

## Permit Fact Sheet

### 1 General Information

Permit Number:	WI-0025194-08-0	
Permittee Name:	Racine Wastewater Utility	
Address:	2101 S Wisconsin Ave	
City/State/Zip:	Racine WI 53403-3372	
Discharge Location:	Approximately 500' offshore of Building 160 into Lake Michigan, Racine County	
Receiving Water:	Lake Michigan, Racine County	
StreamFlow (Q <sub>7,10</sub> ):	A lake discharge dilution of 10:1 was used	
Stream Classification:	Great Lakes, cold water fishery	
Design Flow(s)	Daily Maximum	181.66 MGD 1998 facility plan
	Weekly Maximum	122.98 MGD 1998 facility plan
	Monthly Maximum	48.94 MGD 1998 facility plan
	Annual Average	36.00 MGD 1998 facility plan
Significant Industrial Loading?	Yes	
Operator at Proper Grade?	Yes – Rick Pace 4 - A, C, E, F, G, I, J; 1 - B, D, H; L - T. Others on staff as well. Required 4 - A, C, E, F, G, I, J	
Pretreatment Program Approval Date:	August 1, 1984	

### 2 Facility Description

The Racine Wastewater Treatment Plant (WWTP) is a conventional activated sludge plant with an average annual design flow of 36 MGD. The WWTP has flow equalization (EQ) basins, mechanically cleaned bar screens, grit removal, primary clarifiers, aeration tanks, final clarifiers, anaerobic digestion, gravity belt thickening, belt filter press dewatering, liquid chlorine disinfection with dechlorination for EQ basins and UV disinfection for plant effluent. The WWTP serves the communities of Racine, Caledonia, Elmwood Park, Mount Pleasant, North Bay, Somers (KR area), Sturtevant, and Wind Point.

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)
701	13.3 MGD last two years average	Influent samples shall be taken in the channel at the headworks structure.

<b>Sample Point Designation</b>		
<b>Sample Point Number</b>	<b>Discharge Flow, Units, and Averaging Period</b>	<b>Sample Point Location, Waste Type/sample Contents and Treatment Description (as applicable)</b>
001	18.3 MGD last two years average	Final effluent flow and samples shall be taken from Outfall #001, the combined outfall structure, the point where the plant effluent mixes with the effluent from the equalization basins before discharge to the lake. The flow through the equalization basins, if occurring, at a minimum receives primary treatment and disinfection before the combined outfall structure.
002	2950 dry ton/during year 2012	Anaerobically digested cake sludge - representative samples shall be collected prior to land application.
010	0 times since the upgraded plant began in Aug 2005	Safety Site PLANT - 21st Street & Roosevelt Avenue - Manhole SS-U0904
011	1 time during this permit term 0.002 MG total	Safety Site S01 - Augusta Street & Michigan Boulevard - Manhole SS-AC003
012	2 times during this permit term 1.635 MG total	Safety Site S02 - Michigan Boulevard & South Street Extd. - Manhole SS-B0045
013	2 times during this permit term 0.3844 MG total	Safety Site S03 - Carlton Drive & La Salle Street - Manhole SS-B0133R
014	0 times during this permit term	Safety Site S04 - 16th Street & College Avenue - Manhole SS-T0005
015	0 times during this permit term	Safety Site S05 - 21st Street & Grove Avenue - Manhole SS-U0040
016	6 times during this permit term 4.735 MG total	Safety Site S06 - Washington Avenue & Grove Avenue - Manhole SS-Z0010
018	3 times during this permit term 0.1495 MG total	Safety Site S08 - East 6th Street Siphon - Manhole SS-QQ006
019	4 times during this permit term 8.6334 MG total	Safety Site S09 - Ontario Street & 4th Siphon - Manhole SS-MC001
020	2 times during this permit term 0.1058 MG total	Safety Site S10 - Spruce Street & Brentwood Drive - Manhole SS-U0430
021	5 times during this permit term 1.2733 MG total	Safety Site S11 - Knoll Place & Norwood Drive - Manhole SS-KK005
022	0 times during this permit term	Safety Site S12 - Golf Avenue & Conrad Drive - Manhole SS-A0428
032	4 times during this permit term	Safety Site L02 - Spring Street & Luedke Court - LS #2 -

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)
	2.9542 MG total	Manhole SS-Y0001
036	1 time during this permit term 0.0017 MG	Safety Site L06 - Drexel Avenue & Maryland Avenue - LS #6 - Manhole SS-UO352
037	1 time during this permit term 0.0255 MG	Safety Site L07 - Steeple Chase Drive - Manhole ST – NL02005
038	1 time during this permit term 0.0016 MG total	Safety Site L08 - Rapids Court LS #8 - Manhole SS-BB005
039	6 times during this permit term 9.3533 MG total	Safety Site L09 - Frances Drive & Harrington Drive LS #9 - Station
110	8.37 MGD last 2 years average. Used five times during this period. Maximum 28.89 MGD on 4/18/13; Minimum 0.01 MGD on 4/12/13	EQ Basin #1, east basin. Flow rate shall be monitored only when blended with final effluent. Any blended effluent receives primary settling, disinfection, and is sampled with outfall 001 before discharge.
111	8.37 MGD last 2 years average. Used five times during this period. Maximum 28.89 MGD on 4/18/13; Minimum 0.01 MGD on 4/12/13	EQ Basin #2, west basin. Flow rate shall be monitored only when blended with final effluent. Any blended effluent receives primary settling, disinfection, and is sampled with outfall 001 before discharge.
112	NA	Collect field blanks using standard sampling procedures.
113	NA	Analyze samples for arsenic using an acceptable and highly sensitive analytical method.

### 3 Influent - Proposed Monitoring

#### 3.1 Sample Point Number: 701- INFLUENT TO PLANT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Continuous	Continuous	
BOD5, Total		mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	Daily	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Weekly	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Phosphorus, Total		mg/L	Weekly	24-Hr Flow Prop Comp	
Cadmium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 1.2.1.1 & 1.2.1.2
Chromium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 1.2.1.1 & 1.2.1.2
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 1.2.1.1 & 1.2.1.2
Lead, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 1.2.1.1 & 1.2.1.2
Nickel, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 1.2.1.1 & 1.2.1.2
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 1.2.1.1 & 1.2.1.2
Mercury, Total Recoverable		ng/L	Monthly	24-Hr Flow Prop Comp	See 1.2.1.3

### 3.1.1 Changes from Previous Permit:

Requirement for reporting precipitation at the plant, including noting snowmelt as a result of rain, discontinued.

### 3.1.2 Explanation of Monitoring Requirement Discontinuation

The Department agreed there could be difficulty in measuring and recording correctly the amount of snowmelt as a result of rain at the plant as expressed by the permittee. Besides, the impact of snowmelt will be evident in the influent flow. The permittee will continue to note the impact of snowmelt in its eDMR form Remarks section when it is necessary to provide additional information on high flows at the plant, following snowmelt that results from rain.

