# CHAPTER 1.3 - Representative Data, Reasonable Potential, Monitoring and Limits

**This chapter was written to provide guidance for staff use when choosing representative data and considering facility-specific information in order to make decisions regarding WET monitoring and limitations, including instructions for use of the electronic WET Checklist.**

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*NOTICE: This chapter and the associated SWAMP WET Checklist are intended solely as guidance, and do not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.*

## Staff Responsible For WET Determinations

In order to insure consistent and efficient decision making and in order to be able to describe the whole effluent toxicity (WET) determination process in this guidance, it is necessary to include recommendations that identify which WDNR staff should be making decisions regarding WET requirements. In order to make good decisions, the person responsible for making WET determinations needs to be familiar with receiving water and effluent conditions, water quality-based effluent limit (WQBEL) recommendations, and other site-specific information, or be able to easily obtain it (have access to field staff with this knowledge). In order to make the best informed decisions possible, it is necessary for WQBEL and WET determinations to be made via a collaborative effort with permit coordinator, compliance engineer/specialist, and WQBEL staff. In most cases WQBEL staff should make WET monitoring and limit recommendations by completing the WET Checklist concurrently with WQBEL recommendations, with compliance staff input related to facility-specific information. Once complete, WET recommendations are given to permit drafters for incorporation into permits.

## Making WET Determinations Using Representative Data

It is important that decisions about monitoring and limits be made using data that is representative of the discharge being evaluated, as specified in s. NR 106.08, Wis. Adm. Code (see Figure 1), and discussed further in the guidance below.

***Figure 1. NR 106.08(3) Representative Data***

**NR 106.08 Determination of the necessity for whole effluent toxicity testing requirements and limitations.**

**(3) Representative Data.** Toxicity test data available to the department shall be considered representative when those data meet the following conditions:

(a) Data are representative of normal discharge conditions and current effluent quality;
(b) Data were produced by a lab certified or registered under ch. NR 149;
(c) Data were produced from toxicity test procedures specified in the WPDES permit; and
(d) Data were produced from toxicity tests that met all applicable QA/QC requirements specified in the WPDES permit.

**(4) No Representative Data.** If no representative discharge data are available for an effluent being discharged from a point source, whole effluent toxicity testing requirements are necessary if, in the judgment of the department, water quality standards may be exceeded. In such cases, all of the following factors shall be considered:

(a) Any relevant information which is available that indicates a potential for an effluent to impact the receiving water aquatic life community.
(b) Available dilution in the receiving water.
(c) Discharge category and predicted effluent quality.
(d) Proximity to other point source dischargers.

**(7) Data Exclusions.** The Department may exclude data from a WET reasonable potential determination when those data meet any of the following conditions:
(a) Data are not representative pursuant to sub. (3);
(b) Positive WET results are caused by deficiency toxicity only; or
(c) Positive WET results are caused by groundwater or surface water remediation needed to correct or prevent an existing surface or groundwater contamination situation or a public health problem.

Steps 1 and 2 below include a description of criteria that staff should consider as they review WET data prior to making decisions about the need for monitoring and limits. Step 3 describes using the WET Checklist to determine if limits are necessary and to help staff make WET monitoring frequency recommendations, and provides examples for various discharge scenarios.

**Step 1: Collect and summarize all WET data** (see below) and other related information,

**Step 2: Select WET data which is representative of the discharge being evaluated** (see p. 4), and

**Step 3: Complete the WET Checklist** (see p. 6) to determine the monitoring frequency and the need for WET limits.

*The guidance in this chapter is intended to apply in most situations, but there may be situations where the general assumptions it is based on may not apply and deviations from the suggested criteria will be necessary. Decisions that are made contrary to the guidance should be shared with the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov; 608-267-7663) and clearly documented, so others can tell why decisions were made. Examples and possible reasons for deviating from WET Checklist recommendations are given starting on page 38.*

**Step 1 - Data Collection and Summarization**

When WQBEL staff are getting ready to make WET determinations, all available data for each outfall being evaluated should be collected and summarized. As a first step, staff should review data in the SWAMP WET database and print WET database summary reports. (Instructions for creating summary reports are found here: \\central\water\WQWT_PROJECTS\WY_CW_SWAMP\SWAMPUserManual\WET_Database.doc). **It is critical that staff review all available WET data for the facility that they are evaluating.** Staff should compare tests listed in the database with requirements in the previous permit, to insure that all data has been submitted to the Department. *(Note: There may be a delay between report submittal and data entry. Contact the Biomonitoring Coordinator, if it appears that tests have been completed recently which have not yet made it into the database.)* Database reports summarize WET data and allow for visual review of results and comparison to other effluent data. Since these reports include only summaries, manual retrieval of hard copy reports may be required in some cases (especially if there is a history of effluent toxicity). Detailed WET files are kept in the central office, so a call or email to the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov; 608-267-7663) can be helpful when questions arise.

The Department uses its WET laboratory certification program, regular communication with labs and permittees, and staff and external customer training strategies to insure WET data quality. Data quality can be a complex issue and is determined for each test by the Biomonitoring Coordinator during the report review process (see Chapter 1.5 at http://dnr.wi.gov/topic/wastewater/WETguidance.html for more on data review). If data quality is questionable, a note is placed on the test report form and in the WET Database. Tests with poor data quality should be identified on reports from the WET Database, however, it may be necessary to check hard copies of report forms (which are kept in permit and WET files for the facility) or talk with the Biomonitoring Coordinator.

Only WET tests with clear documentation of data quality problems should be eliminated from the data set at this stage in the process. WET Database reports should include comments noting when problems have occurred or if results are questionable (see discussion of "Qualified Data" below in the next section). A quick call or email to the Biomonitoring Coordinator to verify the appropriateness of using such data could make things go more smoothly later on. If available, it may be useful to consult other effluent data when making decisions regarding the representativeness of WET data. For instance, flow data and results of conventional pollutant testing may be an indicator of abnormal treatment plant operations. It may also be helpful to compare WET results with other effluent data to look for similar trends.

*Staff should clearly indicate in the WQBEL memo which WET data was used in RP decisions (and which were not) and discuss why any changes were made to data sets, so that others can understand why decisions were made.*

**Step 2 - Selecting Representative Data**

Decisions about the need for WET limits and appropriate monitoring frequencies should be based on data that is representative of the discharge being evaluated. Once all valid WET data have been compiled (Step 1), additional screening of the data may be necessary. At this point in the process, only data that are clearly flawed have been screened out. Now, additional decisions can be made based on the complete body of data and other factors. Following is a list of considerations when selecting representative data. For many of these, staff may have to rely on the permittee to know whether there is a potential problem. For others, staff may have to dig a little deeper if things don't seem right.

1. **Qualified Data**. The Biomonitoring Coordinator reviews all WET Test Report Forms and notes should be added to the WET Database when there are QA concerns or unusual circumstances at the time of sampling that might render data unrepresentative. Reasons for disqualifying data may include lab error, poor organism health, interferences in the test that confounded test data, or other factors. In many cases when test acceptability concerns are noted, it may be appropriate to exclude the test from the data set. If staff or permittees have any questions about the quality of WET data, they should discuss them with the Biomonitoring Coordinator. Tests completed during upset conditions may be excluded if it is determined that conditions were not representative of normal effluent conditions. However, recurrent plant upsets should not be excused. Staff should judge whether the problem regularly occurs or is due to poor operation. If regular upsets or poor operation represent normal conditions, the data should be used in making WET monitoring and limits decisions. Occasionally, tests must be repeated due to poor QA. When this happens, only the unacceptable portions are repeated. Tests done under these conditions shouldn't be double-counted. For example, suppose toxicity tests were performed using the *Ceriodaphnia dubia* and fathead minnow. The fathead minnow portion was unacceptable, so that had to be repeated. The original acceptable *C. dubia* results and the repeated fathead minnow results should be counted together as one complete test. (Only 1 value, that of the most sensitive species, should be used in reasonable potential decisions).

