

**CORRESPONDENCE / MEMORANDUM**

**State of Wisconsin**

DATE: April 9, 2007 FILE REF: 3200

TO: Angela Parkhurst - WCR

FROM: Susan Sylvester - WT/2

SUBJECT: Water Quality-Based Effluent Limitations for the City of River Falls (WI-0029394)

This is in response to your request for an evaluation of water quality-based effluent limitations for toxic substances using chs. NR 102, 105, 106, and 207 of the Wisconsin Administrative Code (where applicable), for the City of River Falls's discharge to the Lower Kinnickinnic Pond (Lake Louise). The discharge is located in the Kinnickinnic River Watershed of the St. Croix River in Pierce County.

Based on our review, the following recommendations are made on a chemical-specific basis:

Parameter	Limit Type	Limit and Units	Notes
Flow Rate		MGD	1
BOD <sub>5</sub> , Total	Monthly Avg	30 mg/L	1
BOD <sub>5</sub> , Total	Weekly Avg	31 mg/L, 465 lbs/day	1,2
BOD <sub>5</sub> , Total	Weekly Avg	45 mg/L	1,3
Suspended Solids, Total	Monthly Avg	30 mg/L	1
Suspended Solids, Total	Weekly Avg	31 mg/L, 465 lbs/day	1,2
Suspended Solids, Total	Weekly Avg	45 mg/L	1,3
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Daily Max	35 mg/L	3
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Weekly Avg	2.0 mg/L, 30 lbs/day	1,2
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Weekly Avg	7.5 mg/L, 113 lbs/day	1,3
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Monthly Avg	5.7 mg/L, 86 lbs/day	3,4
pH Field	Daily Max	9.0 su	1
pH Field	Daily Min	6.0 su	1
Chlorine, Total Residual	Daily Max	38 µg/L	1,5
Chlorine, Total Residual	Weekly Avg	24 µg/L	1,5
Fecal Coliform	Geometric Mean	400 #/100 ml	1,5
Phosphorus, Total	Monthly Avg	1.5 mg/L	1,6
Mercury		ng/L	7
4,4'-DDE		µg/L	8
Zinc, Total Recoverable	Daily Max	470 µg/L, 14 lbs/day	9
Acute WET		TU <sub>a</sub>	10
Chronic WET		rTU <sub>c</sub>	10

- Continued from last permit.
- Summer limit effective May 1 - October 31 each year.
- Winter limit effective November 1 - April 30 each year.
- The alternate wet weather monthly mass limit for ammonia is 94 lbs/day.
- Summer limit effective May 1 - September 30 each year. The applicable mass limits for Total Residual Chlorine are 0.84 pounds per day (daily maximum), 0.36 pounds per day (non-wet weather weekly

- average), and 0.46 pounds per day (wet weather weekly average).
6. Pending re-approval of the current alternate phosphorus limit.
  7. Quarterly influent, effluent, and field blank monitoring is recommended. Samples should be collected and analyzed according to s. 106.145(9) and (10).
  8. Quarterly monitoring is recommended. If all samples collected during the first year of the permit, and analyzed by an analytical technique at least as sensitive as the method used for the permit application, are reported below a level of detection, the monitoring may be discontinued.
  9. After the facility analyzes additional samples, either the P99 values or mean effluent concentration may allow these limits to be removed from the permit and decrease further testing requirements. Once additional copper sample results have been submitted the permittee may request a reevaluation of these limit recommendations.
  10. 1X yearly throughout the permit term (rotating quarters).

If there are any questions or comments, please contact Pat Oldenburg at (715) 831-3262 or via e-mail at [Patrick.Oldenburg@dnr.state.wi.us](mailto:Patrick.Oldenburg@dnr.state.wi.us).