## 4 Inplant - Proposed Monitoring and Limitations

### 4.1 Sample Point Number: 110- EQ Basin #1; & 111 – EQ Basin #2

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Per Occurrence	Measure	See 2.2.1.1.
Flow Rate		hours	Per Occurrence	Calculated	Total time of blending

#### 4.1.1 Changes from Previous Permit:

None

#### 4.2 Sample Point Number: 112- Effluent Mercury blank

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Mercury, Total Recoverable		ng/L	Monthly	Blank	See 2.2.2.1

#### 4.2.1 Changes from Previous Permit:

None

Explanation of Limits and Monitoring Requirements

Standard mercury monitoring for a WWTP greater than 5 MGD

#### 4.3 Sample Point Number: 113 – Arsenic in the City Water Intake

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Arsenic		ug/L	Quarterly	Grab	See permit Note
Mercury		ng/L	Quarterly	Grab	See permit Note

#### 4.3.1 Changes from Previous Permit:

Arsenic and Mercury monitoring in the City Water Intake has been included.

#### 4.3.2 Explanation of Monitoring Requirement

Arsenic: The single effluent concentration of 1.5 ug/L reported by Racine in its permit application exceeds the Lake Michigan arsenic human health criterion of 0.2 ug/L. Also, the 1.5 ug/L concentration was associated with a level of detection (LOD) of 1.3 ug/L, which is considered very high compared with the human health criterion of 0.2 ug/L. Typically this situation would warrant an effluent limit equal to the 30-day P99 value of the intake water pursuant to s. NR 106.06(6)(e). But Racine currently has no intake arsenic data. Also, there is the potential, due to the high LOD, that the arsenic concentration reported at Racine is representative of a “false positive” regarding the presence or absence of arsenic. Therefore, it is proposed that Racine conduct a 2-year monthly monitoring of arsenic on the intake water from Lake Michigan, using a highly sensitive and acceptable analytical method.

Mercury: To obtain a baseline mercury level in the lake. The City water intake will be more representative of ambient mercury concentration in Lake Michigan.

## 5 Surface Water - Proposed Monitoring and Limitations

### 5.1 Sample Point Number:001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Continuous	Continuous	
BOD5, Total	Monthly Avg	30 mg/L	Daily	24-Hr Flow Prop Comp	
BOD5, Total	Weekly Avg	45 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	Daily	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	Daily	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	1.0 mg/L	Daily	24-Hr Flow Prop Comp	This is an interim limit, pending the development of a whole lake model {NR 217.13(4)}
Fecal Coliform	Geometric Mean	400 #/100 ml	Daily	Grab	
E. coli		#/100 ml	Daily	Grab	May to September only
Chlorine, Total Residual	Daily Max	38 ug/L	Daily	Grab	The applicable daily maximum mass limit is 58 lbs/day
Cadmium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 3.2.1.2 and 3.2.1.3
Chromium, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 3.2.1.2 and 3.2.1.3
Copper, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 3.2.1.2 and 3.2.1.3
Lead, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 3.2.1.2 and 3.2.1.3
Nickel, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 3.2.1.2 and 3.2.1.3
Zinc, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	See 3.2.1.2 and 3.2.1.3
Mercury, Total	Daily Max	5.8 ng/L	Monthly	Grab	See 3.2.1.5 and 3.2.1.6

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Recoverable					
Hardness, Total as CaCO <sub>3</sub>		mg/L	Quarterly	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	Daily	Continuous	
pH Field	Daily Min	6.0 su	Daily	Continuous	
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Daily Max - Variable	mg/L	Daily	24-Hr Flow Prop Comp	Report the effluent ammonia results. Limits apply Nov through April
Nitrogen, Ammonia (NH <sub>3</sub> -N) Total	Monthly Avg	34 mg/L	Daily	24-Hr Flow Prop Comp	Nov-April limit
Nitrogen, Ammonia Variable Limit		mg/L	Calculated	24-Hr Flow Prop Comp	Report the daily maximum ammonia limit using the Table in 3.2.1.4. limits apply Nov through April
Arsenic, Total Recoverable		ug/L	Quarterly	24-Hr Flow Prop Comp	See 2.2.3.1.
Chronic WET		rTUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See 3.2.1.7
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	See 3.2.1.7

### 5.1.1 Changes from Previous Permit

Inclusion of Arsenic Monitoring in the WWTF effluent.

Inclusion of a daily maximum limit of 5.8 ng/L for effluent mercury

### 5.1.2 Explanation of Monitoring Requirement

**Arsenic:** See 4.3.2 above

**Mercury:** NR 106.06(2) notes that the Great Lakes Water Quality Initiative requires that for existing dischargers of bioaccumulating chemicals of concern (BCCs), of which mercury is one, effluent limits may not exceed the most stringent criterion as of March 23, 2007, i.e. effluent limits will no longer be based upon the use of a mixing zone. For mercury, the most stringent criterion is 1.3 ng/l, which Racine has a reasonable potential to exceed in the absence of lake dilution. However, 40 CFR, Part 132, Appendix F, Procedure 3.C.6 of Federal Rules specifies procedures for an exception to the phase-out of a mixing zone for BCCs. These include submittal of a request by the permittee for an exemption to the mixing zone phase-out for mercury for technical and economic considerations. The City of Racine has submitted this request, which shall only apply to the 5-year permit term. In conformance with the conditions of 40 CFR, Part 132, Appendix F, Procedure 3.C.6, the proposed permit for Racine includes an alternative limit of 5.8 ng/l, as a daily maximum. The concentration is equal to the 1-day P99 of evaluated mercury data. Influent and effluent Monthly mercury monitoring are required along with field blanks. For detailed information see the attached memo on **Granting to the Racine Water Utility, an Exemption to the Mercury Mixing Zone Phase-out.**

**5.2 Sample Point Number: 010- SS PLANT; 011- S01; 012- S02; 013- S03; 014- S04; 015- S05; 016- S06; 018- S08; 019- S09; 020- S10; 021- S11; 022- S12; 032- L02; 036- L06; 038- L08, and 039- L09**

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Bypass		gal	Per Occurrence	Total Batch Volume	
Flow Bypass		hours	Per Occurrence	Calculated	

**5.2.1 Changes from Previous Permit**

None

**5.2.2 Explanation of Monitoring Requirements**

These are the points Racine uses in the event of SSOs. The addition of monitoring at these points to the DMR allows for future data analysis. SSO rules are still in effect and SSO forms are still required as described in the permit.

