EVERYTHING YOU NEED TO KNOW ABOUT WET TESTING

ENVIRONMENTAL CONSULTING & TESTING, INC.

SUPERIOR, WI

> ? >

WHOLE EFFLUENT TOXICITY (WET) TEST REPORT FORM

GENERAL INFORMATION

FACILITY:	Water City	WPDES PERMIT NO.:	WI-01234567-08
OUTFALL NO.:	001	LABORATORY NAME:	ECT, Superior, WI
RECEIVING WATER:	Lake Michigan	Project #:	4000

SAMPLE INFORMATION

SAMPLE NO.	SAMPLE TYPE	SAMPLE COLLECTION BEGINNING DATE	SAMPLE COLLECTION END DATE	SAMPLE TEMP °C COLLECTION	SAMPLE TEMP °C AT LAB	pH at LAB	HAND DELIVER? (If Yes, ≤ 4 hr?)	HOLD TIME ≤ 36 HR?	SAMPLE ACCEPTABLE?
1	EFF-24C	5/20/2018	5/21/2018	10.1	5.1	7.81	☐ Yes ☑ No	☑ Yes ☐ No	☑ Yes ☐ No
2	EFF-24C	5/22/2018	5/23/2018	9.5	4.6	7.92	☐ Yes ☑ No	☑ Yes ☐ No	☑ Yes ☐ No
3	EFF-24C	5/24/2018	5/25/2018	9.8	5.1	7.85	☐ Yes ☑ No	☑ Yes ☐ No	☑ Yes ☐ No
4	RW-G	5/21/2018	5/21/2018	20.4	6.0	7.46	☐ Yes ☑ No	☑ Yes ☐ No	☑ Yes ☐ No

Describe any unusual conditions during sampling that may influence test results. (see Part 6.1.2 of the Methods Manual for examples.)

COMMENTS: **NP=Not Provided**

TEST INFORMATION

	CHRONIC
Date Test Initiated:	5/22/2018
Tests Are For:	WPDES Compliance (Required by Permit)
Date of Initial Test:	
ZID/IWC Info.:	Instream Waste Concentration = 100.0%

Dilution Water:	C.dubia	FHM	Other
	☑ RW	☑ RW	☐ RW
	☐ LW	☐ LW	☐ LW

QA/QC CONDITIONS

Temperatures maintained during test? (25 ± 1°C)	☑ Yes ☐ No
Dissolved oxygen ≥ 4.0 mg/l throughout test?	☑ Yes ☐ No
Effluent pH maintained within 6.0 - 9.0 s.u. throughout test?	☑ Yes ☐ No
Concurrent or monthly reference tests within acceptable limits?	☑ Yes ☐ No
Tests conducted in a carbon dioxide atmosphere throughout test?	☐ Yes ☑ No
Were effluent samples modified prior to testing? (ex. filtration, aeration, chem addition)	☐ Yes ☑ No

COMMENTS:

WATER CHEMISTRY (All values reported in mg/L, except pH)

SAMPLE TYPE	NO.	HARDNESS	ALKALINITY	TOTAL AMMONIA	pH (s.u.) After Warming	TOTAL RESIDUAL CHLORINE
Receiving Water	NA	40	32	<0.24	7.53	ND
Effluent	#1	120	100	<0.24	7.84	ND
	#2	124	104	<0.24	7.88	ND
	#3	128	92	<0.24	7.79	ND
Lab Water	MHSW	80	60	NA	7.86	NA

COMMENTS: **Receiving water was used as the primary control/dilution water. MHSW was used as the secondary control in the chronic testing.**
ND=Not Detected

WHAT IS WET TESTING?
(WHOLE EFFLUENT TOXICITY)

- A BIOASSAY TO DETERMINE THE PRESENCE OF TOXICITY IN AN EFFLUENT SAMPLE
- A SERIES OF TEST MIXTURES OF EFFLUENT AND RECEIVING WATER OR LAB WATER
- ORGANISM SURVIVABILITY, REPRODUCTION, OR GROWTH DETERMINES RESULTS

HISTORY

- CLEAN WATER ACT 1972
- GAVE EPA AUTHORITY OVER WASTEWATER DISCHARGE AND CREATED NPDES PERMITTING
- WISCONSIN CREATED WPDES TO COMPLY WITH EPA
- FIRST LIMITS WERE ONLY FOR PHYSICAL CHARACTERISTICS (BOD, SUSPENDED SOLIDS)
- LATER, 126 “PRIMARY POLLUTANTS” WERE ADDED TO DISCHARGE LIMITS
- FINALLY SETTLED ON WET TESTING

WHY WET TESTING?