Attachment: Addendum 1 (WQBELs – City of River Falls Wastewater Treatment Plant)

Prepared by: Patrick Oldenburg, WCR Water Resources Engineer

Approved for Signature by:   
Diane Figiel, Water Resources Engineer - Madison

cc: Pete Skorseth - WCR/Baldwin (via e-mail)  
Ken Schreiber - WCR (via e-mail)  
Pat Oldenburg - WCR

**Addendum 1:  
Water Quality-Based Effluent Limitations for  
City of River Falls (WI-0029394)**

**Prepared by:  
Pat Oldenburg - WCR  
March 14, 2007**

**Existing Permit Limitations:**

<b>Parameter</b>	<b>Limit Type</b>	<b>Limit and Units</b>	<b>Notes</b>
Flow Rate		MGD	1
BOD <sub>5</sub> , Total	Monthly Avg	30 mg/L	1
BOD <sub>5</sub> , Total	Weekly Avg	31 mg/L	1
BOD <sub>5</sub> , Total	Weekly Avg	45 mg/L	1
BOD <sub>5</sub> , Total	Weekly Avg	465 lbs/day	1
Suspended Solids, Total	Monthly Avg	30 mg/L	1
Suspended Solids, Total	Weekly Avg	31 mg/L	1
Suspended Solids, Total	Weekly Avg	45 mg/L	1
Suspended Solids, Total	Weekly Avg	465 lbs/day	1
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Weekly Avg	2.0 mg/L	
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Weekly Avg	7.5 mg/L	
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Weekly Avg	113 lbs/day	
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Weekly Avg	30 lbs/day	
pH Field	Daily Max	9.0 su	1
pH Field	Daily Min	6.0 su	1
Chlorine, Total Residual	Daily Max	38 µg/L	
Chlorine, Total Residual	Weekly Avg	24 µg/L	
Fecal Coliform	Geometric Mean	400 #/100 ml	1
Phosphorus, Total	Monthly Avg	1.5 mg/L	2
Acute WET		TU <sub>a</sub>	
Chronic WET		rTU <sub>c</sub>	

1. This substance is not being evaluated as part of this review. Since the reference effluent and stream flows have not changed, limitations for conventional pollutants do not need to be re-evaluated at this time.
2. Pending re-approval of the current alternate phosphorus limit.

**Information for Permit Reissuance Evaluation:**

**Receiving Water Information**

Name: Lower Kinnickinnic Pond (Lake Louise), an impoundment of the Kinnickinnic River

Classification: Warm water sport fish, Non-public Water Supply. At the point of discharge, the receiving water is a WWSF resource. It is an impoundment of the Kinnickinnic River. While Lower Kinnickinnic Pond (Lake Louise) is not a codified cold water resource, the Kinnickinnic River is a Class I trout stream, downstream of the impoundment and is an Outstanding Resource Water. The limitations calculated in this document will be based on the designated use of the downstream receiving water.

**Effluent Data**

Substances tested: Along with the substances for which monitoring was required in the permit, the City of River Falls, as a major municipality, was required to perform a priority pollutant scan. Detected substances with ch. NR 105 criteria (except ammonia) are shown in the effluent summary section below. Results for substances tested multiple times are listed at the end of this document.

**Effluent limit calculations for:** City of River Falls  
 WPDES Permit #: 0029394  
 Permit Drafter: Angela Parkhurst  
 Basin Engineer: Pete Skorseth - WCR/Baldwin  
 WQ Reviewer: Ken Schreiber - WCR

**Receiving Water Information:**  
 Receiving Water: Lower Kinnickinnic Pond (Lake Louise)  
 Watershed: Kinnickinnic River Watershed  
 Basin: St. Croix River  
 County: Pierce  
 Classification: Cold Water, Non-public Water Supply

Flows		7Q10	7Q2	90Q10	Estimated Harmonic Mean	Basin Area (mi <sup>2</sup> )
		26	37		54	
% Used For Mixing	=	25				
Hardness	=	208	PPM			

Background Metals Data Source: Rush River at Martell

Substance	Result
Cadmium	0.012
Chromium	0.295
Copper	0.598
Lead	0.099
Mercury	1.60E-03
Zinc	0.981

Effluent Information:		Daily Average Flow	
Outfall Number	f	(mgd)	(cfs)
001		1.8	2.79
<b>Σ</b>	<b>0</b>	<b>1.8</b>	<b>2.79</b>
Effluent Hardness	=	217	PPM
Effluent Dilution due to ZID	=		NA
7Q10:Qe	=	9.3	:1