2. **Laboratory capabilities and sample integrity.** Lab performance, results of recent audits, and sample quality may need to be considered when deciding whether to include WET data in reasonable potential decisions. All WDNR certified WET labs are audited regularly (on a ~3 year cycle) and audit reports are available. Any evidence of improper sample collection, preservation, or holding times should be considered (test results with these problems may have to be discarded). Tests done by labs not certified or registered according to ch. NR 149, Wis. Adm. Code, at the time the tests were done, are not acceptable for determining permit compliance. A list of currently certified WET labs can be found at: http://dnr.wi.gov/topic/wastewater/WETCertified.html

   *Note: The DNR has reason to believe that tests completed by S-F Analytical Labs from July 2008 through March 2011 were not performed using proper test methods. WET data from this lab during this period has been disqualified and flagged as "not reliable" in the WET Database. These tests should not be used in reasonable potential decisions.*

3. **"Inconclusive" tests.** Tests may be labeled "inconclusive" during the test report review process, when confounding factors have made the results difficult to interpret. For example, prior to changes made to WET test methods in 2004, inconclusive tests were often the result of the "pathogen effect" (a biological interference) in fathead minnow chronic tests (see Chapter 2.7 at http://dnr.wi.gov/topic/wastewater/WETguidance.html for a detailed discussion of this phenomenon). When the pathogen effect occurs, there is unusually high variability between replicates and an abnormal concentration-response (i.e., lower effluent concentrations have poorer performance than higher concentrations), which may make test results unreliable. In most cases, inconclusive tests cannot be used in reasonable potential decisions because confounding factors have made the results difficult to interpret and it is hard to tell whether the effluent would have "passed" or "failed" with the affected species. An exception to this would be when the unaffected species (i.e., the one that wasn't "inconclusive") showed toxicity. In that case, the portion of the test that failed should be used, even if the other half of the test was inconclusive. (Because if the inconclusive half had passed, the failing half would be used in the RP analysis.)

4. **WET Method Changes and Older WET Data.** Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005. It may be appropriate to exclude data collected before July 1, 2005, unless 1) it shows repeated toxicity that was never resolved or 2) older data is all that is available and no significant changes have occurred which obviously make it unrepresentative. Still, staff should use judgment when determining whether treatment, process, or other significant changes have occurred which would render data unrepresentative. Staff should evaluate test data to determine whether factors such as treatment plant upgrades, industrial process modifications, or other significant changes have caused WET data to no longer be representative of the discharge, and should not disqualify data simply because it was not generated during the last permit term.

5. **Split samples.** Care should be taken to count only tests conducted on unique effluent samples. Tests are occasionally conducted simultaneously at two different labs, as a check on laboratory performance and/or sampling procedures, and should not be counted as separate tests in reasonable potential determinations. Information from these tests may point out problems, however, which may lead to data elimination (for example, if split samples indicate a contaminated sampler or lab error caused past toxicity problems).

6. **Contributing Sources.** It may be necessary to investigate source loadings to the WWTP, including industrial sources to a municipality. For example, abrupt changes in WET results may be explained by the shutdown of a local industry or the clampdown by a municipality on its industrial contributors. Wide fluctuations in data could represent slug loads from contributors that remain undetected for a time and then reoccur. Wide fluctuations in data caused by permanent industrial discharges or regularly discharged slug loads (for example, a high strength waste that is occasional, but expected) should not cause data to be thrown out. For industrial permittees, wide fluctuations in a data set could mean a change in manufacturing processes. Data gathered during a period when a particular process was used, that is no longer in use (and won't be used during the next permit term), are not likely to be representative of the present discharge and may be excluded. If significant changes have occurred to contributing sources within a treatment facility, WET data collected prior to these changes may no longer be representative.

7. **WWTP upgrades.** Consider whether treatment processes have been upgraded which could significantly affect toxicity removal through the plant. Remember that toxicity can be caused by many factors and an upgrade that only improves solids or $BOD_5$ removal may not affect effluent toxicity. Data collected prior to an upgrade should be thrown out, in most cases, only if data collected after the upgrade suggests a change in effluent toxicity.

8. **Toxicity Reduction Evaluations (TRE).** Data generated during toxicity reduction evaluations are not usually used in reasonable potential decisions, unless they were compliance-style tests done to demonstrate the successful completion of the TRE. Tests completed during a TRE often involve single-species, single dilutions, or modified samples, used in order to investigate toxicity and are not comparable to standard toxicity tests.

   Successful TREs usually identify the cause of toxicity, steps needed to eliminate toxicity, and results from WET tests conducted after implementation of changes showing that toxicity is gone (accounting for seasonal, process, source loading and other changes, when appropriate). Therefore, successfully completed TREs can significantly change a discharge's potential to exhibit toxicity. In most cases, successful completion of the TRE means that previously collected data (including that collected during the TRE) are no longer representative. When this is the case, only tests that were collected after the TRE that are representative of current discharge conditions should be used in reasonable potential decisions. If failures are present in the dataset, WQBEL staff should check permit files and talk to compliance staff and/or the Biomonitoring Coordinator to determine whether a TRE was conducted and completed successfully.

In order to demonstrate that previous WET data is no longer representative of the current discharge, information is needed that shows why it is no longer representative - for example, significant changes in wastewater treatment, contributing industries, or industrial processes. In most cases it will be necessary to provide WET data which shows a change in toxicity (e.g., data collected after changes were made). Depending on the seasonal nature of the discharge and other factors, 3-4 passing tests conducted under normal operating conditions (at least 30 days apart) are usually enough to demonstrate that changes have resulted in toxicity removal.

When making WET determinations as recommended by this guidance, staff should remember that data are not automatically representative of the discharge being evaluated. If it is determined that representative data are not available, staff should recommend WET monitoring and should not be bound to setting WET limits in the permit. When there is doubt regarding the representativeness of one or a few data points, additional WET data may clarify the representativeness of those data. When representativeness of existing data is questionable, more experienced permittees (or those helped along by supportive Department staff) will conduct additional tests when faced with results that could trigger a limit.

Other factors may cause data to be unrepresentative. Staff should use best professional judgment to determine when this is the case and talk to the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov; 608-267-7663) if questions arise.

*It is essential that decisions be well documented in WQBEL memos and fact sheets. Decisions will be more defensible if the Department can demonstrate it is actively applying a set of criteria in arriving at them. Documentation also helps to make future decisions and assess opportunities for program improvement. Decisions that are made contrary to the guidance here should be shared with the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov; 608-267-7663) and clearly documented, so others can tell why decisions were made.*

**Step 3 - Determination of Monitoring Frequency and Need for a Limit**

Once it is determined which data are representative, it can be decided whether a limit is necessary and how much monitoring should be done. WET limits are required as specified in ch. NR 106.08, Wis. Adm. Code (http://docs.legis.wisconsin.gov/code/admin_code/nr/100/106). Limits should be given whenever WET and/or other data shows there is a reasonable potential for toxicity to be present.

***Figure 2. NR 106.08(1) Determining the Need for WET Limits***

**NR 106.08 Determination of the necessity for whole effluent toxicity testing requirements and limitations.**

**(1)** GENERAL. The department shall establish whole effluent toxicity testing requirements and limitations whenever necessary to meet applicable water quality standards as specified in chs. NR 102 to 105 as measured by exposure of aquatic organisms to an effluent and specified effluent dilutions. When considering the necessity for whole effluent toxicity testing requirements and limitations, the department shall consider in-stream biosurvey data and data from ambient toxicity analyses, whenever such data are available.

**Should WET limits be carried over into the next permit?** Whole effluent toxicity and other facility-specific data should be reassessed and the WET Checklist redone with each permit reissuance. In situations where a WET limit was previously given and a successful toxicity reduction evaluation (TRE) was completed (permanent changes were made to remove toxicity), a limit may no longer be required. However, if WET limit violations occurred during the previous permit term and changes were not made to fix previous toxicity problems, the WET limit should be carried over into the next permit term. If questions exist, staff should talk to the Biomonitoring Coordinator.

## WET Checklist (General Information)

In order to guide staff through the WET limit and monitoring decision-making process, an automated "WET Checklist" is provided in SWAMP. The Checklist is designed to assist staff that are deciding whether WET limits are necessary and what levels of WET monitoring should be assigned to individual discharges, based on their potential to exhibit toxicity or exceed water quality standards. As the potential for toxicity increases, more points accumulate in the Checklist and the more monitoring is recommended to insure that toxicity is not occurring. Step-by-step instructions and supporting guidance for use when completing the Checklist are provided below. The WET Checklist and this chapter are intended as guidance, and do not contain mandatory requirements except where statute or administrative rules are referenced. Staff should use the Checklist and their best professional judgment to make final monitoring and other WET-related decisions.

*If staff have reason to deviate from Checklist recommendations, they should share their decisions with the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov; 608-267-7663) and clearly document their decisions in the WQBEL memo so that others can tell why decisions were made.*

Questions asked by the WET Checklist and the screens as they appear in SWAMP are presented below. After each screen is further instruction and explanation of the points given and information needed.

**Minor Municipal Dischargers.** If evaluating a minor municipal facility (< 1.0 MGD design flow) that receives only domestic wastewater, staff should consult the guidance in Chapter 1.11 (http://dnr.wi.gov/topic/wastewater/WETguidance.html) to determine if the in-depth analysis presented in the WET Checklist is necessary. A pop-up screen in the WET Checklist will remind users of this additional guidance, whenever the user indicates that a municipal facility is being evaluated.