- INDICATES TOXICITY FROM MANY SOURCES
- INEXPENSIVE COMPARED TO A WIDE-ARRAY TOXICANT ANALYSIS
- RELATIVELY QUICK TURNAROUND TIME

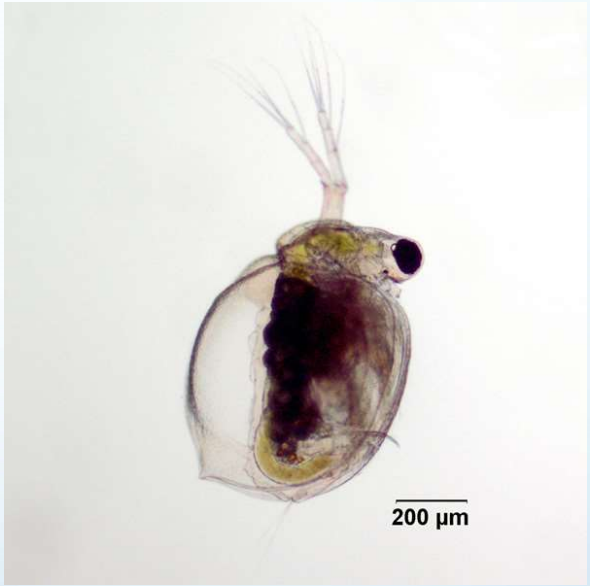
TEST ORGANISMS

FATHEAD MINNOW (FHM)

- NATIVE TO MOST OF NORTH AMERICA
- EASY TO RAISE IN A HATCHERY
- CAN SURVIVE IN SMALL VOLUMES OF WATER

TEST ORGANISMS

CERIODAPHNIA DUBIA (C. DUBIA)



- AKA WATER FLEAS
- SMALL AQUATIC CRUSTACEAN
- NATIVE TO MOST OF NORTH AMERICA
- EASY TO CULTURE
- IMPORTANT FOOD SOURCE FOR MANY AQUATIC ORGANISMS

Photo Credit:http://cfb.unh.edu/cfbkey/html/Organisms/CCladocera/FDaphnidae/GCeriodaphnia/Ceriodaphnia_dubia

TYPES OF WET TESTS

ACUTE

- SHORT TERM
- MEASURES SURVIVABILITY ONLY
- CAN BE DILUTED WITH RECEIVING WATER OR LAB WATER
- 20 C
- TWO EFFLUENT SAMPLES
- LC50 (LETHAL CONCENTRATION)