The safety sites, designated as S01 above for example, are built into the collection system to prevent basement back-ups. In the event of a surcharge, a high level is detected in the manhole and a message is sent through FM telemetry to the SCADA at the WWTP. When the flow reaches a higher elevation in the manhole it is redirected automatically to the storm sewer system. Flow monitoring begins at this point. The above stations designated by an L preceding a number are lift stations which may direct high flows to a storm sewer or directly from the lift station. Safety sites and lift stations are monitored by SCADA continuously through radio telemetry to the WWTP and are tested monthly. In addition, Racine has sites all over the city monitoring flow and gauging rainfall.

**6 Land Application - Proposed Monitoring and Limitations**

Municipal Sludge Description						
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Tons/Year)
002	B	Cake	Anaerobic Digestion	Incorporate	Land Apply and Landfill	5000 DT in year 2012
Does sludge management demonstrate compliance? Yes						
Is additional sludge storage required? No						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No						
If yes, special monitoring and recycling conditions will be included in the permit to track any potential						

Municipal Sludge Description						
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Tons/Year)
problems in landapplying sludge from this facility						
Is a priority pollutant scan required? Yes, in 2017 (the last scan was performed in 1999)						
Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.						

## 6.1 Sample Point Number:002- ANAEROBIC CAKE SLUDGE

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Solids, Total		Percent	1/ 2 Months	Grab	
Arsenic Dry Wt	Ceiling	75 mg/kg	1/ 2 Months	Grab	
Arsenic Dry Wt	High Quality	41 mg/kg	1/ 2 Months	Grab	
Cadmium Dry Wt	Ceiling	85 mg/kg	1/ 2 Months	Grab	
Cadmium Dry Wt	High Quality	39 mg/kg	1/ 2 Months	Grab	
Copper Dry Wt	Ceiling	4,300 mg/kg	1/ 2 Months	Grab	
Copper Dry Wt	High Quality	1,500 mg/kg	1/ 2 Months	Grab	
Lead Dry Wt	Ceiling	840 mg/kg	1/ 2 Months	Grab	
Lead Dry Wt	High Quality	300 mg/kg	1/ 2 Months	Grab	
Mercury Dry Wt	Ceiling	57 mg/kg	1/ 2 Months	Grab	
Mercury Dry Wt	High Quality	17 mg/kg	1/ 2 Months	Grab	
Molybdenum Dry Wt	Ceiling	75 mg/kg	1/ 2 Months	Grab	
Nickel Dry Wt	Ceiling	420 mg/kg	1/ 2 Months	Grab	
Nickel Dry Wt	High Quality	420 mg/kg	1/ 2 Months	Grab	
Selenium Dry Wt	Ceiling	100 mg/kg	1/ 2 Months	Grab	
Selenium Dry Wt	High Quality	100 mg/kg	1/ 2 Months	Grab	
Zinc Dry Wt	Ceiling	7,500 mg/kg	1/ 2 Months	Grab	
Zinc Dry Wt	High Quality	2,800 mg/kg	1/ 2 Months	Grab	
Nitrogen, Total Kjeldahl		Percent	1/ 2 Months	Grab	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Nitrogen, Ammonium (NH4-N) Total		Percent	1/ 2 Months	Grab	
Phosphorus, Total		Percent	1/ 2 Months	Grab	
Phosphorus, Water Extractable		Percent	1/ 2 Months	Grab	
Potassium, Total Recoverable		Percent	1/ 2 Months	Grab	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2016
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2016

### 6.1.1 Changes from Previous Permit:

None

### 6.1.2 Explanation of Limits and Monitoring Requirements

Requirements for land application of municipal sludge are determined in accordance with ch. NR 204 Wis. Adm. Code. Ceiling and high quality limits for metals in sludge are specified in s. NR 204.07(5). Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7) for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k).

## 7 Compliance Schedules

### 7.1 Mercury Pollutant Minimization Program

The permittee shall continue to implement a pollutant minimization program as defined in s. NR 106.145(7), Wis. Adm. Code and submit to the Department annual status reports on the progress of the PMP. The reports shall demonstrate verifiable reductions in the discharge of mercury.

Required Action	Due Date
Submit the first Annual Status Report.	09/30/2015
Submit second annual status Report.	09/30/2016
Submit third annual status report.	09/30/2017
Submit fourth annual status report.	09/30/2018
Submit the final annual status report.	06/30/2019
Note: The granting of this exception to a mercury mixing zone phase-out for the Racine WWTF shall apply only to the 5-year permit term of this WPDES permit. If the permittee wishes to apply for the mixing zone extension due to technical and economic considerations, the City of Racine will need to	

make a similar request and the WDNR will need to make a determination of the appropriateness of a continuation of the mixing zone phase-out exemption for the next permit term.	
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## **7.2 Explanation of Compliance Schedules**

7.1 is a requirement for all communities discharging to Lake Michigan whereby a community reports a bypass occurrence to the nearest water utilities within eight hours

7.2 is a continuation of Racine's mercury PMP. This is also a condition for granting an exception to the phase-out of a mixing zone for BCCs in accordance with 40 CFR, Part 132, Appendix F, Procedure 3.C.6 of Federal Rules specifies procedures.

## **8 Attachments:**

WQBEL Recommendations

Substantial Compliance Determination

Public Notice

Notice of Final Determination

Memo on Exemption to Mercury Mixing Zone Phase-out

## **9 Proposed Expiration Date:**

September 30, 2019

### **Prepared By:**

Timothy Thompson, Wastewater Engineer

**Date: August 20, 2014**

## CORRESPONDENCE / MEMORANDUM

State of Wisconsin

DATE: May 16, 2014

FILE REF: 3200

TO: Tim Thompson – South District East / Milwaukee

FROM: Jim Schmidt – WY/3 

SUBJECT: Water Quality-Based Effluent Limitations for the Racine Wastewater Treatment Facility (WPDES Permit # WI-0025194)

This is in response to your request for an evaluation of water quality-based effluent limitations using chs. NR 102, 105, 106, 207, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Racine Wastewater Treatment Facility to Lake Michigan. The evaluation of the permit recommendations is discussed in more detail in the attached report. Based on our review, the following recommendations are made on a chemical-specific basis:

<u>Substance</u>	<u>Effluent Limitations</u>
BOD5	30 mg/L monthly average, 45 mg/L weekly average
Total Suspended Solids	30 mg/L monthly average, 45 mg/L weekly average
pH	6.0 – 9.0 s.u. daily range
Fecal Coliforms	400 counts / 100 mL monthly geometric mean
<i>E. coli</i>	Monitoring only, once per week from May – September (1)
Mercury	
WQ-based limit	1.3 ng/L and 0.00039 lbs/day monthly average
Potential Variance	5.8 ng/L daily maximum
Arsenic	Effluent monitoring only, along with levels of detection and intake data if possible (2)
Total Phosphorus:	
Interim limit	1.0 mg/L monthly average
WQ-based limit	Not recommended at this time pending EPA development of the whole lake model for Lake Michigan
Temperature	Limits are not recommended; the permittee may discontinue its effluent temperature monitoring
Ammonia:	
November – April	Variable daily maximum limit table based on effluent pH (see table on next page) plus 34 mg/L monthly average

## Footnotes:

- (1) Monitoring for *E. coli* is required during the months of May through September to complement beach monitoring efforts during the recreation season. These data can assist the permittee in dealing with public inquiries regarding beach closings.
- (2) Because of a high level of detection reported with the effluent sample in the permit application, additional monitoring at a lower level of detection (LOD) is recommended with a goal LOD of 0.2 ug/L. Intake monitoring is also recommended if possible to determine the extent of the permittee's potential actual net addition of arsenic to the environment.

