for the Vermillion River.

Table 4: Critical Low Flow Values for the Vermillion River

Month	7Q5 Low Flow (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q5	Allowable Ratio of 7Q5	Critical Low Flow Q_u (cfs)
January	1.00	1.36	1.36	1.00	1.00
February	1.00	1.36	1.36	1.00	1.00
March	1.00	1.36	1.36	1.00	1.00
April	1.00	1.36	1.36	1.00	1.00
May	1.00	1.36	1.36	1.00	1.00
June	1.00	1.36	1.36	1.00	1.00
July	1.00	1.36	1.36	1.00	1.00
August	1.00	1.36	1.36	1.00	1.00

Month	7Q5 Low Flow (cfs)	Effluent Flow (cfs)	Ratio of Effluent to 7Q5	Allowable Ratio of 7Q5	Critical Low Flow Q_u (cfs)
September	1.00	1.36	1.36	1.00	1.00
October	1.00	1.36	1.36	1.00	1.00
November	1.00	1.36	1.36	1.00	1.00
December	1.00	1.36	1.36	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 Chancellor WWTF's discharge into the Vermillion River 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 Chancellor WWTF's discharge into the Vermillion RIver can be calculated as follows:

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

The water quality-based effluent limits for ammonia for the Chancellor WWTF's discharge into the Vermillion River are presented in Table 5.

Table 5: Variables Calculated for Mass Balance Equation

Month	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
January	0.30	3.73	7.79	2.36	1.36	6.3	13.3
February	0.56	3.78	7.94	2.36	1.36	6.1	13.4
March	0.89	1.78	5.68	2.36	1.36	2.4	9.2
April	0.13	1.18	3.88	2.36	1.36	2.0	6.6
May	0.05	0.79	3.88	2.36	1.36	1.3	6.7
June	0.08	0.65	3.88	2.36	1.36	1.1	6.7
July	0.06	0.47	3.50	2.36	1.36	0.8	6.0
August	0.05	0.57	3.88	2.36	1.36	1.0	6.7
September	0.05	0.77	3.75	2.36	1.36	1.3	6.5
October	0.05	1.29	3.88	2.36	1.36	2.2	6.7
November	0.05	1.80	3.62	2.36	1.36	3.1	6.2
December	0.12	2.91	5.73	2.36	1.36	5.0	9.9

The Chancellor WWTF'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.

During the months of February, April, May, June, and September, Chancellor's current 30-Day Average limits are adequate to protect the beneficial use and the water quality criteria for the Vermillion River. During the months of February, March, April, and September, Chancellor's current Daily Maximum limits are adequate to protect the beneficial use and the water quality criteria for the Vermillion River. These limits will be continued in the proposed permit, to prevent backsliding. During the remaining months, it was necessary to establish more stringent limits. The shaded values in Table 6 indicate the limits that will be proposed for the Chancellor WWTF. July's 30-day average limit was calculated as 0.8 mg/L. However, this limit was increased to 1.0 mg/L based on BPJ because of the inability of small wastewater treatment facilities to meet ammonia limits less than 1.0 mg/L

Table 6: 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	7.0	15.2	**6.3**	**13.3**
February 1 – February 29	**5.8**	**12.7**	6.1	13.4
March 1 – March 31	3.4	**8.6**	**2.4**	9.2
April 1 – April 30	**1.8**	**6.4**	2.0	6.6
May 1 – May 31	**1.3**	7.1	1.3	**6.7**
June 1 – June 30	**1.1**	6.9	1.1	**6.7**
July 1 – July 31	1.0	6.2	**0.8**	**6.0**
August 1 – August 31	1.1	7.8	**1.0**	**6.7**
September 1 – September 30	**1.3**	**6.1**	1.3	6.5
October 1 – October 31	2.8	8.8	**2.2**	**6.7**
November 1 – November 30	4.1	8.0	**3.1**	**6.2**
December 1 – December 31	5.1	10.2	**5.0**	**9.9**