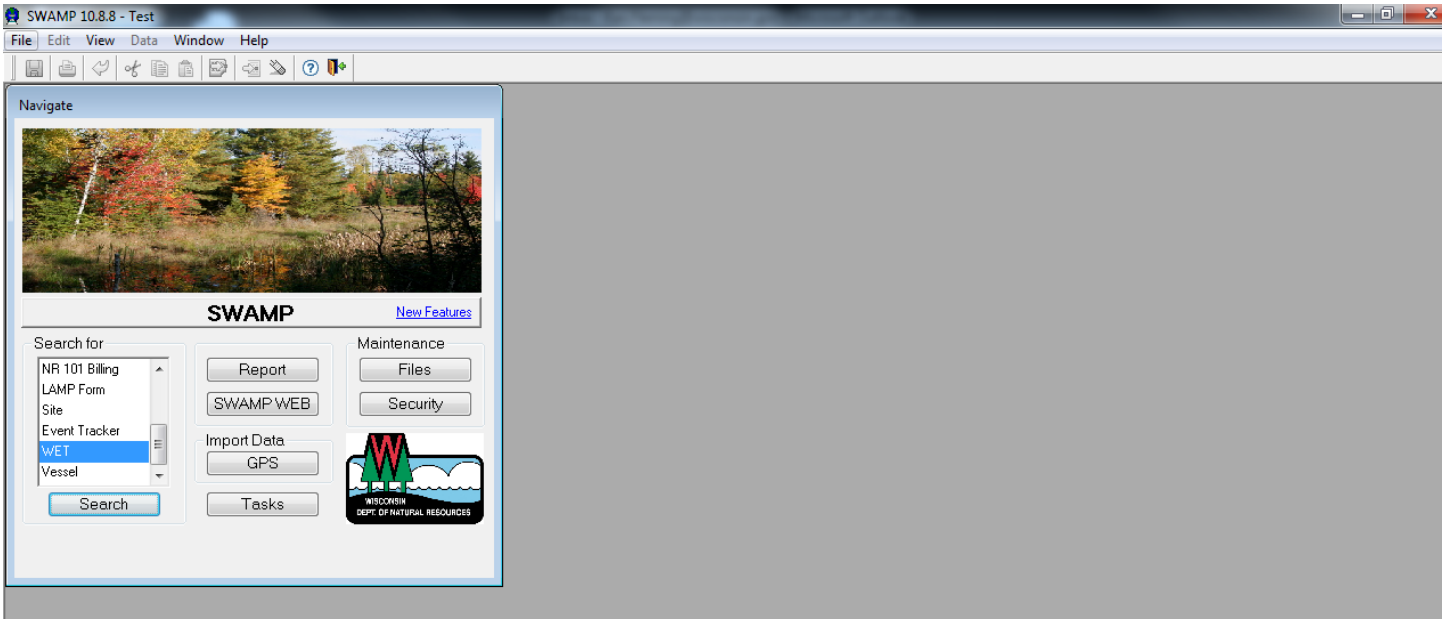
**Points Assessed.** The WET Checklist assigns points based on factors present that increase the chances for toxicity. Points are based on responses given and may be assessed towards acute, chronic, or both types of monitoring. Points given for each question are shown below after each screen shot. The "Points Assessed" tables indicate whether points are added to acute, chronic or both. The completed Checklist recommends acute and chronic WET limits (when needed), based on reasonable potential calculations required by s. NR 106.08, Wis. Adm. Code, and WET monitoring frequencies, based on points accumulated during the Checklist analysis. Once the Checklist is complete, the user can generate a summary of points assessed and answers given, by clicking on the "Generate" button shown on the lower right corner of the screen.

## WET Checklist (Getting Started)

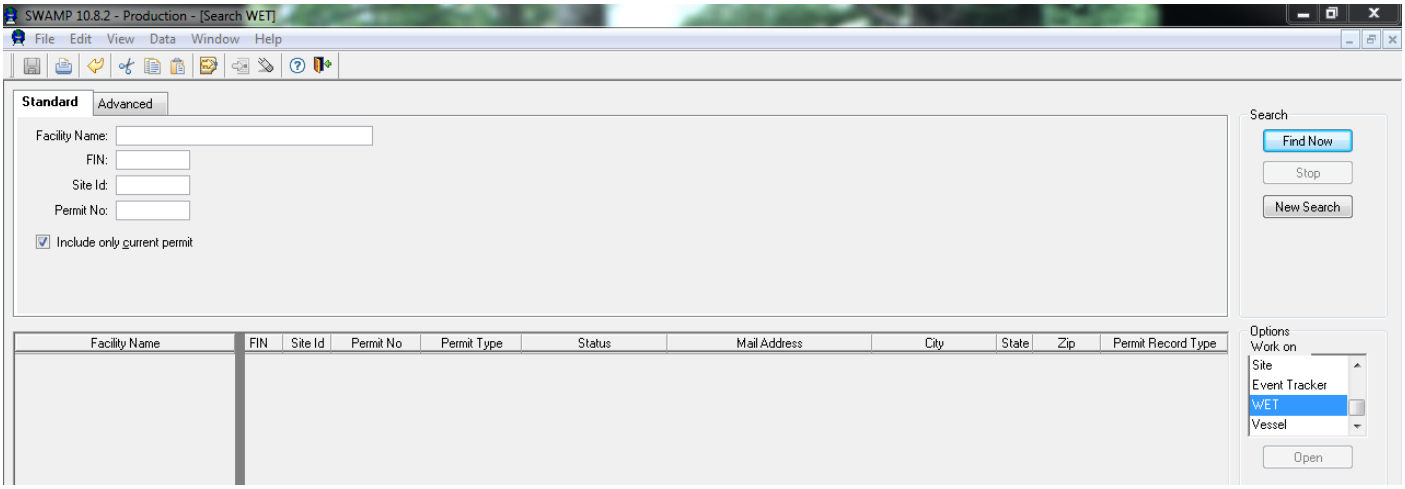
In order for the Checklist to work, information regarding effluent flow (annual average design flow), percent effluent withdrawn from the receiving water (withdrawal factor), receiving water flow ($Q_{7,10}$), receiving water classification, and acute mixing zone (ZID), will need to be entered in the "Sample Point" tab. This information must be entered before creating a new Checklist or revising an existing Checklist. (See attachment 3 at the end of this chapter for instructions on entering or changing data under the "Sample Point" tab in SWAMP).

Municipal effluent flows: Correct and up-to-date consultant engineered and DNR approved design flow information is kept in the System tab area in SWAMP. Staff should confirm that the design flow they are entering into the Surface Water tab for use in WET determinations is not in conflict with the Design Flow info at the System tab in SWAMP.

Receiving water flows: The WET Checklist uses the $Q_{7,10}$ entered in the Sample Point tab in SWAMP. If another receiving water flow value is appropriate, staff will need to calculate Qs:Qe ratios, AMZs, and IWCs outside of the checklist and note this difference in WQBEL memos.

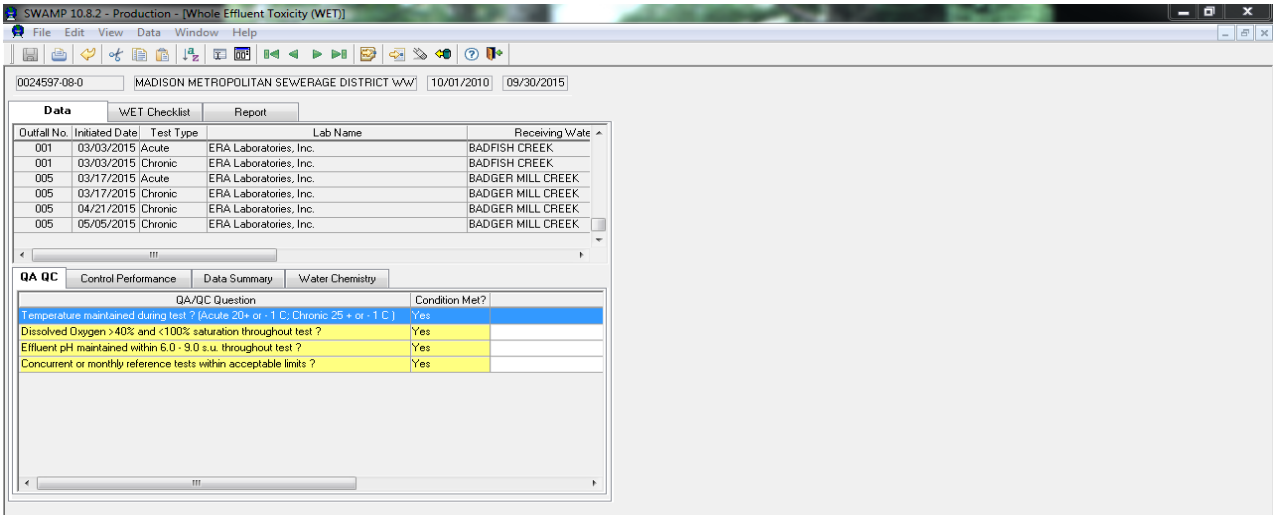



At the Navigate screen (shown above), click on “WET” in the “Search for:” box, then click on the “Search” button.