Variable Daily Maximum Ammonia Limit Table – November through April (same as previous permit)

Effluent pH - s.u.	NH <sub>3</sub> -N Limit – mg/L	Effluent pH - s.u.	NH <sub>3</sub> -N Limit – mg/L
pH ≤ 7.1	No Limit	8.0 < pH ≤ 8.1	9.3
7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

The need for acute and/or chronic whole effluent toxicity testing was re-evaluated here. Following the guidance provided in the most recent version of the Department's Whole Effluent Toxicity Program Guidance Document, acute and chronic testing is recommended once per year (each) in rotating quarters. Please consult the attached document for the whole effluent toxicity discussion.

If there are any questions or comments, please contact me at (608) 267-7658 or via e-mail at jamesw.schmidt@wisconsin.gov.

Attachment

**Water Quality-Based Effluent Limitations for  
Racine WWTF  
WPDES Permit # WI-0025194  
Prepared by:  
Jim Schmidt - WY/3**

**Existing Permit Limitations (WPDES Permit #WI-0025194-07-1, effective July 1, 2008 and expired December 31, 2012):**

Outfall 001 – Treatment plant effluent, activated sludge plant plus ultraviolet disinfection  
**Permit conditions following modification on April 1, 2011**

<u>Substance</u>	<u>Effluent Limitations</u>
BOD5	30 mg/L monthly average, 45 mg/L weekly average
Total Suspended Solids	30 mg/L monthly average, 45 mg/L weekly average
pH	6.0 – 9.0 s.u. daily range
Fecal Coliforms	400 counts / 100 mL monthly geometric mean
Total Phosphorus	1.0 mg/L monthly average
Total Residual Chlorine	38 ug/L daily maximum
Ammonia:	
November – April	Variable daily maximum limit table based on effluent pH, plus 34 mg/L monthly average

**Daily Maximum Ammonia Limits**

Effluent pH - s.u.	NH <sub>3</sub> -N Limit – mg/L	Effluent pH - s.u.	NH <sub>3</sub> -N Limit – mg/L
pH ≤ 7.1	No Limit	8.0 < pH ≤ 8.1	9.3
7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

The current permit also required periodic monitoring of *E. coli*, hardness, and because Racine is a pretreatment community monitoring was also required for cadmium, chromium, copper, lead, nickel, zinc and mercury. As part of the implementation process for the state's new thermal standards, Racine began continuous temperature monitoring in April of 2011. The results of that sampling, which has continued through the present, shall be used to determine the need for thermal limits in the reissued permit.

Limits are not being re-evaluated at this time for BOD5, TSS, pH, fecal coliforms, and ammonia. Since relevant water quality standards and design discharge rates have not changed, no changes are recommended for those limits. Chlorine limits are no longer calculated and evaluated because Racine no longer uses chlorine for disinfection. Ammonia limits are not re-evaluated because standards and design

discharge rates have not changed, but also because the permittee already has a variable limit table which also isn't changing based on current ammonia standards.

Phosphorus limits shall be re-evaluated in this report along with the pretreatment-related sample parameters mentioned above and the substances tested as part of the WPDES permit reissuance application.

**Information for Permit Reissuance Evaluation:**

**Receiving Water Information**

Name: Lake Michigan (WBIC = 20)  
Classification: Coldwater classification, public water supply  
Dilution factor used to calculate limits = 10 parts lake water to 1 part effluent

Source of background concentration data = Intake data from the WE Energies Oak Creek Power Plant and Elm Road Generating Facility

Background results used in limit calculations:

<u>Substance</u>	<u>Result</u>	<u>Substance</u>	<u>Result</u>
Chloride	13 mg/L	Ammonia (as N)	0.042 mg/L
Antimony	0.38 ug/L	Arsenic	0.84 ug/L
Cadmium	0.033 ug/L	Chromium (total)	0.40 ug/L
Copper	1.44 ug/L	Cyanide (total)	4.1 ug/L
Lead	0.15 ug/L	Nickel	0.33 ug/L
Thallium	0.03 ug/L	Zinc	1.2 ug/L
Methyl chloride	0.30 ug/L	Hardness	140 PPM
Mercury	0.66 ng/L (30-day 99 <sup>th</sup> upper percentile value = 0.93 ng/L)		

**Effluent Information**

Actual Flow (7/1/2008 – 2/28/2014):

Peak daily =	92.38 MGD (4/11/2013)
Peak 7-day average =	66.74 MGD (4/9 – 4/15/2013)
Peak 30-day average =	45.51 MGD (3/28 – 4/26/2013)
Peak 365-day average =	24.08 MGD (12/28/2008 – 12/26/2009)

Design Flow:

Annual average =	36 MGD (from WPDES permit reissuance application)
Estimated peak daily =	138.11 MGD (92.38 MGD X 36 / 24.08)
Estimated peak weekly =	99.78 MGD (66.74 MGD X 36 / 24.08)
Estimated peak monthly =	68.04 MGD (45.51 MGD X 36 / 24.08)

Acute dilution factor used = Not applicable

Effluent concentration data (reference database = 7/1/2008 – 3/31/2014):

Substances tested:

During term of the current WPDES permit = Ammonia, hardness, cadmium, chromium (total), copper, lead, mercury, nickel, zinc, phosphorus

In 2012 WPDES permit reissuance application = Chloride plus all substances on the EPA priority pollutant list not monitored periodically during the permit term

Results:

Substances detected in the WPDES permit reissuance application = Chloride, arsenic, chromium (+6), cyanide (total and amenable to chlorination), chloroform. Single results are available for all of those substances except for chloride. The chloride results as well as the others monitored during the permit term are summarized below.