**CALCULATION OF EFFLUENT LIMITATIONS BASED ON ATC (ug/L)**

SUBSTANCE	Ref. Hard. or pH	ATC	Max. Effl. Limit	1/5 of Effl. Limit	Mean Effl. Conc.	1- day P99	1-day Max. Conc.
Chlorine		19.03	38.06	7.61			
Arsenic		339.80	679.60	135.92	1.4		
Chromium (+3)	217	3400.70	6801.40	1360.28	3.37		
Copper	217	32.65	65.30			37.0	34.1
Mercury		0.83	1.66	0.33	0.024		
Nickel	157	2219.01	4438.02	887.60	1.45		
Zinc	217	237.01	474.02	94.80	110		
Gamma-BHC		0.96	1.92	0.38	0.029		
Chloride (mg/L)		757	1514.00			143.6	142

**CALCULATION OF EFFLUENT LIMITATIONS BASED ON CTC (ug/L)**

Receiving Water Flow = 6.5 cfs

SUBSTANCE	Ref. Hard. or pH	CTC	Mean Back- ground	Max. Effl. Limit	1/5 of Effl. Limit	Mean Effl. Conc.	4- day P99	4-day Max. Conc.
Chlorine		7.28		24.27	4.85			
Arsenic		152.20		507.41	101.48	1.40		
Chromium (+3)	208	157.05	0.295	522.89	104.58	3.37		
Copper	208	22.30	0.598	72.95			24.88	
Mercury		0.44	1.60E-03	1.46	0.29	0.024		
Nickel	157	246.88		823.06	164.61	1.45		
Zinc	208	228.40	0.981	759.16	151.83	110.0		
Chloride (mg/L)		395		1316.88			137	

**CALCULATION OF EFFLUENT LIMITATIONS BASED ON WC (ug/L)**

Receiving Water Flow = 7.86 cfs

SUBSTANCE	Ref. Hard. or pH	WC	Mean Back- ground	Max. Effl. Limit	1/5 of Effl. Limit	Mean Effl. Conc.	30- day P99	30- day Max. Conc.
4,4'-DDE		1.10E-05		4.21E-05	8.41E-06	3.90E-02		
Mercury		1.30E-03	1.60E-03	1.30E-03	2.60E-04	2.40E-02		

**CALCULATION OF EFFLUENT LIMITATIONS BASED ON HTC (ug/L)**

Receiving Water Flow = 13.50 cfs

SUBSTANCE	Ref. Hard. or pH	HTC	Mean Back- ground	Max. Effl. Limit	1/5 of Effl. Limit	Mean Effl. Conc.	30- day P99	30- day Max. Conc.
Chromium (+3)		2.50E+06	0.295	1.46E+07	2.92E+06	3.37		
Mercury		1.50E-03	1.60E-03	1.50E-03	3.00E-04	2.40E-02		
Nickel		4.30E+04		2.51E+05	5.03E+04	1.45		
Gamma-BHC (Lindane)		0.84		4.91	0.982	0.029		
Selenium		2.60E+03		1.52E+04	3.04E+03	0.72		
Silver		2.80E+04		1.64E+05	3.27E+04	0.88		

**CALCULATION OF EFFLUENT LIMITATIONS BASED ON HCC (ug/L)**

Receiving Water Flow = 13.50 cfs

SUBSTANCE	Ref. Hard. or pH	HCC	Mean Back- ground	Max. Effl. Limit	1/5 of Effl. Limit	Mean Effl. Conc.	30- day P99	30- day Max. Conc.
Arsenic		50		292	58	1.40		
Gamma-BHC (Lindane)		0.064		0.374	0.075	0.029		
Dichlorobromomethane		1960		11461	2292	0.526		
Chloroform		1960		11461	2292	2.13		
Total Halomethanes		1960		11461	2292	2.656		

**Effluent Limit and Monitoring Recommendations:**

Chlorine: No changes are recommended to the current chlorine limitations.

Mercury: Recently, ch. NR 106 was updated to include new rules pertaining to discharges of mercury. Quarterly mercury monitoring is recommended (see s. NR 106.45(3)). Since sufficient representative data is not available to determine reasonable potential under s. 106.145(2), it is recommended that this permit be a "Data Generation" permit. This means that quarterly influent, effluent, and field blank monitoring is recommended for River Falls but no numerical effluent limitations are recommended. Samples should be collected and analyzed according to s. 106.145(9) and (10).