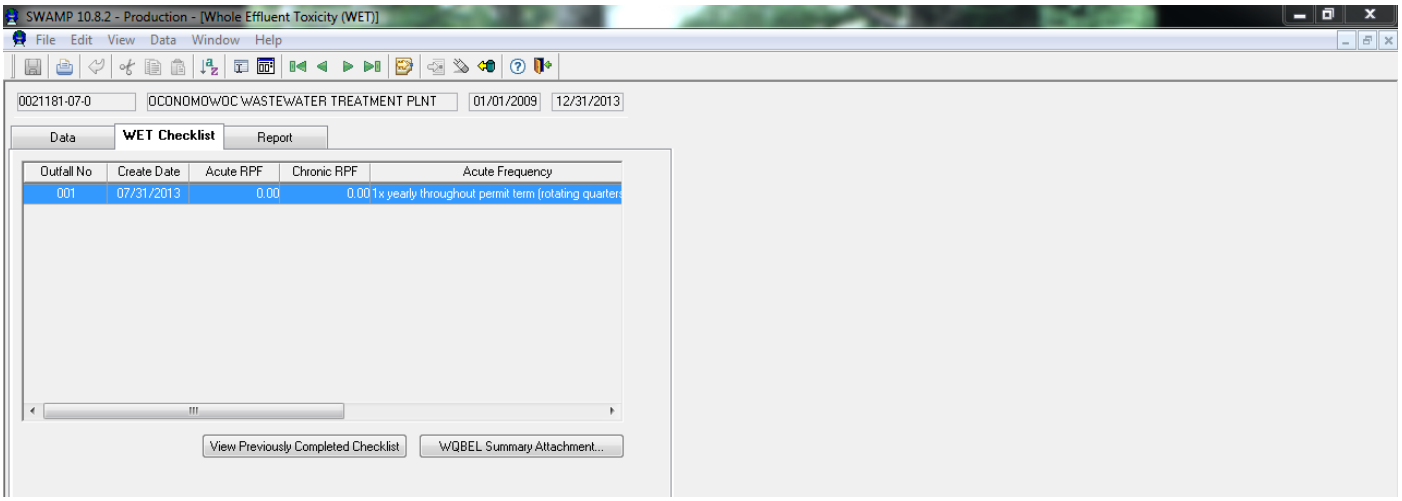

When the “Search WET” window appears (above), enter the permit number and click the “Find Now” button. From the list given, click on the facility you are interested in and then click on the “Open” button.

*Previously created WET Checklists will be attached to the permit that was in effect when the analysis was being done. In other words, the WET Checklist for the permit marked “current” will be attached to the previous permit (now expired), since the previous permit was in effect when the current one was being drafted and the WET Checklist was created.*




The “Whole Effluent Toxicity (WET)” screen (above) appears with the Data tab displayed. To modify an existing Checklist or to create a new one, select the “WET Checklist” tab from the “Whole Effluent Toxicity (WET)” screen (shown above).

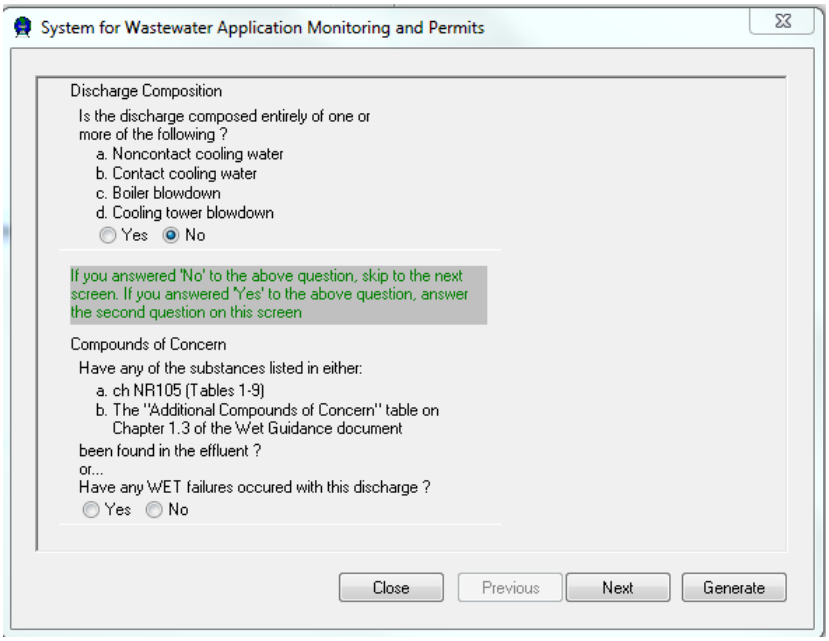
## WET Checklist (Creating a New or Modifying an Existing Checklist)




The WET Checklist screen (shown above) will show a list of previously completed checklists (if there are any) for the given facility, the date each was created, the person who completed the last update, and other pertinent information. The screen above also allows the user to create an abbreviated summary of a completed WET checklist to be attached to a WQBEL document (click the “WQBEL Summary Attachment” button), or a more complete summary showing answers given, point totals, and monitoring and limit recommendations (click on “View Previously Completed Checklist” button).

To modify an existing Checklist, select the appropriate row, then double-click. To create a new Checklist, right-click in the WET Checklist tab area, then choose “insert”. Completed WET Checklists will be marked “final”, once the permit is reissued. Once marked final, users will no longer be able to modify that Checklist. A new Checklist can be created. Staff should contact the Biomonitoring Coordinator, if they need to modify a final Checklist.

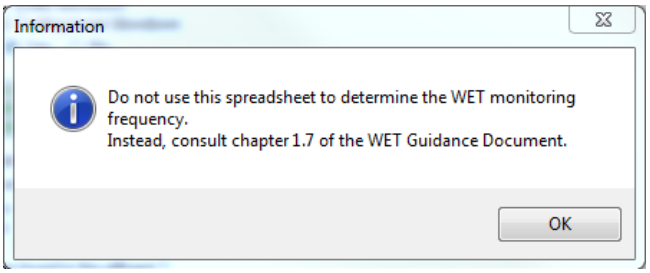
**Non-process Waters & Compounds of Concern**




The questions shown in the screen above are designed to determine whether the user has chosen the correct tool for determining WET monitoring frequencies. If the discharge is not made up entirely of noncontact cooling water, contact cooling water, cooling tower blowdown, or boiler blowdown (i.e., if the answer to the 1st question is "no"), the Checklist is appropriate and will continue to the facility information screen shown on page 11 (the answer to the 2nd question does not matter and the Checklist will not allow it to be answered). If it is solely a noncontact cooling water, contact cooling water, cooling tower blowdown, or boiler blowdown discharge (i.e., if the answer to the 1st question is "yes"), the Checklist only needs to be completed if WET failures have occurred or if "compounds of concern" have been detected (so the answer to the 2nd question will need to be given for the Checklist to continue).

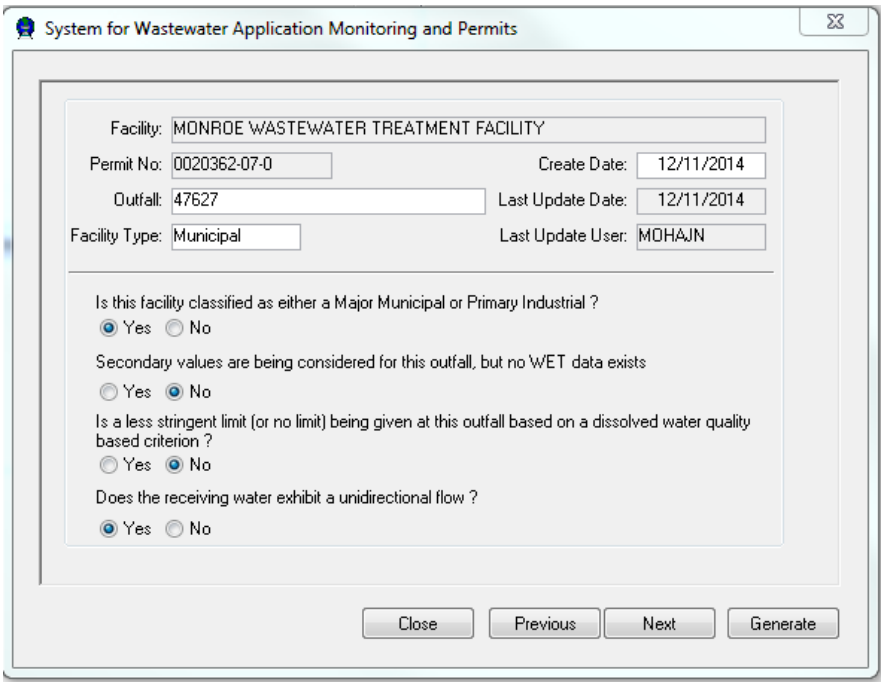
If the discharge is made up solely of one of the categories mentioned above and no compounds of concern have been detected in that discharge and no WET failures have occurred (in other words, a "yes" is given in the 1st question, and a "No" in the 2nd), an information box will appear instructing the user to consult the *Water Quality Review Procedures for Additives* guidance (see http://dnr.wi.gov/topic/wastewater/Guidance.html).