Date	Chloride (mg/L)
3/29/2012	210
4/2/2012	190
4/10/2012	180
4/23/2012	180
Mean	190

Date	Hardness (PPM)	Date	Hardness (PPM)	Date	Hardness (PPM)
7/9/2008	248	7/7/2010	236	10/2/2012	184
10/7/2008	232	10/5/2010	180	10/16/2012 *	243
10/30/2008 *	313	1/4/2011	248	1/15/2013	296
1/7/2009	248	4/5/2011	300	4/3/2013	332
2/5/2009 *	313	7/6/2011	316	8/13/2013	264
4/7/2009	288	8/30/2011 *	233	9/24/2013 *	231
8/4/2009	220	10/4/2011	276	10/2/2013	216
10/6/2009	192	1/3/2012	276	1/7/2014	228
1/6/2010	284	4/3/2012	236		
4/6/2010	264	7/24/2012 *	251	GEO. MEAN	255
5/6/2010 *	307	8/1/2012	312		

\* - Hardness result was obtained as part of Racine's whole effluent toxicity testing. The indicated values are a mean of three samples results.

Because of the large number of results reported during the current permit term, only the effluent statistics shall be summarized below rather than all the individual results for cadmium, chromium, copper, lead, nickel, mercury, zinc, and phosphorus. Ammonia data are not summarized here because no changes were considered to the permit limits. The effluent temperature data shall be summarized later in this report as part of the temperature limit discussion because different statistical analyses were used to determine the need for temperature limits in permits. However, one significant modification was made to the database. Between April, 2013 and March, 2014 (along with an additional copper sample from September, 2008), all of the reported results had levels of detection (LODs) significantly greater than the remainder of the database. These high LODs questioned the accuracy and representative status of all the results reported during that period, including both the detected results and the non-detects. All of those values with high LODs were excluded from the database. The non-detects were excluded under s. NR 106.05(7)(b) while the detects were excluded because of the potential for false positives. The following summaries cover the results that were not excluded.

	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)
# of Results	59	59	58	59
# of Detects	4	24	48	23
Mean	0.0081	0.57	8.27	0.43
Maximum	0.197 (3/2011)	2.322 (3/2009)	22 (2/2009)	2.464 (9/2012)
1-day P99	NA	2.54	22.52	2.57
4-day P99	NA	1.72	16.29	1.50
30-day P99	NA	0.96	10.78	0.78

	Nickel (ug/L)	Zinc (ug/L)	Mercury (ng/L)	Phosphorus (mg/L)
# of Results	59	59	77	2100
# of Detects	57	49	77	2100
Mean	3.79	32.36	1.75	0.73
Maximum	8.303 (8/2011)	97 (1/2009)	5.8 (10/2/2013)	2.5 (8/2/2012)
1-day P99	7.79	106.16	4.52	1.43
4-day P99	5.78	69.63	2.94	1.04
30-day P99	4.45	43.82	2.13	0.83

In the above tables, "P99" refers to the 99<sup>th</sup> upper percentile value calculated using the procedure in s. NR 106.05(5), only for any substance with 11 or more detected results. "NA" is indicated for P99 values where less than 11 detected results are available.

### Effluent Limit Summary

Only the detected substances are summarized here. Results are in units of ug/L unless noted otherwise.

#### DAILY MAXIMUM LIMITS based on ACUTE TOXICITY CRITERIA

<u>Substance</u>	<u>Crit-erion</u>	<u>Effl. Limit</u>	<u>1/5 of Limit</u>	<u>Effluent Concentrations</u>		
				<u>Mean</u>	<u>P99</u>	<u>Max.</u>
Cadmium	12.75 *	25.50	5.10	0.0081		0.197
Chromium (total or +3)	3881.18 *	7762.36			2.54	2.322
Chromium (+6)	16.02	32.04	6.41	2		
Copper	37.53 *	75.06			22.52	22
Lead	264.16 *	528.32			2.57	2.464
Mercury	0.83	0.83			0.00454	0.0058
Nickel	1005.67 *	2011.34			7.79	8.303
Zinc	272.94 *	545.88			106.16	97
Chlorides (mg/L)	757	1514	302.80	190		210

\* - Criteria are based on a geometric mean effluent hardness of 255 PPM.

#### WEEKLY AVERAGE LIMITS based on CHRONIC TOXICITY CRITERIA

<u>Substance</u>	<u>Crit-erion</u>	<u>Effl. Limit</u>	<u>1/5 of Limit</u>	<u>Effluent Concentrations</u>	
				<u>Mean</u>	<u>P99</u>
Arsenic	148	1619.60	323.92	1.5	
Cadmium	3.21 *	34.98	7.00	0.0081	
Chromium (total or +3)	113.56 *	1245.16			1.72
Chromium (+6)	10.98	120.78	24.16	2	
Copper	13.80 *	137.40			16.29
Lead	38.76 *	424.86			1.5
Mercury	0.44	0.44			0.00295
Nickel	69.38 *	759.88			5.78
Zinc	161.56 *	1765.16			69.63
Cyanide	5.22	57.42	11.48	6	
Chlorides (mg/L)	395	4215	843	190	

\* - Criteria are based on a mean receiving water hardness of 140 PPM.

#### MONTHLY AVERAGE LIMITS based on WILDLIFE CRITERIA

<u>Substance</u>	<u>Crit-erion</u>	<u>Effl. Limit</u>	<u>1/5 of Limit</u>	<u>Effluent Concentrations</u>	
				<u>Mean</u>	<u>P99</u>
<b>Mercury (ng/L)</b>	<b>1.3</b>	<b>1.3</b>			<b>2.14</b>

MONTHLY AVERAGE LIMITS based on HUMAN THRESHOLD CRITERIA

<u>Substance</u>	<u>Crit- erion</u>	<u>Effl. Limit</u>	<u>1/5 of Limit</u>	<u>Effluent Concentrations</u>	
				<u>Mean</u>	<u>P99</u>
Cadmium	4.4	48.07	9.61	0.0081	
Chromium (total or +3)	100	1096			0.96
Chromium (+6)	83.5	919	184	2	
Lead	10	109			0.78
<b>Mercury (ng/L)</b>	<b>1.5</b>	<b>1.5</b>			<b>2.14</b>
Nickel	100	1097			4.45
Cyanide	138.6	1525	305	6	

MONTHLY AVERAGE LIMITS based on HUMAN CANCER CRITERIA

<u>Substance</u>	<u>Crit- erion</u>	<u>Effl. Limit</u>	<u>1/5 of Limit</u>	<u>Effluent Concentrations</u>	
				<u>Mean</u>	<u>P99</u>
<b>Arsenic</b>	<b>0.2</b>	<b>P99 of background</b>			<b>1.5</b>
Chloroform	53	583	117	0.27	

NOTE: No cumulative risk evaluation is necessary at this time because the arsenic limit is set equal to background-based statistics.