4,4'-DDE: It is fairly unusual to detect this substance in a municipal wastewater plant effluent. 4,4'DDE is a breakdown product of DDT, the use of which has been banned for many years. The water quality based effluent limits for 4,4'DDE are all extremely low. However, since DDT is no longer approved for production or use, there is a possibility that the detected concentrations are not representative of the waste stream. Therefore, quarterly monitoring, rather than limits, is recommended to determine whether there are consistent measurable levels in the waste stream. If all samples collected during the first year of the permit, and analyzed by an analytical technique at least as sensitive as the method used for the permit application, are reported below a level of detection, the monitoring may be discontinued.

Zinc: The average effluent concentration exceeds 1/5 the calculated daily maximum limit. The recommended effluent limitations are 470 µg/L and 14 lbs/day (both rounded to two significant digits). The mass limit is based on the peak daily flow of 3.6 MGD. 9. After the facility analyzes additional samples, either the P99 values or mean effluent concentration may allow these limits to be removed from the permit and decrease further testing requirements. Once additional zinc sample results have been submitted the permittee may request a reevaluation of these limit recommendations.

Ammonia: The Department has recently revised its methods of developing ammonia limitations based on USEPA's 1999 Update of Ambient Water Quality Criteria for Ammonia. This included changes to the ammonia criteria and associated limits for all surface waters. The changes in the chronic criteria would have normally resulted in changes to the ammonia limitations, however since the Kinnickinnic River downstream is an outstanding resource water, the existing weekly average limitations cannot be increased beyond their current levels. In addition to the current limitations, a monthly average limitation of 5.7 mg/L and 86 lbs/day is recommended for the November through April time period. The mass limit is based on the concentration limit and the average design flow of 1.8 MGD. In addition an alternate wet weather mass limit of 94 lbs/day is recommended. This mass limit is based on the concentration limit and the peak monthly design flow of 1.97 MGD.

Based on the effluent pH data collected in the past three years the calculated daily maximum ammonia limit is 35 mg/L. Current departmental guidance suggests that for permittees who already have ammonia limits in their current permit, that all limit types (daily maximum, weekly and monthly average) be included in the reissued permit. It is recommended that the daily maximum limit be included in the permit for the months of November through April.

**Whole Effluent Toxicity Evaluation:**

For purposes of interpreting toxicity test data for the effluent discharges from River Falls Municipal Utility WWTF the following dilutions were applied:

Acute: Test organism survival after species-specific exposure period shall not be less than 50% in an effluent concentration of 100% (v:v).

Chronic: Based on effluent and receiving stream flow conditions summarized below, the dilution based instream waste concentration (IWC) is estimated as 30%. The IWC was calculated as follows:

$$IWC = \frac{Q_e}{[(1-f)Q_e + Q_s]}$$

Where:  $Q_e$  = 2.79 cfs (1.8 MGD) average annual design flow  
 $f$  = 0 (fraction of effluent flow withdrawn from the receiving water)  
 $Q_s$  = 6.5 cfs (25% of the 7Q10 of 26 cfs)

## Summary of Available Toxicity Test Data

Summary of Available Toxicity Test Data for Effluent Discharged from River Falls Municipal Utility WWTF. (NOTE: All pass/fail interpretations are based on dilution criteria described above.)

Date Initiated	Acute Results LC50 (% survival in 100% effluent)				Chronic Results IC25					Footnotes
	C. dubia	Fathead minnow	Pass or Fail?	Use in RPF?	C. dubia	Fathead Minnow	Algae	Pass or Fail?	Use in RPF?	
18-Oct-05	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
25-Aug-98	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
13-Apr-99	>100	>100	Pass	Yes	>100			Pass	No	1
18-Jan-00					>100	>100		Pass	Yes	
06-Nov-01					>100				No	1
17-Oct-02	>100	>100	Pass	Yes	>100				No	1
07-Jan-03	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
15-Apr-04	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
12-Oct-04	>100	>100	Pass	Yes	75	69		Pass	Yes	