**Additive Evaluations**




If answers given in the Discharge Composition/Compounds of Concern screen indicate that the discharge is not composed entirely of noncontact cooling water, contact cooling water, boiler blowdown, or cooling tower blowdown, or if substances listed in ch. NR 105, Wis. Adm. Code, or the "Additional Compounds of Concern" table have been detected or WET failures have occurred, the Checklist will continue to the next screen.

**Facility Type & Minimum Monitoring Frequency**




Information entered in the screen above identifies the outfall being assessed, its discharge type, and other pertinent information. WET Checklists will need to be completed for each outfall at each facility, unless it has been decided that site-specific situations are better represented by conducting WET tests on combined outfalls (evaluations on combined outfalls will have to be done with the WET Checklist). The Checklist will automatically update the "last update date" and "last update user" each time the Checklist is revised.

**Facility Type:** The user must choose "municipal" or "industrial". (NOTE: all non-municipals are considered industrial for the purposes of this Checklist.) Indication of facility type is needed for the Checklist to continue, as future screens appear based on this designation.

**Major Municipal or Primary Industrial:** Federal regulations require that major municipal dischargers submit at least 4 acute and chronic WET tests with their permit reissuance application, as detailed in 40 CFR 122.21(j) (see Figure 3 below). It is recommended that these same testing minimums be applied to process wastewater discharges from primary industries. These federal regulations allow tests to be conducted within the previous term of the permit, so the Checklist recommends a minimum of 1x yearly acute and chronic monitoring (need for chronic is based on dilution) for major municipal and primary industrials, so that data can be available at the time of the next permit application. The Checklist does not assign points for this question, but instead evaluates whether the points given once the Checklist is complete are enough to satisfy this requirement. If less than 1x yearly testing would otherwise be recommended due to point totals, the Checklist recommends 1x yearly monitoring for these dischargers.

**Secondary Values:** In situations where secondary values are being considered, those substances are present at levels of concern, and no WET data is available, the *Water Quality Rules Implementation Plan* (1/98; Chapter 3A. "CALCULATION OF SECONDARY VALUES"), recommends that monitoring for that substance and at least 2x annual acute and chronic WET (need for chronic based on dilution) be required in the permit. The Checklist uses this question to insure this monitoring frequency is recommended whenever secondary values are considered. The *Water Quality Rules Implementation Plan* also recommends that chemical-specific monitoring be conducted on WET samples. See "Procedures for Deriving Wisconsin's Numeric Water Quality Criteria" for guidance on how to calculate secondary values.

**Dissolved Water Quality Criteria:** The *Water Quality Rules Implementation Plan* (1/98; Chapter 4. "DISSOLVED WATER QUALITY CRITERIA FOR HEAVY METALS"), recommends that 1x yearly acute & chronic WET be given to any discharge which receives a less stringent effluent limit (or no limit) based on a dissolved water quality criterion. The Checklist uses this question to insure that this monitoring frequency is recommended when effluent limits are given based on dissolved water quality criteria. WET in these situations should be applied at the point of application of the chemical-specific limit (regardless of stream classification, distance to full fish and aquatic life waters, etc.).

***Figure 3. 40 CFR Part 122.21(j) Permit Application Requirements for Major Municipal Dischargers***

**§122.21 Application for a permit**

**(j)** ***Application requirements for new and existing POTWs.***

(5) *Effluent monitoring for whole effluent toxicity.* (i) All applicants must provide an identification of any whole effluent toxicity tests conducted during the four and one-half years prior to the date of the application on any of the applicant's discharges or on any receiving water near the discharge.

(ii) As provided in paragraphs (j)(5)(iii)-(ix) of this section, the following applicants must submit to the Director the results of valid whole effluent toxicity tests for acute or chronic toxicity for samples taken from each outfall through which effluent is discharged to surface waters, except for combined sewer overflows:

(A) All POTWs with design flow rates greater than or equal to one million gallons per day;

….

(iv) Each applicant required to perform whole effluent toxicity testing pursuant to paragraph (j)(5)(ii) of this section must provide:

(A) Results of a minimum of four quarterly tests for a year, from the year preceding the permit application; or

(B) Results from four tests performed at least annually in the four and one half year period prior to the application, provided the results show no appreciable toxicity using a safety factor determined by the permitting authority.

(v) Applicants must conduct tests with multiple species (no less than two species; e.g., fish, invertebrate, plant), and test for acute or chronic toxicity, depending on the range of receiving water dilution…

(vi) Each applicant required to perform whole effluent toxicity testing pursuant to paragraph (j)(5)(ii) of this section must provide the number of chronic or acute whole effluent toxicity tests that have been conducted since the last permit reissuance.

(vii) Applicants must provide the results using the form provided by the Director, or test summaries if available and comprehensive, for each whole effluent toxicity test conducted pursuant to paragraph (j)(5)(ii) of this section for which such information has not been reported previously to the Director.

…

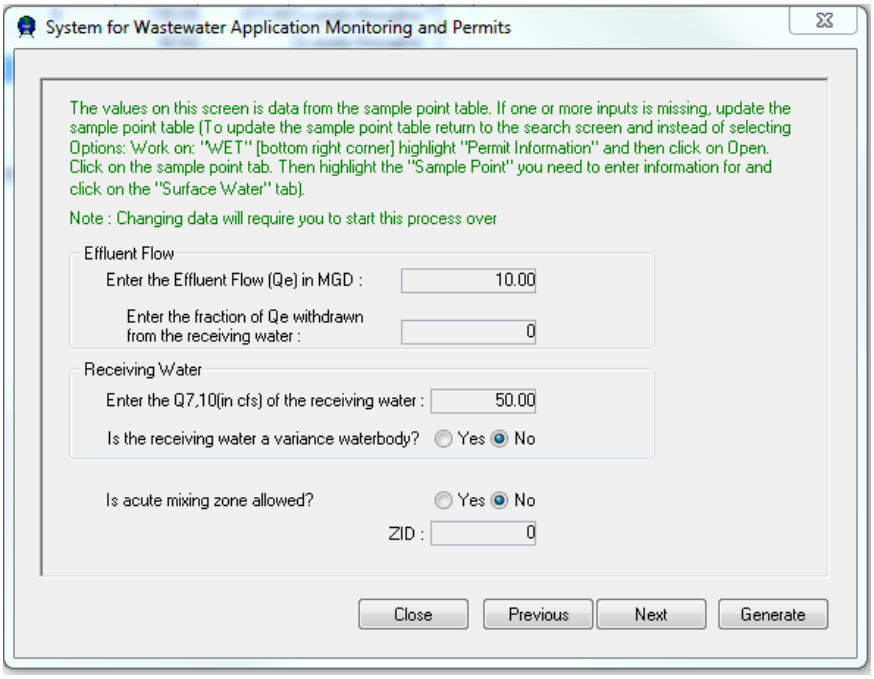
(ix) For whole effluent toxicity data submitted to the Director within four and one-half years prior to the date of the application, applicants must provide the dates on which the data were submitted and a summary of the results.

(x) Each POTW required to perform whole effluent toxicity testing pursuant to paragraph (j)(5)(ii) of this section must provide any information on the cause of toxicity and written details of any toxicity reduction evaluation conducted, if any whole effluent toxicity test conducted within the past four and one-half years revealed toxicity.

**Available Dilution and Appropriate Mixing Zones**

Because the magnitude of effect usually increases as a toxicant's concentration increases, one of the most important factors affecting the potential for environmental impacts due to effluent toxicity is the dilution available in the receiving water. A very toxic effluent may cause less environmental damage if there is a lot of receiving water dilution available, than a less toxic effluent if there is very little available dilution. Since dilution and mixing are important considerations used to determine types of WET testing, the Checklist evaluates this information.

The last question in the screen above asks whether the receiving water has a unidirectional flow in order to determine whether sufficient mixing is present at the point of discharge. If the receiving water is a flowing waterbody, the Checklist continues to the next screen. If the discharge is to a non-flowing waterbody (e.g., lake, pond, or static wetland), a "No" is given. Since adequate mixing does not occur in these situations, the Checklist assigns a default instream waste concentration (IWC) of 9% as required in s. NR 106.06, Wis. Adm. Code, and skips to the "Calculate Reasonable Potential" screen on page 16. (*NOTE: the Checklist uses this default 10:1 ratio and IWC = 9% for non-flowing waterbodies. If another ratio is appropriate, staff will have to calculate the IWC outside of the checklist and note this in WQBEL memos.)*




If any values are missing from this screen, the user will need to update information in the Sample Point tab, before continuing with the WET Checklist (see attachment 3). In most cases, the effluent flow ($Q_e$) used in the WET Checklist should be the annual average design flow for municipals or average annual actual flow for industrial dischargers. The Checklist uses this information to determine the appropriate $Q_{7,10}$:$Q_e$ ratio, IWC, AMZ, and chronic dilution series, as shown below. The withdrawal factor (f) should be entered as a decimal (for example, if ½ is withdrawn from the receiving water, enter 0.5). This value will be used in the IWC calculation, as shown on page 16.