MONTHLY AVERAGE LIMITS based on TASTE & ODOR CRITERIA

<u>Substance</u>	<u>Crit- erion</u>	<u>Effl. Limit</u>	<u>1/5 of Limit</u>	<u>Effluent Concentrations</u>	
				<u>Mean</u>	<u>P99</u>
Copper	1000	10986			10.78
Zinc	5000	54988			43.82

Based on the above evaluations, the only substances potentially in need of permit limits are mercury and arsenic.

**Permit Recommendations:**

**Mercury:** As noted in the above tables, the mercury limits are set equal to the available criteria. This is done in order to conform with the EPA guidelines eliminating mixing zones for bioaccumulative chemicals of concern (BCCs) in the Great Lakes basin, language for which the Department plans to include in NR 106 for existing discharges the next time that code is revised. As a result, the proposed water quality-based limits are equal to the most stringent criterion which is the 1.3 ng/L monthly average based on the NR 105 wildlife criterion. The water quality-based limit for Racine would therefore be 1.3 ng/L monthly average along with a monthly average mass limit of  $3.9 \times 10^{-4}$  lbs/day based on the 36 MGD design flow and the limit/criterion. Since Racine's 30-day P99 concentration of 2.14 ng/L exceeds the 1.3 ng/L limit/criterion, a variance may be considered if the permittee wishes to apply for one. Typically, mercury variance limits are set equal to the 1-day P99 and expressed as a daily maximum rather than a monthly average. Based on that, the variance limit would be 5.8 ng/L daily maximum.

**Arsenic:** Racine reported an effluent concentration of 1.5 ng/L, which potentially exceeds the limit since background levels (as measured in the intake waters of the nearby Oak Creek power plant) are above the 0.2 ug/L human health criterion. Typically, a situation like this would warrant an effluent limit equal to the 30-day P99 value of the intake water pursuant to s. NR 106.06 (6)(e). However, with only a single intake result available at the Oak Creek power plant, a P99 intake value cannot be calculated. An additional complicating factor is the fact the 1.5 ug/L effluent concentration was associated with a level of detection (LOD) of 1.3 ug/L, which is considered to be fairly high for arsenic. Many other facilities in southern and southeastern Wisconsin have recently reported LODs around 1 to 1.3 ug/L, including

Beloit, Madison, Brookfield, Kenosha, Oshkosh, and industrial discharges such as the Appleton Coated, Georgia Pacific, Kimberly Clark, Procter & Gamble, and the Expera paper mills along the Lower Fox River, but others such as Watertown (0.44 ug/L), Walworth County MSD (0.61 ug/L), Sheboygan (0.5 ug/L), Cleveland (0.06 to 0.2 ug/L) and Janesville (0.12 ug/L) have reported lower LODs to such a degree that the Department feels LODs lower than 1.3 ug/L can be reported using acceptable test methods. It is noted that the permittees not having direct discharges to the Great Lakes don't need stringent LODs for arsenic, though, since the relevant water quality criterion is much looser in inland waters (13.3 ug/L) than it is for Lake Michigan (0.2 ug/L).

It is also noted that the reported intake value at the Oak Creek power plant was 0.84 ug/L, which is also lower than the LOD at Racine. Since the current human health criterion for Lake Michigan is only 0.2 ug/L, it is unclear at this time whether or not Racine is actually providing a net addition of arsenic to the environment. There is also the potential that the concentration reported at Racine is representative of a "false positive" regarding the presence or absence of arsenic. These conclusions are primarily related to the high LOD in Racine's effluent and the high intake value at Oak Creek.

The comparison with Cleveland is of particular significance in the summary above because of the large amount of data generated there over recent years. Its situation is unique because Cleveland uses groundwater for its municipal water supply and then discharges to Lake Michigan; with the groundwater concentrations being very high that community has taken considerable care and interest in the collection of arsenic samples as they relate to the treatment plant's arsenic variance. That situation is enviable because there is much more effluent and LOD information at Cleveland than at all the other (much larger) communities mentioned earlier, and maybe even more than the combined databases. It is noted that effluent data from Milwaukee and Waukesha were not readily available at the time of this evaluation.

For the reasons discussed above, it is recommended at this time that additional monitoring be performed on Racine's outfall, using as low of an LOD as possible (compared to the 1.3 ug/L reported in the application). Based on limited data from other municipal treatment plants, it is believed that lower LODs are achievable. In addition, if possible it is recommended that Racine attempt to do some monitoring on the intake water from Lake Michigan using similarly low LODs. This sampling should be performed, if possible, on the city water supply intake and not on the treatment plant influent as the former is more representative of ambient concentrations in Lake Michigan.

#### **Other Evaluations:**

**Thermal Limits:** Chapter NR 102, Subchapter II of the Wisconsin Administrative Code establishes water quality standards for temperature, in order to protect fish and other aquatic life from lethal and sub lethal effects. Chapter NR 106, Subchapter V, specifies procedures for calculating water quality based effluent limitations for temperature. These rule changes became effective on October 1st, 2010.

In accordance with s. NR 106.53(2)(b), the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. This monthly temperature calculation is based on a Great Lakes off-shore discharge site, with a 3,141,593 sq. ft. mixing zone. The thermal spreadsheets used for this calculation are presented on the following page.

The first table lists the applicable criteria for Lake Michigan (Southern Lake Michigan waters from Table 5 of ch. NR 102 as well as the relevant factors used to calculate limits from the formula in s. NR

106.55(7). Most importantly, though, are the effluent flows used to calculate thermal limits. Since Racine has been doing continuous thermal monitoring since April of 2011, the peak daily and weekly (Sunday – Saturday) flows that have been reported by Racine since April of 2011 are used to calculate the thermal limits in order to provide consistency between the flow and temperature reference databases.

Based on that information, the second table provides the calculated daily maximum and weekly average thermal limits at Racine for each month of the year, alongside the reported peak daily and the calculated peak weekly temperatures for each month using ss. NR 106.52 and 106.54.

Month	Water Quality Criteria			Representative Highest Effluent Flow Rate (Qe)		B	e <sup>-a</sup> (for SL- WQBEL)	e <sup>-a</sup> (for A- WQBEL)
	Ta (default)	Sub- Lethal WQC	Acute WQC	7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)			
	(°F)	(°F)	(°F)	(mgd)	(mgd)			
JAN	35	43	69	26.42	57.55	0.405	0.193	0.470
FEB	34	46	69	22.68	46.850	0.405	0.147	0.395
MAR	37	52	70	46.06	74.900	0.405	0.389	0.560
APR	43	59	70	66.74	92.380	0.405	0.521	0.625
MAY	48	65	72	35.68	47.810	0.405	0.296	0.403
JUN	54	70	73	51.60	75.930	0.405	0.431	0.564
JUL	59	71	74	23.64	30.490	0.405	0.159	0.240
AUG	63	70	76	15.15	17.860	0.555	0.032	0.055
SEP	60	64	74	17.77	22.670	0.555	0.054	0.101
OCT	53	57	73	14.96	20.420	0.405	0.055	0.119
NOV	45	49	71	22.04	35.480	0.405	0.139	0.294
DEC	38	44	70	23.53	37.630	0.405	0.158	0.315