ATTACHMENT 4

Water Quality Data from WQM 61

January Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
01/06/2004		1	8
01/06/2004	0.02		
01/07/2002		2	8.13
01/07/2002	0.06		
01/07/2003		2	8.3
01/07/2003	0.02		
01/08/2008	0.02	0	7.8
01/09/1980		0	6.4
01/09/1980	0.06		8.26
01/09/2001		3.2	7.76
01/09/2001	0.32		
01/09/2007	0.53	1	7.9
01/10/2006		1	8.1
01/10/2006	0.27		
01/12/1976			
01/12/2005		1	7.5
01/12/2005	0.13		
01/13/2010	0.16	1	7.8
01/18/1977			7.69
01/18/1977		0	
01/19/2011	0.1	1	8.5
01/22/2009	0.09	1	7.3
01/24/1979		0	7.4
01/24/1979	0.46		7.38
01/25/1978		0	6.5
01/25/1978	0.84		7.5
01/25/2000		1.5	7.53
01/25/2000	0.05		
01/26/1999		0.2	7.97
01/26/1999	0.02		
01/27/1981		0	7.4
01/27/1981	0.05		7.73
01/27/1982		0.26	7.8
01/27/1982	0.26		7.45
Average	**0.19**	**0.850526316**	**7.670833**
50th percentile	**0.095**	**1**	**7.745**
80th percentile	**0.3**	**1.2**	**8.04**

February Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
02/08/1977			
02/08/2011	0.18	1	7.5
02/10/2004		1	7.4
02/10/2004	0.15		
02/11/2002		2	8.23
02/11/2002	0.02		
02/11/2009	0.61	1	8.1
02/12/2003		1	7.9
02/12/2003	0.02		
02/14/2006		1	8.2
02/14/2006	0.02		
02/15/2005		1	8
02/15/2005	0.25		
02/17/2010	0.18	1	7.5
02/18/1976		0	7.5
02/18/1976			7.83
02/19/2008	0.09		7.54
02/21/1978		-0.56	6.3
02/21/1978	0.56		7.37
02/21/2007	0.47	1	7.4
02/22/1999		0.1	8.35
02/22/1999	0.02		
02/24/1981		1.11	7.6
02/24/1981	0.03		7.81
02/24/1982		0	7.3
02/24/1982	0.97		7.01
02/24/2000		3.5	8.03
02/24/2000	0.15		
02/26/1980		0	
02/26/1980	0.87		7.5
02/28/1979			
Average	**0.29**	**0.88**	**7.64**
50th percentile	**0.165**	**1**	**7.54**
80th percentile	**0.56**	**1**	**8.03**

March Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
03/02/1976		0	7.5
03/02/1976			7.87
03/09/1977		0	6.5
03/09/1977			7.72
03/15/2011	1	1	7.6
03/18/2003		8	8.3
03/18/2003	0.05		
03/18/2009	0.05	5	8.1
03/20/2007	1.29	4	7.8
03/22/2005		4	8.3
03/22/2005	0.02		
03/23/1982		3.33	
03/23/1982	0.58		7.85
03/23/1999		5.5	8.48
03/23/1999	0.02		
03/24/1980		3.89	
03/24/1980	0.18		8.15
03/24/1981		11.1	8.1
03/24/1981	0.04		8.13
03/25/2008	0.89	6	8
03/25/2010	0.16	6	7.8
03/26/2002		2.5	8.18
03/26/2002	0.02		
03/27/1979		2.22	7.3
03/27/1979			7.3
03/27/2001		9.5	7.69
03/27/2001	1.25		
03/28/2000		10.7	8.47
03/28/2000	0.02		
03/29/1978		5.56	7.1
03/29/1978			7.47
03/29/2004		9	8.1
03/29/2004	0.02		
03/29/2006		10	8.4
03/29/2006	0.02		
Average	**0.35**	**5.365**	**7.8484**
50th percentile	**0.05**	**5.25**	**7.87**
80th percentile	**0.89**	**9.1**	**8.204**

April Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
04/07/1976		12.2	8
04/07/1976			8.39
04/08/2002		10	8.35
04/08/2002	0.17		
04/11/2006		13	8
04/11/2006	0.14		
04/12/2005		9	8.2
04/12/2005	0.02		
04/12/2005			
04/12/2007	0.12	6	7.8
04/13/2004		14	8.3
04/13/2004	0.02		
04/13/2010	0.05	17	8.4
04/14/2009	0.05	13	8.4
04/15/2003		21	8.4
04/15/2003	0.02		
04/15/2008	0.02	11	8.7
04/18/2000		13.3	8.29
04/18/2000	0.02		
04/19/1977		17.80	8.5
04/19/1977			8.2
04/19/1999		10.4	8.08
04/19/1999	0.03		
04/23/1979		15.6	8.2
04/23/1979	0.03		8.52
04/23/2001		6	7.96
04/23/2001	0.27		
04/24/1978		7.78	7.6
04/24/1978	0.15		8.1
04/27/1982		15.6	8.7
04/27/1982	0.06		7.99
04/28/1981		14.4	8.2
04/28/1981	1.60E-02		
04/28/1982		15.56	8.7
04/28/1982	0.06		7.99
04/29/1980		17.80	8.1
04/29/1980	0.07		8.21
Average	**0.07**	**13.02178**	**8.232593**
50th percentile	**0.05**	**13.15**	**8.2**
80th percentile	**0.132**	**15.88**	**8.4**

May Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
05/04/1976		18.90	8
05/04/1976			8.38
05/05/2009	0.05	20	8.3
05/07/2002		15	8.44
05/07/2002	0.02		
05/09/2006		19	8.4
05/09/2006	0.02		
05/10/2011	0.05	19	8.2
05/12/2003	0.02		
05/12/2003		18	
05/15/2007	0.02	17	7.9
05/17/1999		17.2	8.18
05/17/1999	0.02		
05/17/2005		17	8.5
05/17/2005	0.02		
05/19/2004		17	8.2
05/19/2004	0.02		
05/19/2010	0.05	20	8.4
05/20/2008	0.02	18	8.4
05/21/2001		11.5	8.28
05/21/2001	0.02		
05/22/1978		22.20	8.2
05/22/1978	0.03		8.38
05/24/1977		26.70	8.5
05/24/1977			8.5
05/25/1982		17.78	7.5
05/25/1982	0.27		7.7
05/27/1981		22.20	7.6
05/27/1981	0.05		8.04
05/28/1980		23.90	8.2
05/28/1980	0.08		8.1
05/29/1979		22.20	7.9
05/29/1979	0.04		8.23
05/30/2000		23.2	8.42
05/30/2000	0.02		
Average	**0.05**	**19.28889**	**8.19**
50th percentile	**0.02**	**18.95**	**8.215**
80th percentile	**0.05**	**22.19999**	**8.4**

June Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
06/05/2007	0.02	22	8.4
06/08/1976		23.30	8
06/08/1976			8.34
06/10/2003		20	8.4
06/10/2003	0.02		
06/12/2001		22	8.26
06/12/2001	0.25		
06/13/2006	0.02	27	8.4
06/14/1999		24.7	8.35
06/14/1999	0.02		
06/14/2004		25	8.4
06/14/2004	0.02		
06/14/2005		20	7.9
06/14/2005	0.11		
06/14/2011	0.05	19	8.1
06/15/2010	0.09	21	7.6
06/17/2008	0.02	22	8.3
06/18/2002		25.5	8.39
06/18/2002	0.02		
06/21/1977		21.10	8.5
06/21/1977	0.03		8.14
06/23/1981		26.10	8.2
06/23/1981	0.06		8.7
06/23/2009	0.08	26	8
06/24/1980		25	8.3
06/24/1980	0.06		8.12
06/25/1979		24.40	8.2
06/25/1979	0.04		8.43
06/27/1978		25	7.3
06/27/1978			7.78
06/27/2000		20.2	8.12
06/27/2000	0.02		
06/29/1982		20	7.5
06/29/1982	0.07		7.97
Average	**0.06**	**22.965**	**8.151852**
50th percentile	**0.035**	**22.64999**	**8.2**
80th percentile	**0.076**	**25.1**	**8.4**

July Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
07/07/1976		23.30	8
07/07/1976			8.56
07/08/2003		23	7.8
07/08/2003	0.06		
07/09/1975			8.5
07/09/1975			8.3
07/10/2002		28.5	8.61
07/10/2002	0.02		
07/10/2007	0.02	26	8.4
07/12/2011	0.05	24	8.1
07/13/2004		28	8.3
07/13/2004	0.02		
07/13/2010	0.05	26	8.3
07/16/2008	0.02	29	8.5
07/17/2001		24	7.98
07/17/2001	0.03		
07/18/2006	0.02	30	8.4
07/19/1977		26.70	9
07/19/1977	0.08		8.2
07/20/2005		31	7.9
07/20/2005	0.02		
07/21/2009	0.05	24	8.3
07/24/1978		25	7.8
07/24/1978	0.07		8
07/26/1979		26.70	7.9
07/26/1979	0.05		8
07/26/1999		31.4	7.47
07/26/1999	0.02		
07/27/1982		26.10	
07/27/1982	0.06		8.43
07/27/2000		24.2	8.18
07/27/2000	0.02		
07/28/1981		20.60	7.4
07/28/1981	0.04		8.46
07/28/1981			
07/31/1980		24.40	8.2
Average	**0.04**	**26.095**	**8.18**
50th percentile	**0.035**	**26**	**8.2**
80th percentile	**0.056**	**28.6**	**8.454**