The waterbody type question in the screen above helps to determine the receiving water flow value that should be used to make WET determinations. This and the next 3 screens help choose that flow value according to the guidance in Chapter 1.2 (http://dnr.wi.gov/topic/wastewater/WETguidance.html). The type of flow used for these determinations should be the same as was used to calculate chronic WQBEL limits. In most cases, the flow value used to determine the need for chronic testing, calculate the IWC, and choose the correct chronic dilution series should be the $Q_{7,10}$ of the first non-variance classified waterbody encountered by the discharge. In situations where a flow other than the $Q_{7,10}$ was used (for example, a $Q_{4,3}$), that value may be substituted for the $Q_{7,10}$ in this ratio. *(NOTE: the checklist uses default values such as annual average effluent flow, 1/4 $Q_{7,10}$ and a 10:1 dilution ratio for lake dischargers. If other values are more appropriate in a given situation, staff will need to make these decisions outside of the Checklist and note this in WQBEL memos.)*

**Variance Waterbodies.** If the receiving water is classified as a variance waterbody as defined in Chapter 1.2, the Checklist continues to the next screen. If the receiving water is not a variance waterbody, the Checklist skips 3 screens and goes to the "Calculate Reasonable Potential" screen on page 16.

**Acute mixing zone concentration (AMZ).** Use of an AMZ is appropriate only in cases where a zone of initial dilution (ZID) has been approved as defined in s. NR 106.06 (3) (c), Wis. Adm. Code. See Figure 4 below for a discussion of how to use a ZID ratio to calculate the AMZ in each site-specific situation. The AMZ is used as the compliance endpoint in acute tests (i.e., the $LC_{50}$ must be $\geq$ AMZ% to pass). In cases where a ZID has not been approved for the given discharge, acute compliance is determined at the end of pipe (i.e., the $LC_{50}$ must be $\geq$ 100% to pass). No points are given based on the presence or absence of a ZID; the Checklist is used only to calculate the AMZ.

***Figure 4. Acute Mixing Zone Concentration Calculation***

When a zone of initial dilution, or acute mixing zone, has been granted for a discharge, it will typically be expressed as a ratio of the receiving water after it has mixed with the effluent compared to the effluent alone. For example, a ratio expressed as 19.5:1 means that 18.5 parts receiving water is mixing with 1 part effluent. The AMZ concentration to be used in WET tests for determining compliance is calculated as follows:

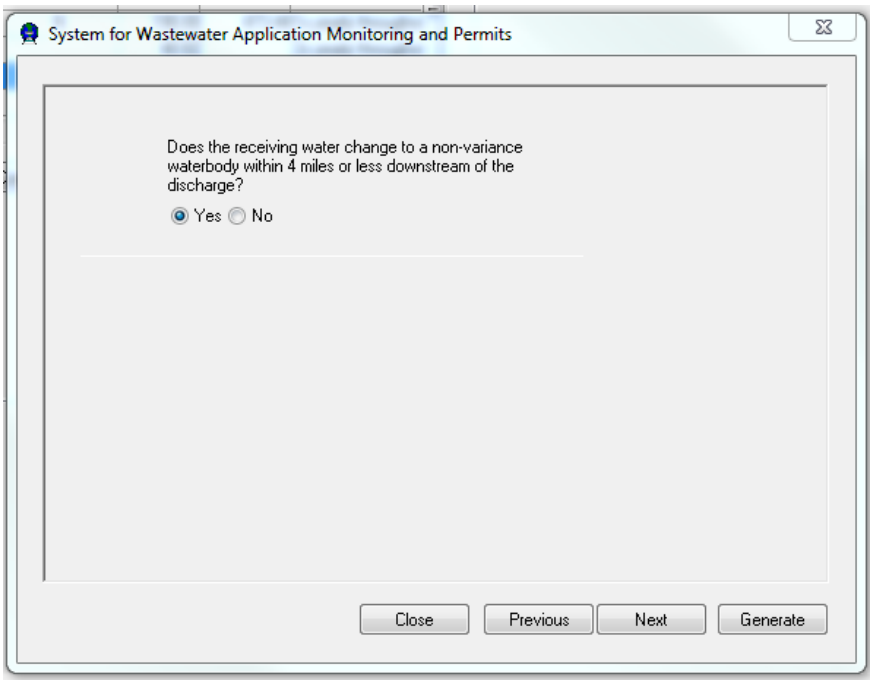
**AMZ (as %) = (100 /receiving water + effluent ratio) x 3.3**

For the example given above, where the dilution ratio is 19.5:1 (where 19.5 = 18.5 parts receiving water + 1 part effluent), the correct AMZ for acute tests would be:

(100 / 19.5) x 3.3 = 16.9

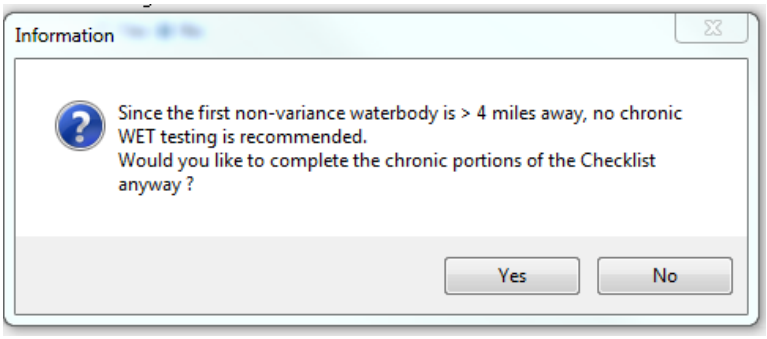
AMZ = 17%

Staff should be careful to note how the mixing zone dilution ratio was expressed in the first place - whether it includes the effluent or not. For example, if it's 19.5 parts receiving water only to 1 part effluent, then it should be expressed as 20.5 (total of effluent plus background) for the example above and the correct dilution in that case would be 16.1%. If it's 19.5 total to 1 (the 19.5 includes the effluent), then it's 16.9%.

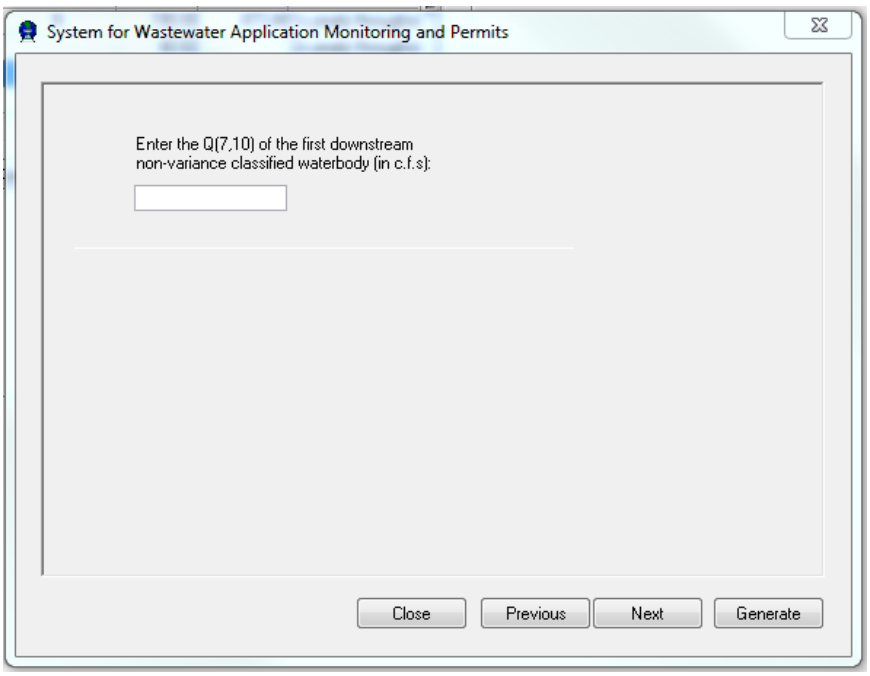



As described in Chapter 1.2, whenever the effluent is discharged directly into a variance waterbody the distance between the outfall and the point where the receiving water becomes a non-variance waterbody will have to be determined. When this distance $\leq$ 4 miles, the flow used should be that of the non-variance waterbody. If the distance is > 4 miles, chronic testing is usually not recommended unless data exists suggesting a potential for chronic impacts.