Month	Peak Weekly Ave. Temp	Peak Daily Max. Temp.	Weekly Ave. Limit	Daily Max. Limit	Month	Peak Weekly Ave. Temp	Peak Daily Max. Temp.	Weekly Ave. Limit	Daily Max. Limit
JAN	57	59	76	107	JUL	72	75	> 120	120
FEB	54	55	116	120	AUG	73	74	> 120	120
MAR	57	63	76	96	SEP	72	73	> 120	120
APR	58	59	74	86	OCT	69	72	> 120	120
MAY	63	65	105	108	NOV	64	66	74	120
JUN	68	72	> 88	88	DEC	62	63	76	120

It is noted that since the peak weekly average temperatures are below the weekly average thermal limits in each month and the peak daily temperatures are below the daily maximum thermal limits in each month, neither daily maximum thermal limits nor monitoring are recommended. Racine may, therefore, discontinue its effluent temperature monitoring.

**Phosphorus – Technology Based:** Wisconsin Administrative Code, ch. NR 217, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of total phosphorus per month to comply with a monthly average technology based limit of 1.0 mg/L, or an approved alternative concentration limit. As noted above, the current permit includes the 1.0 mg/L. Therefore, a technology-based phosphorus limit remains applicable, unless a water quality based effluent limit would be more restrictive.

**Phosphorus – WQBEL:** Revisions to the administrative rules regulating phosphorus took effect on December 1, 2010 and established water quality criteria (WQC) for phosphorus. Because the Racine treatment plant discharges directly into Lake Michigan, s. NR 217.13(4) applies. The criteria for Lake Michigan is 7 ug/L as described in s. NR 102.06 (5)(b). A whole lake model is in development by U.S. EPA which may impact Racine’s permit limit, but until that model is completed only an interim monthly average limit is recommended in accordance with s. NR 217.13(4). NR 217.13(4) states the Department may set an interim limit based on the best readily available phosphorus removal technology, and the note following s. NR 217.13(4) states that the best readily available phosphorus removal technology indicates an interim limit of 0.6 mg/L. However, that is not considered to be a requirement for Lake Michigan discharges because of the use of the word “may” in the above-referenced code.

Based on the effluent results summary listed earlier in this evaluation on page 3, the 30-day P99 value for the 2,100 effluent results reported since July 1, 2008 is 0.83 mg/L. The peak 30-day average phosphorus concentration reported over this time was 0.92 mg/L, covering parts of August and September in 2011. On a total of 151 occasions out of the 2,100 total daily results, the daily effluent phosphorus concentration exceeded 1.0 mg/L, but the exceedances were not consistently occurring at a level where the current permit limit of 1.0 mg/L was also exceeded. The 30-day P99 and peak monthly averages were close enough to 1.0 mg/L, though, that the recommended interim phosphorus limit for Racine is set equal to the current permit limit of 1.0 mg/L monthly average.

**Ammonia:** Although no changes are being considered to the permit limits for ammonia, evaluation of effluent data is needed as part of the whole effluent toxicity evaluation in the next section of this report. Part of that evaluation includes the determination of whether or not ammonia limits are needed in the permit due to high effluent concentrations. Normally, this evaluation isn’t needed for a municipal discharge because s. NR 106.33(2) lists the conditions under which permit limits are not needed for ammonia. Seasonal ammonia limits are not required for municipal discharge permits when the calculated limit is above 20 mg/L in May – October or 40 mg/L in November – April; there is no evaluation of effluent data to determine the reasonable potential for exceedance of water quality standards for ammonia. During the current permit term, Racine reported 2,100 effluent ammonia sample results between July of 2008 and March of 2014. The results are summaries in the following table.

**Year-Round Ammonia Data @ Racine:**

	Ammonia		Ammonia
# of Results	2100	1-day P99	17.19 mg/L
# of Detects	2100	4-day P99	9.69 mg/L
Mean	4.17 mg/L	30-day P99	5.84 mg/L
Maximum	23.2 mg/L (3/4/2010)		

The current permit contains ammonia limits (to which no changes are proposed) consisting of a daily maximum limit table related to effluent pH along with a monthly average limit of 34 mg/L, applicable

between the months of November and April. Monitoring with no limits apply during the months of May through October. Therefore, it may be more appropriate to do the ammonia effluent statistics only on November – April data. The following table summarizes that information.

**November – April Ammonia Data @ Racine:**

	Ammonia		Ammonia
# of Results	1057	1-day P99	18.73 mg/L
# of Detects	1057	4-day P99	10.85 mg/L
Mean	5.08 mg/L	30-day P99	6.85 mg/L
Maximum	23.2 mg/L (3/4/2010)		

Since the 30-day P99 of 6.85 mg/L during November – April is far below the 34 mg/L limit and the maximum daily result is also below 34 mg/L, there are obviously no exceedances of the monthly average limit which is based on chronic toxicity of ammonia.

As for the daily maximum limits, compliance is determined on a day-to-day basis since the permit limit is dependent upon the reported effluent pH. During the current permit term, the reported effluent pH ranged from 6.7 to 7.8 s.u. The effluent pH values were typically in the range of 7.5 to 7.7 s.u. on the days with the highest ammonia results. For instance, on 3/4/2010 when the peak ammonia concentration was 23.4 mg/L, the effluent pH was 7.6 s.u. According to the ammonia limit table in the permit, the ammonia limits are 27 mg/L at pH 7.5, 23 mg/L at pH 7.6, and 19 mg/L at pH 7.7. On 3/4/2010, therefore, the effluent concentration was slightly above the 23 mg/L permit limit, but since the permit limits are rounded to two significant digits (unlike the effluent results), there is a valid argument that after rounding the variable permit limit is not exceeded. The following table lists the twenty highest ammonia results reported during the current permit term, the pH values reported on those days, and the calculated ammonia limit from the table in the permit:

Date	Ammonia (mg/L)	pH (s.u.)	Ammonia Limit (mg/L)	Date	Ammonia (mg/L)	pH (s.u.)	Ammonia Limit (mg/L)
2/9/2010	16	7.5	27	2/16/2010	18.8	7.5	27
2/12/2010	16	7.5	27	2/19/2010	18.8	7.5	27
3/1/2010	16	7.6	23	2/24/2010	18.8	7.6	23
8/30/2008	16.2	7.6	*	2/25/2010	18.8	7.6	23
2/27/2010	16.5	7.6	23	2/23/2010	19	7.5	27
9/2/2008	17.1	7.7	*	2/26/2010	19.6	7.5	27
2/10/2010	17.9	7.5	27	8/29/2008	19.9	7.6	*
2/17/2010	17.9	7.5	27	9/3/2008	21	7.6	*
3/5/2010	17.9	7.5	27	3/3/2010	23	7.6	23
2/18/2010	18.2	7.5	27	3/4/2010	23.2	7.6	23

\* - No limit was calculated because the result was reported on a day in which the permit limits did not apply, namely between the months of May and October.