CHRONIC

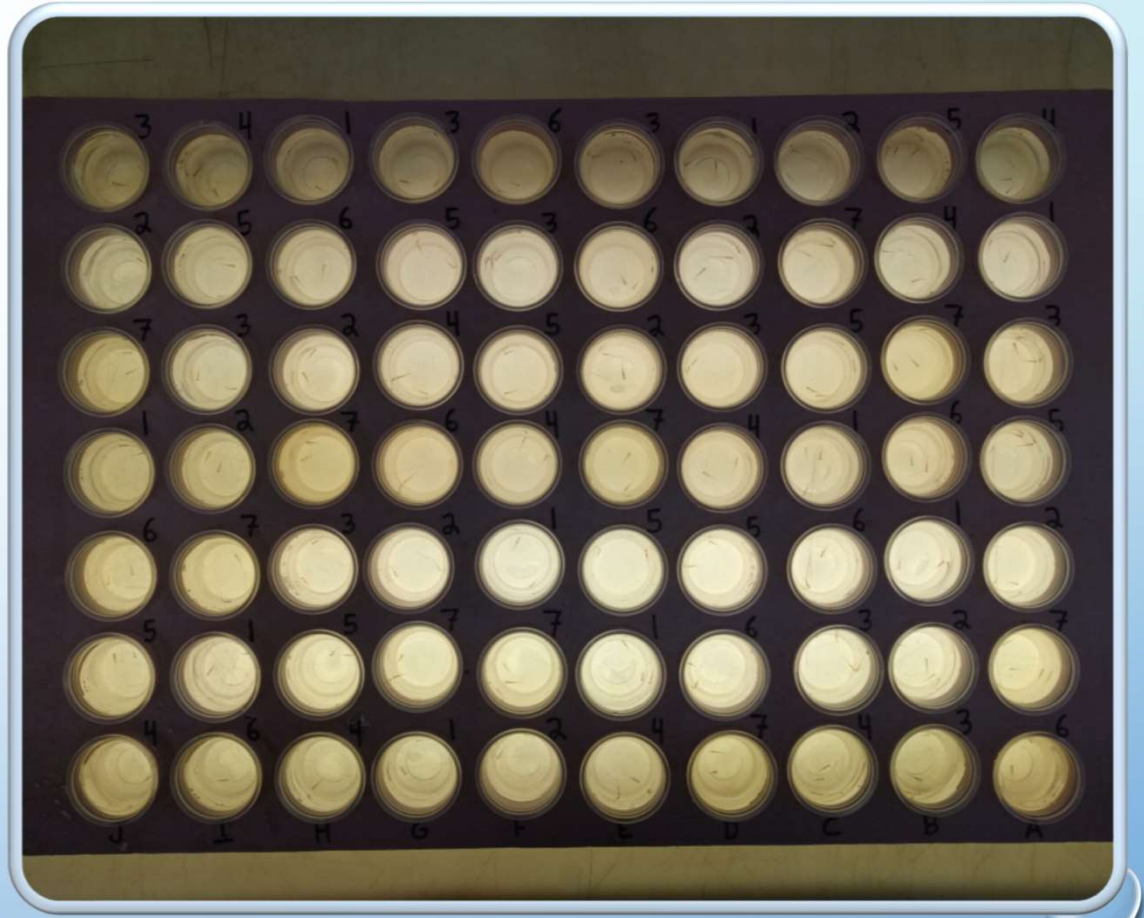
- "LONG TERM"
- MEASURES SURVIVABILITY AND REPRODUCTION OR GROWTH
- USUALLY DILUTED WITH RECEIVING WATER
- 25 C
- THREE EFFLUENT SAMPLES
- IC25 (INHIBITION CONCENTRATION)

ACUTE TESTS

- TEST CONCENTRATIONS OF 6.25%, 12.5%, 25%, 50%, 100%
- C. DUBIA END AFTER 48 HOURS
- FHM END AFTER 96 HOURS
- IF 50% OR MORE OF ORGANISMS DIE IN 100% EFFLUENT, THE TEST HAS FAILED
- ZID (ZONE OF INITIAL DILUTION)
- IF LAB WATER IS TO BE USED, A RW SAMPLE IS NEEDED TO MATCH HARDNESS

CHRONIC TESTS

- IWC DETERMINES TEST CONCENTRATIONS
- 1%, 3%, 10%, 30%, 100% IF IWC ≤30
- 12.5%, 25%, 50%, 75%, 100% IF IWC >30
- FHM TESTS RUN 7 DAYS, THEN FISH ARE EUTHANIZED, DRIED, AND WEIGHED
- C. DUBIA TESTS RUN 6-8 DAYS, OR UNTIL 80% OF ADULTS IN THE CONTROLS HAVE 3 BROODS
- IC25 MUST BE HIGHER THAN IWC TO PASS



SAMPLE CHARACTERITICS

- TEMPERATURE
- DISOLVED OXYGEN
- pH
- CONDUCTIVITY
- HARDNESS
- ALKALINITY
- AMMONIA
- CHLORINE

TEST RENEWAL

- ALL WI TEST ARE RENEWED DAILY
- RENEWAL ENSURES ORGANISMS HAVE FRESH WATER EACH DAY
- IN ACUTES, SURVIVALS ARE RECORDED AND WATER REPLACED IN TEST CHAMBERS
- IN CHRONICS, ORGANISMS ARE TRANSFERRED TO NEW TEST CHAMBERS WITH NEW WATER
- YOUNG ARE COUNTED IN C. DUBIA CHRONICS DURING RENEWAL