If chronic WET data exists for the outfall in question, and chronic WET failures have occurred, staff should consider whether additional chronic WET monitoring is necessary to insure that receiving water impacts are not occurring (see Chapter 1.2 for more discussion).




If the closest non-variance classified waterbody is > 4 miles away, the Checklist asks whether the user would like to evaluate chronic frequencies anyway, then continues to the reasonable potential screen (p. 16). If ≤ 4 miles away, the Checklist goes to the next screen shown below, where the $Q_{7,10}$ of the 1st downstream non-variance waterbody is entered.




After the appropriate $Q_{7,10}$ and the $Q_e$ have been selected in the screens above, the Checklist calculates the $Q_{7,10}$:$Q_e$ ratio, the IWC, and the appropriate chronic dilution series, as described below.

**$Q_{7,10}$:$Q_e$ Ratio.** The stream flow to effluent flow ratio ($Q_{7,10}$: $Q_e$) is calculated to determine whether WET testing is unnecessary because of the amount of dilution that is present.

If the $Q_{7,10}$:$Q_e$ > 1000:1, no WET testing is recommended, as dilution is high and the potential for impacts due to toxicity are low. Staff may determine that testing is necessary despite high dilution and the Checklist allows the user to continue in these circumstances. The Checklist does not need to be completed if no testing is determined to be necessary, however this decision should be clearly documented in the WQBEL and permit file, so others can tell why decisions were made.

If the $Q_{7,10}$:$Q_e$ ≤ 1000:1 and > 100:1, the need for acute monitoring should be evaluated, but chronic monitoring is not recommended, since dilution is high and the potential for impacts due to chronic toxicity are low. Staff may determine that there is a need to evaluate chronic testing despite high dilution and the Checklist allows the user to continue in these cases.

If the $Q_{7,10}$:$Q_e$ ≤ 100:1, the need for acute and chronic monitoring should be further evaluated. The Checklist will continue to the next screen and recommend acute and chronic monitoring frequencies based on final point totals.

**Dilution Series.** In the "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*" (Methods Manual), Section 4.12, the standard acute WET test dilution series is 6.25, 12.5, 25, 50, 100% and the standard chronic WET test dilution series is either 100, 30, 10, 3, 1% (if the IWC is ≤ 30%) or 100, 75, 50, 25, 12.5% (if the IWC is > 30%). These dilution series are appropriate for most situations and are recommended by the WET Checklist. The Methods Manual allows for alternate dilution series, if requested by the permittee and specified in the permit. For more discussion of dilution series, see Chapter 2.11 (http://dnr.wi.gov/topic/wastewater/WETguidance.html).

**Instream waste concentration (IWC).** The IWC is an estimate of the proportion of effluent ($Q_e$) to the total volume of water ($Q_e$ +$Q_s$). Since toxicity typically increases as the concentration of a toxicant (or effluent) increases, one of the most important factors affecting the potential for impacts due to WET is dilution. A highly toxic effluent with a large amount of dilution available in the receiving water may cause less environmental impact than a slightly toxic effluent with very little available dilution. For this reason, outfalls with higher IWCs are given more points by the WET Checklist. The IWC is calculated according to s. NR 106.03(6), Wis. Adm. Code.

***Figure 5. NR 106.03(6) Instream Waste Concentration Calculation***

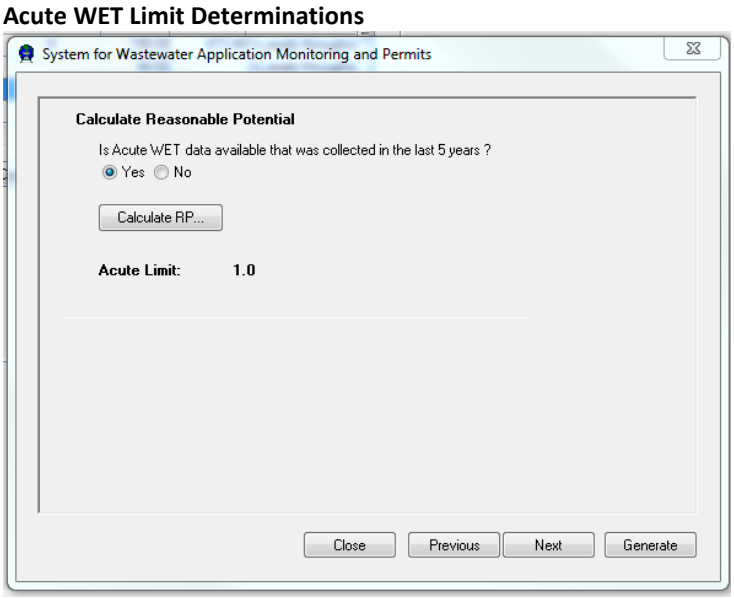
**NR 106.03 Definitions.** The following definitions are applicable to terms used in this chapter.
**(6)** "IWC" or "Instream waste concentration" means an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC is calculated according to the following equation:

$$\text{IWC (as \%)} = 100 \times \frac{Qe}{(1-f)Qe + Qs}$$

where:
Qe = effluent flow
f = fraction of the Qe withdrawn from the receiving water
Qs = receiving water flow (in most cases ¼ of a low flow value, such as the $Q_{7,10}$, is used in order to allow a free zone of passage for aquatic organisms).

| *POINTS ASSESSED (Chronic only)* | |
|---|---|
| ***If the IWC is:*** | ***Points given:*** |
| *≤ 35%* | *0* |
| *> 35 and ≤ 65%* | *10* |
| *> 65%* | *15* |

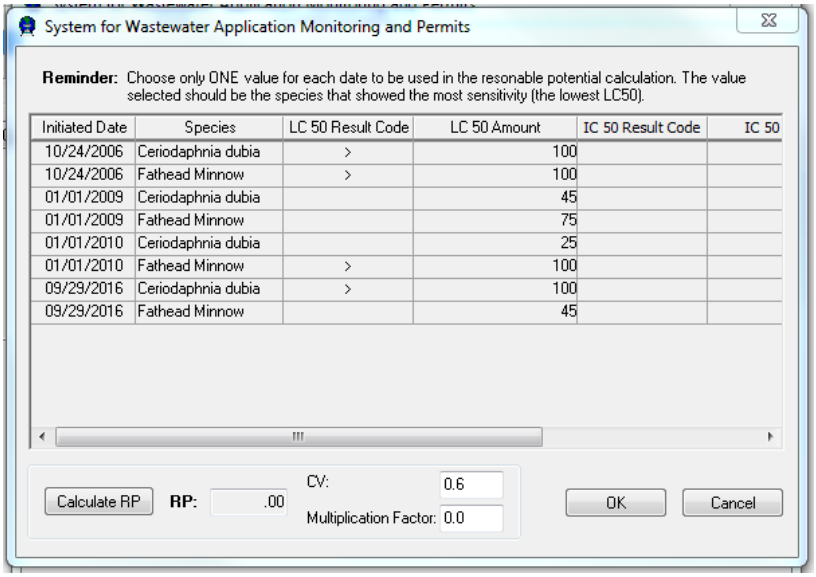
**Acute WET Limit Determinations**



In the screen above, the user indicates whether there is representative acute WET data available from the most recent 5 years for the discharge being evaluated. If no recent data is available, the Checklist assigns 5 points. This is done because more uncertainty exists in situations where testing has not been done in recent times than at those facilities that have produced recent data which shows toxicity problems are not a concern. The user clicks on "Calculate RP" if any representative data is available (even if ≥ 5 years old), in order to choose the data to be used to calculate the acute reasonable potential. The acute WET limit, calculated using the appropriate acute mixing zone (or no mixing zone) indicated for the facility, is also shown on this screen (Acute limit = 100/AMZ).

*Points should be assigned (a "No" given) if no representative data is available from the last 5 years. This does not mean that older data cannot be used in reasonable potential decisions – it is recommended that all representative data be used in WET determinations. This is just a check to insure that WET monitoring has been done in the recent past.*

**Data Used to Calculate Reasonable Potential**




| Initiated Date | Species | LC 50 Result Code | LC 50 Amount | IC 50 Result Code | IC 50 |
|---|---|---|---|---|---|
| 10/24/2006 | Ceriodaphnia dubia | > | 100 | | |
| 10/24/2006 | Fathead Minnow | > | 100 | | |
| 01/01/2009 | Ceriodaphnia dubia | | 45 | | |
| 01/01/2009 | Fathead Minnow | | 75 | | |
| 01/01/2010 | Ceriodaphnia dubia | | 25 | | |
| 01/01/2010 | Fathead Minnow | > | 100 | | |
| 09/29/2016 | Ceriodaphnia dubia | > | 100 | | |
| 09/29/2016 | Fathead Minnow | | 45 | | |

The Checklist uses data selected in the screen above to calculate reasonable potential. WET limits are given whenever representative, facility-specific data shows the effluent may be discharged at a level that has the potential to cause or contribute to an excursion above a WET criterion, as specified in s. NR 106.08(6)(b). See Figure 6 below.