It is noted that the highest ammonia results occurred over two relatively short periods, namely the second week of February through the first week of March in 2010 and late August and early September of 2008 (limits did not apply during the latter period). For the February – March 2010 results, though, none of the daily maximum limits were exceeded outside of the rounding issue on 3/4/2010.

Based on the above summaries, it is concluded that there were no exceedances of ammonia limits during the current permit term which would impact the whole effluent toxicity evaluation.

**Whole Effluent Toxicity Evaluation:**

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time. Acute tests predict the concentration that causes lethality of aquatic organisms during a 48-96 hour exposure. Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven day exposure.

**Acute WET:** In order to assure that the discharge from outfall 001 is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC<sub>50</sub> greater than 100% effluent.

**Chronic WET:** In order to assure that the discharge from outfall 001 is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC<sub>25</sub> greater than the instream waste concentration (IWC). The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC is 9.1% based on dilution of 10 parts lake water to 1 part effluent, or a factor of 1 in 11 to calculate the IWC.

**Dilution Series:** According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Wis. Adm. Code), the default acute dilution series is: 6.25, 12.5, 25, 50, 100%, and the default chronic dilution series is 100, 30, 10, 3, 1%. Other dilution series may be chosen by the permittee or Department staff, but alternate dilution series must be specified in the WPDES permit. For guidance on selecting an alternate dilution series, see Chapter 2.11 of the WET Guidance Document.

**Receiving water:** According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Wis. Adm. Code) receiving water must be used as the dilution water and primary control in WET tests, unless the use of another dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on outfall 001 shall be a grab sample collected from Lake Michigan, out of the influence of the mixing zone and any other known discharge. The receiving water location must be specified in the WPDES permit.

**Historical WET Data:** Below is a tabulation of all available WET data for outfall 001.

Date Initiated	Acute Results LC <sub>50</sub> (% survival in 100% effluent)				Chronic Results IC <sub>25</sub>					Footnotes
	<i>C. dubia</i>	Fathead minnow	Pass or Fail ?	Use in RPF ?	<i>C. dubia</i>	Fathead Minnow	Algae	Pass or Fail ?	Use in RPF ?	
5/6/10	100	100	Pass	Yes	100	100		Pass	Yes	
8/30/11	100	100	Pass	Yes	100	100		Pass	Yes	
7/24/12	100	100	Pass	Yes	100	100		Pass	Yes	
10/16/12	100	100	Pass	Yes	62	100		Pass	Yes	
9/24/13	100	100	Pass	Yes	49	100		Pass	Yes	

RPF = Reasonable Potential Factor

**WET Checklist.** Department staff use the WET Checklist when deciding whether WET limits and monitoring are needed. As toxicity potential increases, more points accumulate and more monitoring is needed to insure that toxicity is not occurring. The Checklist recommends acute and chronic WET limits (as needed) based on the Reasonable Potential Factor (RPF), as required by s. NR 106.08, Wis. Adm. Code, and monitoring frequencies based on points accumulated during the Checklist analysis. The completed WET Checklist and monitoring recommendations are summarized in the table below. (For more on the RPF and WET Checklist, see Chapter 1.3 of the WET Guidance Document, at: <http://www.dnr.state.wi.us/org/water/wm/ww/biomon/biomon.htm>).

### WHOLE EFFLUENT TOXICITY (WET) CHECKLIST SUMMARY

	<b>A C U T E</b>	<b>C H R O N I C</b>
<b>1. INSTREAM WASTE CONC.</b>	1A. Not Applicable <b>TOTAL POINTS = 0</b>	1B. IWC = 9.1% <b>TOTAL POINTS = 0</b>
<b>2. HISTORICAL DATA</b>	2A. Five test performed, all passed. <b>TOTAL POINTS = 0</b>	2B. Five test performed, all passed. <b>TOTAL POINTS = 0</b>
<b>3. EFFLUENT VARIABILITY</b>	3A. Seasonal flow variability, no violations or upsets, consistent WWTF operations <b>TOTAL POINTS = 0</b>	3B. Same as Acute <b>TOTAL POINTS = 0</b>
<b>4. STREAM CLASSIFICATION</b>	4A. Coldwater community <b>TOTAL POINTS = 5</b>	4B. Same as Acute <b>TOTAL POINTS = 5</b>
<b>5. CHEMICAL SPECIFIC DATA</b>	5A. No acute toxicity criteria-based limits triggered by effluent data. Ammonia, arsenic, cadmium, chloride, total chromium, copper, cyanide, chromium (+6), lead, mercury, nickel and zinc were detected but no limits were recommended due to high effluent concentrations (3 pts). Other detected substances without acute criteria included chloroform (2 pts). <b>TOTAL POINTS = 5</b>	5B. The same comparisons for acute criteria also apply to chronic criteria as well. <b>TOTAL POINTS = 5</b>
<b>6. ADDITIVES</b>	6A. Ferric chloride used for phosphorus removal; permittee uses ultraviolet disinfection. <b>TOTAL POINTS = 1</b>	6B. Same as Acute. <b>TOTAL POINTS = 1</b>
<b>7. DISCHARGE CATEGORY</b>	7A. 17 industrial contributors reported in application. <b>TOTAL POINTS = 15</b>	7B. Same as Acute <b>TOTAL POINTS = 15</b>
<b>8. WASTEWATER TREATMENT</b>	8A. Secondary Treatment <b>TOTAL POINTS = 0</b>	8B. Same as Acute <b>TOTAL POINTS = 0</b>

Checklist continued on next page

<b>Checklist continued</b>	<b>A C U T E</b>	<b>C H R O N I C</b>
<b>9. DOWNSTREAM IMPACTS</b>	9A. None attributable to discharge <b>TOTAL POINTS = 0</b>	9B. Same as Acute <b>TOTAL POINTS = 0</b>
<b>TOTAL POINTS</b>	26	26

**WET Monitoring and Limit Recommendations:** Based on historical WET data and RPF calculations (as required in s. NR 106.08, Wis. Adm. Code), no WET limits are required. Based upon the point totals generated by the WET Checklist, other information given above, and Chapter 1.3 of the WET Guidance Document, acute and chronic WET testing are recommended during the next permit term at a frequency of once per year in rotating quarters. This happens to be consistent with the recommendations for the current permit term as well and represents the minimum frequency recommended for major municipal discharges in Wisconsin, meaning no additional testing is warranted by any new issues in this evaluation.