August Steam Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
08/03/1976		24.40	9
08/03/1976			8.42
08/05/2002		24	8.22
08/05/2002	0.03		
08/06/1975		25.5	8
08/06/1975			8.51
08/09/2000		31.2	8.36
08/09/2000	0.02		
08/10/2004		22	8
08/10/2004	0.02		
08/10/2010	0.05	27	7.9
08/11/2009	0.05	26	8.3
08/12/2008	0.02	26	8.4
08/13/2001		25	8.65
08/13/2001	0.02		
08/15/2006	0.02	28	8.4
08/16/1977		17.80	8
08/16/1977	0.07		7.85
08/19/2003		26	8
08/19/2003	0.02		
08/21/2007	0.02	28	8.2
08/22/1978		30	7.4
08/22/1978	0.04		8.38
08/23/1999		24.5	7.59
08/23/1999	0.02		
08/24/1982		25.60	7.8
08/24/1982	0.04		8.04
08/25/1981	0.22		7.74
08/25/1981		23.30	
08/26/1980		20	8
08/26/1980	0.02		8.04
08/28/1979		26.70	8.3
08/28/1979			7.92
08/30/2005		25	8.6
08/30/2005	0.02		
Average	**0.04**	**25.3**	**8.148889**
50th percentile	**0.02**	**25.54999**	**8.04**
80th percentile	**0.048**	**27.2**	**8.4**

September Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
09/04/2002		22	8.43
09/04/2002	0.02		
09/07/2004		22	7.4
09/07/2004	0.02		
09/07/2004	0.02		
09/08/2010	0.05	18	7.9
09/10/2001		23	8.68
09/10/2001	0.02		
09/12/2000		17.3	8.18
09/12/2000	0.04		
09/14/2009	0.05	23	8.1
09/16/2003		19	7.9
09/16/2003	0.02		
09/18/2007	0.02	21	7.9
09/20/1976		17.80	8.5
09/20/1976			8.2
09/20/1977		15.6	7.5
09/20/1977			7.82
09/20/2005		20	8.5
09/20/2005	0.02		
09/23/1975		11.1	8
09/23/1975			7.98
09/23/1999		19.2	6.91
09/23/1999	0.02		
09/23/2008	0.02	22	8.4
09/24/1979		21.10	8.1
09/24/1979	0.05		8.2
09/25/1978		19.44	7.8
09/25/1978	0.17		8
09/25/1979		21.10	8.1
09/25/1979	0.05		8.2
09/26/2006	0.02	18	8.5
09/30/1980		20	8.5
09/30/1980	0.06		8
09/30/1981		15.6	7.8
09/30/1981	0.02		8.06
Average	**0.04**	**19.31222**	**8.055714**
50th percentile	**0.02**	**19.72222**	**8.08**
80th percentile	**0.05**	**22**	**8.418**

October Steam Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
10/06/2003		20	8
10/06/2003	0.02		
10/09/1975		11.1	8
10/09/1975			8.12
10/10/2007	0.02	14	8.4
10/11/2006	0.02	8	8.4
10/12/2004		15	8.4
10/12/2004	0.02		
10/12/2005		14	8.5
10/13/2010	0.05	15	8.2
10/15/2002		10	8.22
10/15/2002	0.02		
10/15/2008	0.04	11	8.4
10/16/2001		11	8.76
10/16/2001	0.02		
10/18/1976		3.33	8.5
10/18/1976			8.21
10/20/2009	0.05	11	8
10/24/1978		8.33	8
10/24/1978	0.03		7.76
10/26/1977		9.4	8
10/26/1977	0.05		8.04
10/26/1999		9.6	7.08
10/26/1999	0.02		
10/26/2000		13.3	8.2
10/26/2000	0.02		
10/27/1981		12.2	
10/27/1981	0.02		7.9
10/28/1980		2.2	
10/28/1980	0.05		8.06
10/29/1979		13.3	8.3
10/29/1979	0.04		8.05
Average	**0.03**	**11.14544**	**8.145833**
50th percentile	**0.02**	**11**	**8.16**
80th percentile	**0.05**	**14**	**8.4**

November Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
11/04/1975			8.2
11/06/2002		3.5	8.46
11/06/2002	0.02		
11/07/2007	0.02	4	8.6
11/08/2004		10	8.6
11/08/2004	0.02		
11/10/2010	0.05	9	8
11/15/1976		2.22	8
11/15/1976			8.11
11/16/1999		7.5	6.86
11/16/1999	0.02		
11/17/2009	0.05	5	7.9
11/18/2008	0.02	2	8.5
11/19/2001		6.5	8.62
11/19/2001	0.02		
11/19/2003		10	8.4
11/19/2003	0.02		
11/19/2003	0.02		
11/21/1978		1.67	7
11/21/1978	0.05		8
11/22/2005		7	8.4
11/22/2005	0.02		
11/25/1980		1.11	
11/25/1980	0.04		7.96
11/27/1979		0	7.8
11/27/1979	0.09		8.08
11/27/2000		2.1	6.89
11/27/2000	0.07		
11/29/1977		1.67	7.4
11/29/1977	0.26		7.8
11/30/1981		2.22	
11/30/1981			8.04
Average	**0.05**	**4.440523**	**7.982727**
50th percentile	**0.02**	**3.5**	**8.02**
80th percentile	**0.05**	**7.4**	**8.448**

December Stream Data

Sample Date	Nitrogen, ammonia as N (mg/L)	Temperature, water (°C)	pH (SU)
12/01/1975			
12/02/2003		1	8.2
12/02/2003	0.02		
12/03/1979		0	8.7
12/03/1979	0.1		7.92
12/04/2000		1.2	6.98
12/04/2000	0.09		
12/04/2007	0.02	0	8.2
12/07/2010	0.05	1	7.4
12/08/1975		0	7.5
12/08/1975			7.6
12/08/2004		3	8.4
12/08/2004	0.02		
12/10/2002		1.5	8.2
12/10/2002	0.02		
12/13/1999		1.6	
12/13/1999	0.02		
12/13/2005		1	7.9
12/13/2005	0.15		
12/14/2006	0.02	1	7.9
12/16/2009	0.05	1	7.1
12/18/2001		2	8.34
12/18/2001	0.08		
12/18/2008	0.02	1	
12/19/1978		1.11	7.5
12/19/1978	0.12		7.8
12/20/1976			8
12/20/1976		0	
12/28/1977		0	
12/28/1977	0.62		7.7
12/29/1980		0	7.6
12/29/1980	0.19		7.56
12/29/1981		0	7.5
12/29/1981	0.02		7.68
Average	**0.09**	**0.86**	**7.80**
50th percentile	**0.05**	**1**	**7.75**
80th percentile	**0.116**	**1.32**	**8.2**