1. Fathead minnow test inconclusive.

## WHOLE EFFLUENT TOXICITY TESTING CHECKLIST SUMMARY

	ACUTE	CHRONIC
<b>1. IWC</b>	1A. NOT APPLICABLE. <b>TOTAL POINTS = 0</b>	1B. IWC = < 35% <b>TOTAL POINTS = 0</b>
<b>2. HISTORICAL DATA</b>	2A. Passed all batteries. RPF = 0 <b>TOTAL POINTS = 0</b>	2B. Passed all batteries. RPF = 0 <b>TOTAL POINTS = 0</b>
<b>3. EFFLUENT VARIABILITY</b>	3A. Consistent operation and loading. <b>TOTAL POINTS = 0</b>	3B. Same as acute. <b>TOTAL POINTS = 0</b>
<b>4. STREAM CLASSIFICATION</b>	4A. Downstream ORW <b>TOTAL POINTS = 15</b>	4B. Same as acute. <b>TOTAL POINTS = 15</b>
<b>5. CHEMICAL SPECIFIC DATA</b>	5A. WQBEL required:1 Substances detected without WQBEL: 5 Additional compounds of concern: 5 <b>TOTAL POINTS = 10</b>	5B. WQBEL required:1 Substances detected without WQBEL: 9 Additional compounds of concern: 5 <b>TOTAL POINTS = 10</b>
<b>6. ADDITIVES</b>	6A. Biocide(s):1 Additive(s): 1 <b>TOTAL POINTS = 4</b>	6B. Same as acute. <b>TOTAL POINTS = 4</b>
<b>7. DISCHARGE CATEGORY</b>	7A. 1 industrial contributors. <b>TOTAL POINTS = 5</b>	7B. Same as acute. <b>TOTAL POINTS = 5</b>
<b>8. WASTEWATER TREATMENT</b>	8A. Secondary Treatment. <b>TOTAL POINTS = 0</b>	8B. Same as acute. <b>TOTAL POINTS = 0</b>
<b>9. DOWNSTREAM IMPACTS</b>	9A. None directly attributable to permittee. <b>TOTAL POINTS = 0</b>	9B. Same as acute. <b>TOTAL POINTS = 0</b>
<b>TOTAL POINTS</b>	<b>34</b>	<b>34</b>



Based upon the totals in the above checklist, the recommended acute test frequency is once per year for both acute and chronic.

**AMMONIA (as N) LIMITS**

Effluent Flow (mgd):	1.8
Effluent Flow (cfs):	2.785
<hr/>	
Effluent pH data:	
Begin Date	01-Jan-03
End Date	31-Dec-06
# of Samples	1460
Maximum	7.8
Average	6.90
Standard Deviation	0.177
Estimated 99th Percentile	7.31
Max. Effluent pH (s.u.):	7.30

**BACKGROUND INFORMATION:**

	<i>summer</i>	<i>fall</i>
4Q3 (cfs)		
7Q10 (cfs)	26	26
30Q5 (cfs)		
7Q2 (cfs)	37	37
Ammonia (mg/L) (1)	0.03	0.05
Temperature (deg C) (2)	17.75	7
pH (std. units) (3)	8.3	8.3
% of river flow used:	100	25
Reference weekly flow:	26	6.5
Reference monthly flow:	31.45	7.8625

**CRITERIA (in mg/L):**

Acute (@ effl. pH):	17.51	17.51
4-day Chronic (@ backgrd. pH):		
early life stages present	3.09	3.81
early life stages absent	3.09	6.19
30-day Chronic (@ backgrd. pH)		
early life stages present	1.24	1.52
early life stages absent	1.24	2.47

**EFFLUENT LIMITS (in mg/L):**

Daily maximum	35	35
Weekly average		
early life stages present	32	12.6
Monthly average		
early life stages present	15	5.7

(1) Kinnickinnic River Data

(2) Kinnickinnic River Data

(3) Kinnickinnic River Data

Date	Cu ( $\mu\text{g/L}$ )	Cl- (mg/L)	Date	Hardness (mg/L as $\text{CaCO}_3$ )
16-May-06	9.22	132	06-Jun-06	216
23-May-06	14.4	142	13-Jun-06	210
31-May-06	11.3	132	11-Jul-06	217
06-Jun-06	12.3	132	17-Aug-06	225
13-Jun-06	34.1	124		
20-Jun-06	13	129		
27-Jun-06	13.5	129		
06-Jul-06	13.7	134		
11-Jul-06	17.7	131		
19-Jul-06	16.1	131		
26-Jul-06	16.9	121		