SAMPLE MANIPULATION

- DECHLORINATION – REQUIRES SIDE-BY-SIDE
- FILTRATION – ONLY IF HARMFUL ORGANISMS PRESENT
- AERATION – ONLY IF DO IS LOWER THAN 4.0 mg/L
- pH CONTROL – ONLY TO CORRECT FOR DRIFT AFTER THE TEST IS SET UP
  - ACUTE - pH CANNOT GO BELOW EFFLUENT pH AT TIME OF SAMPLING
  - CHRONIC - pH CANNOT GO BELOW RECEIVING WATER pH

WHAT IF I FAIL?

- TWO RETEST TESTS MUST BE COMPLETED WITHIN 90 DAYS
- IF A RETEST TEST FAILS, A TOXICITY REDUCTION EVALUATION (TRE) MAY BE REQUIRED
- PERMITTEE MAY BE PLACED ON AN ACCELERATED TESTING SCHEDULE

COMMON CAUSES OF FAILURES

AMMONIA

- PRIMARILY AFFECTS FISH
- pH DEPENDANT (HIGHER pH, HIGHER TOXICITY)
- CAN BE CONTROLLED WITH CO2

CHLORINE

- PRIMARLIY AFFECTS C. DUBIA
- SMALL AMOUNTS CAN BE TOXIC
- DECHLORINATED SIDE-BY-SIDE TEST CAN BE RUN TO ELIMINATE CHLORINE AS SOURCE OF TOXICITY

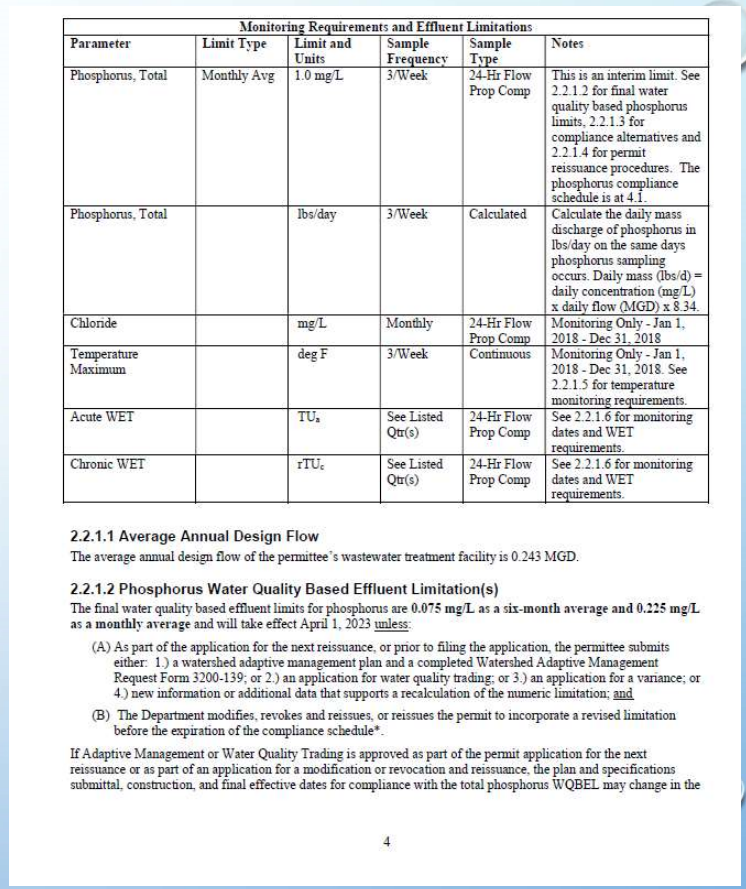
POLYMERS

- CAN BE VERY TOXIC AT LOW DOSES
- OVERDOSES OFTEN CAUSE COMPLETE TEST DEATHS
- FAIRLY EASY TO CORRECT

WHAT CAN YOU DO TO MAKE SURE TESTING GOES SMOOTHLY?