ATTACHMENT 5

Chancellor WWTF's Daily Maximum Flow Rate

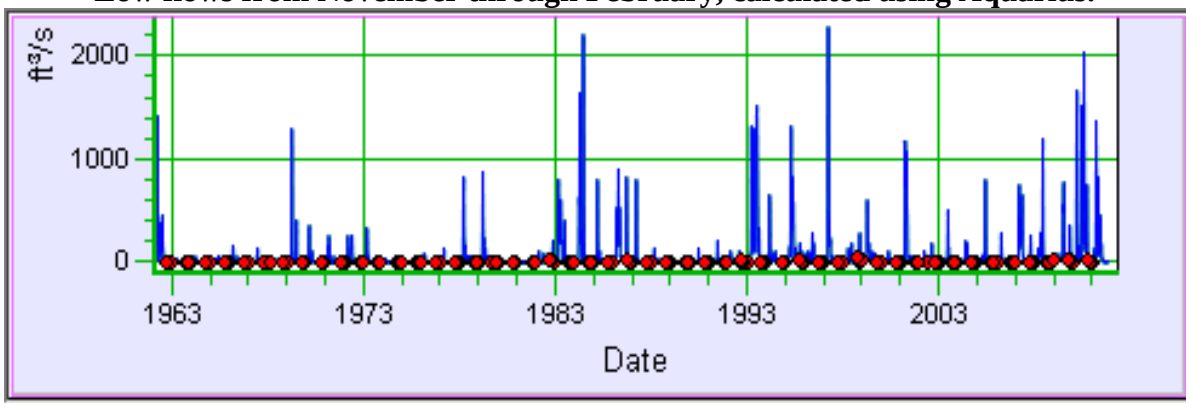
Date	MGD	Gallons per Day	cfs
04/30/2001	0.59	590000	0.91
05/31/2002	0.36	360000	0.56
04/30/2003	0.69	690000	1.07
11/30/2003	0.23	230000	0.36
05/31/2004	0.66	660000	1.02
11/30/2004	0.79	790000	1.22
05/31/2005	0.5	500000	0.77
04/30/2006	0.69	690000	1.07
10/31/2006	0.05	50000	0.08
11/30/2006	0.24	240000	0.37
04/30/2007	0.24	240000	0.37
05/31/2007	0.11	110000	0.17
10/31/2007	12	12000000	18.56
05/31/2008	0.78	780000	1.21
04/30/2009	0.36	360000	0.56
10/31/2009	0.28	280000	0.433
03/31/2010	0.1	100000	0.15
04/30/2010	0.1	100000	0.15
06/30/2010	0.59	590000	0.913
08/31/2010	0.79	790000	1.22
11/30/2010	0.43	430000	0.67
03/31/2011	0.78	780000	1.21
04/30/2011	0.28	280000	0.43
05/31/2011	0.17	170000	0.26
06/30/2011	0.17	170000	0.26
		Average=	**1.36**

ATTACHMENT 6

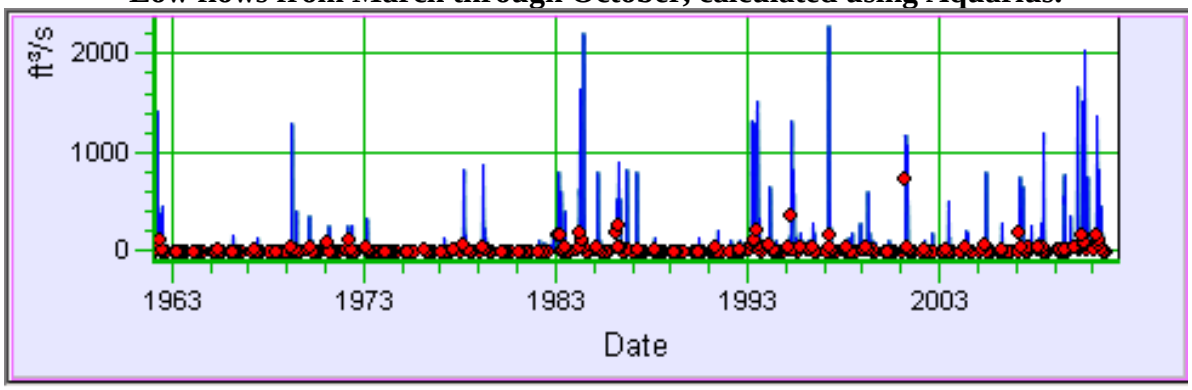
Receiving Stream Flow Data

RECEIVING STREAMFLOW DATA
USGS 06478600 Gauging Station

Low flows from November through February, calculated using Aquarius.



Low flows from March through October, calculated using Aquarius.



In the above charts, the blue lines show the flow in the Vermillion River. The red dots show the rolling 7 day average low flow. These were used to calculate the minimum 7-day average flow that can be expected to occur once every 5 years (7Q5).

November - February	
Log Pearson Type III	
m=-12.1293	
a=4.38825	
b=2.02621	
Log Normal	
mu=-3.23777	
sigma=6.24645	
Return Period of 5 years	Calculated 7Q5 (cfs)
Log Pearson Type III	**0.10210**
Log Normal	**0.00020**

March - October	
Log Pearson Type III	
m=-5.14468	
a=4.61997	
b=1.01468	
Log Normal	
mu=-0.456873	
sigma=4.65377	
Return Period of 5 years	Calculated 7Q5 (cfs)
Log Pearson Type III	**0.635646**
Log Normal	**0.012606**