SAMPLING

- CLEAN/REPLACE HOSES ON SAMPLERS
- PLANT UPSETS>RESCHEDULE
- CHECK TO SEE IF A GRAB OR COMPOSITE SAMPLE IS REQUIRED
- SAMPLE FULL 24 HOURS FOR COMPOSITE SAMPLES
- MEASURE TEMPERATURE AND pH (AMMONIA CONTROL)
- SAMPLE RW UPSTREAM OF OUTFALL LOCATION
- KEEP CRITTERS OUT OF RW IF POSSIBLE



Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Total	Monthly Avg	1.0 mg/L	3/Week	24-Hr Flow Prop Comp	This is an interim limit. See 2.2.1.2 for final water quality based phosphorus limits, 2.2.1.3 for compliance alternatives and 2.2.1.4 for permit reissuance procedures. The phosphorus compliance schedule is at 4.1.
Phosphorus, Total		lbs/day	3/Week	Calculated	Calculate the daily mass discharge of phosphorus in lbs/day on the same days phosphorus sampling occurs. Daily mass (lbs/d) = daily concentration (mg/L) x daily flow (MGD) x 8.34.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring Only - Jan 1, 2018 - Dec 31, 2018
Temperature Maximum		deg F	3/Week	Continuous	Monitoring Only - Jan 1, 2018 - Dec 31, 2018. See 2.2.1.5 for temperature monitoring requirements.
Acute WET		TU_a	See Listed Qtr(s)	24-Hr Flow Prop Comp	See 2.2.1.6 for monitoring dates and WET requirements.
Chronic WET		rTU_c	See Listed Qtr(s)	24-Hr Flow Prop Comp	See 2.2.1.6 for monitoring dates and WET requirements.

2.2.1.1 Average Annual Design Flow

The average annual design flow of the permittee's wastewater treatment facility is 0.243 MGD.

2.2.1.2 Phosphorus Water Quality Based Effluent Limitation(s)

The final water quality based effluent limits for phosphorus are **0.075 mg/L as a six-month average and 0.225 mg/L as a monthly average** and will take effect April 1, 2023 unless:

(A) As part of the application for the next reissuance, or prior to filing the application, the permittee submits either: 1.) a watershed adaptive management plan and a completed Watershed Adaptive Management Request Form 3200-139; or 2.) an application for water quality trading; or 3.) an application for a variance; or 4.) new information or additional data that supports a recalculation of the numeric limitation; and

(B) The Department modifies, revokes and reissues, or reissues the permit to incorporate a revised limitation before the expiration of the compliance schedule*.

If Adaptive Management or Water Quality Trading is approved as part of the permit application for the next reissuance or as part of an application for a modification or revocation and reissuance, the plan and specifications submittal, construction, and final effective dates for compliance with the total phosphorus WQBEL may change in the

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SHIPPING

- GROUND SERVICE v AIR DELIVERY
- HAND DELIVERY > TEMPERATURE DOESN'T MATTER IF DELIVERED IN UNDER 4 HOURS
- ICE! SAMPLE MUST ARRIVE BELOW 10 C
- EFFLUENT MUST BE USED WITHIN 36 HOURS OF SAMPLING

REPORTING

Sample Point Number	Parameter	Date Sample Taken	Sample Type	Sample Results	Units	Limit	Limit Type	LOD	LOQ	QC Exceed	Lab Certification Number
001	Acute WET	5/22/2X	24 HR FLOW PR	TUa or TUc	TUa	1.0 TUa	Daily Max.	NA	NA	NA	p.4 of WET Report Form

Date WET Test Initiated

If a limit exists in the permit

Not Applicable (Enter either NA or 0.0)

REPORTING

- 45 DAYS TO SUBMIT RESULTS FROM THE DATE OF TEST COMPLETION

- OLD PERMITS USE rTUc (IWC÷IC25)
  - Effective date of the permit is before September 1, 2016
  - rTUc=1.0 if test passes, greater than 1.0 if the test fails

- NEW PERMITS USE TUc (100÷IC25)
  - Effective date of the permit is on or after September 1, 2016
  - TUc is calculated by using the IWC (100/IWC)
  - If TUc from test is greater than the calculated TUc in the permit, the test fails