Decisions about reasonable potential, monitoring frequencies, and other WET determinations should be based on data that is representative of the discharge being evaluated, as discussed in step 2 on page 4. When the screen above opens, all valid WET data in the SWAMP WET Database for the selected outfall will appear. The user will have to select WET data to be used in the reasonable potential calculation, by highlighting one species from each test date to be used. Once the most sensitive species (see next paragraph) from each test has been highlighted, the user clicks "Calculate Reasonable Potential". The WET Checklist will choose the appropriate equation and show the resulting RP value.

**Most sensitive species.** The user should choose one value for each test date to be used in the RP calculation. The value selected should be the species that showed the most sensitivity (the lowest $LC_{50}$ or $IC_{25/50}$) for each test. For example, if 2 tests were completed and the 1st resulted in an $LC_{50}$ = 50% for *C. dubia* and an $LC_{50}$ = 75% for the fathead minnow, and the 2nd resulted in an $LC_{50}$ >100% for *C. dubia* and an $LC_{50}$ = 25% for the fathead minnow, the user would select the *C. dubia* result ($LC_{50}$ = 50%) from the 1st test and the fathead minnow result ($LC_{50}$ = 25%) from the 2nd test.

**Tests with one species.** Permit-required WET tests require a battery of organisms, in order to represent different trophic levels and taxonomic groups. Because species sensitivity can change as effluent quality and makeup changes, tests conducted with only one species should not be included in reasonable potential calculations, in most cases. An exception should be made if the tested species failed the test – in this case, that species should be included in the RP analysis because if both species had been included and only one failed, the failed species would have been used in the RP analysis. Tests conducted in a manner consistent with permit requirements (e.g., full dilution series, etc.) should be used; screening tests for TREs (100% effluent only) cannot be used because no LC or IC value is generated from these tests.

**Coefficient of Variation (CV).** Section NR 106.08(6)(c) requires that the multiplication factor chosen from Table 4 be based on a CV = 0.6 whenever there are less than 10 toxicity detects in the dataset. (See Figure 6 below.) Since this will be the case in the majority of situations, the Checklist sets the CV = 0.6 in the screen above. If there are more than 10 detects in the given dataset, staff will have to calculate the appropriate CV, enter it into the space provided (replace the CV = 0.6) and add the correct multiplication factor from Table 4.

**Table 4 Multiplication Factor.** The multiplication factor from Table 4 in s. NR 106.08, Wis. Adm. Code, is used to convert the calculated effluent toxicity value to the estimated 95$^{th}$ percentile value. This multiplication factor must be chosen based on the number of <u>detects</u> (number of samples that resulted in an LC or IC < 100%) and the appropriate coefficient of variation. Staff should be careful to use the number of toxicity detects, <u>not</u> the total number of samples in the dataset, when selecting this multiplication factor.

When it has been determined that there is reasonable potential for a limit to be exceeded, that WET limit must be included in the permit. WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by the multiplication factor, in order to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable RP equation (shown in Figure 6) results in a value greater than 1.0.**

*Figure 6. NR 106.08(6) Reasonable Potential Calculations*

**NR 106.08 Determination of the necessity for whole effluent toxicity testing requirements and limitations.**

**(6)** REASONABLE POTENTIAL TO RECEIVE AN ACUTE OR CHRONIC WHOLE EFFLUENT TOXICITY LIMIT.

**(b)** *Reasonable potential.*
1. If a zone of initial dilution has not been approved, the potential to exceed an acute criterion shall be calculated using the following equation:

(TUa effluent) (B) > 1.0

Where:

TUa effluent= maximum calculated TUa from the most sensitive species in the data set
B= Reasonable potential multiplication factor determined under par. (c)
1.0= Numeric acute WET limitation in acute toxic units (TUa) derived from narrative criterion in s. NR 102.04(1)(d)

2. If a zone of initial dilution has been approved, the potential to exceed an acute criterion shall be calculated using the following equation:

[(TUa effluent) (B) (AMZ)] > 1.0

Where:

TUa effluent= Maximum calculated TUa from the most sensitive species in the data set
B= Reasonable potential multiplication factor determined under par. (c)
AMZ= Acute mixing zone concentration based on presence of a zone of initial dilution as defined in s. NR 106.03(1) expressed as a decimal
1.0= Numeric acute WET limitation in acute toxic units (TUa) derived from narrative criterion in s. NR 102.04(1)(d)

3. The potential to exceed a chronic criterion shall be calculated using the following equation:

[(TUc effluent) (B) (IWC)]> 1.0

Where:

TUc effluent= Maximum calculated TUc from the most sensitive species in the data set
B= Reasonable potential multiplication factor determined under par. (c)
IWC= Instream waste concentration as defined in s. NR 106.03(6) expressed as a decimal
1.0= Numeric chronic WET limitation in chronic toxic units (TUc) derived from narrative criterion in s. NR 102.04(4)(d)

**(c)** *Reasonable potential multiplication factor*. The reasonable potential multiplication factor in par. (b) is used to convert the calculated effluent toxicity value to the estimated 95$^{th}$ percentile value. The department shall use the following methods to select a reasonable potential multiplication factor:

1. Where there are < 10 individual toxicity **detects**, the multiplication factor shall be taken from Table 4 and based on a coefficient of variation of 0.6.
2. Where there are ≥ 10 individual toxicity **detects**, the multiplication factor shall be taken from Table 4 and based on coefficient of variation calculated as the standard deviation of the WET test endpoints (IC25, IC50 or LC50) divided by the arithmetic mean of the WET tests.

**NR 106.08 (5) (c) Table 4 — Reasonable Potential Multiplication Factor.**

| | Coefficient of variation (CV) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of samples (n) | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 |
| 1 | - | - | - | - | - | 6.2 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | - | - | - | - | - | 3.8 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | - | - | - | - | - | 3.0 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | - | - | - | - | - | 2.6 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | - | - | - | - | - | 2.3 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | - | - | - | - | - | 2.1 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | - | - | - | - | - | 2.0 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | - | - | - | - | - | 1.9 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 9 | - | - | - | - | - | 1.8 | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.7 | 1.9 | 2.0 | 2.2 | 2.3 | 2.4 | 2.6 | 2.7 | 2.8 | 3.0 | 3.1 | 3.2 | 3.3 | 3.4 | 3.6 |
| 11 | 1.1 | 1.2 | 1.3 | 1.4 | 1.6 | 1.7 | 1.8 | 1.9 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.7 | 2.8 | 2.9 | 3.0 | 3.1 | 3.2 | 3.3 |
| 12 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.6 | 2.7 | 2.8 | 2.9 | 3.0 | 3.0 |
| 13 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.5 | 2.6 | 2.7 | 2.8 | 2.9 |
| 14 | 1.1 | 1.2 | 1.3 | 1.4 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.3 | 2.4 | 2.5 | 2.6 | 2.6 | 2.7 |
| 15 | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.2 | 2.3 | 2.4 | 2.4 | 2.5 | 2.5 |
| 16 | 1.1 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.6 | 1.7 | 1.8 | 1.9 | 1.9 | 2.0 | 2.1 | 2.1 | 2.2 | 2.3 | 2.3 | 2.4 | 2.4 |
| 17 | 1.1 | 1.1 | 1.2 | 1.3 | 1.4 | 1.4 | 1.5 | 1.6 | 1.7 | 1.7 | 1.8 | 1.9 | 1.9 | 2.0 | 2.0 | 2.1 | 2.2 | 2.2 | 2.3 | 2.3 |
| 18 | 1.1 | 1.1 | 1.2 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 1.6 | 1.7 | 1.7 | 1.8 | 1.9 | 1.9 | 2.0 | 2.0 | 2.1 | 2.1 | 2.2 | 2.2 |
| 19 | 1.1 | 1.1 | 1.2 | 1.3 | 1.3 | 1.4 | 1.5 | 1.5 | 1.6 | 1.6 | 1.7 | 1.8 | 1.8 | 1.9 | 1.9 | 2.0 | 2.0 | 2.0 | 2.1 | 2.1 |
| 20 | 1.1 | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.4 | 1.5 | 1.5 | 1.6 | 1.6 | 1.7 | 1.7 | 1.8 | 1.8 | 1.9 | 1.9 | 2.0 | 2.0 | 2.0 |
| 21-100 | (see table in NR 106) | | | | | | | | | | | | | | | | | | | |

NOTE: Red text is highlighted above to note that "number of samples" in column 1 is the number of detects in the dataset, not the total number of data.

**(d)** *Maximum toxicity values.* The Department shall set the TUc effluent and TUa effluent values in par. (b) equal to zero whenever toxicity is not-detected or the LC50, IC25, or IC50 equals or exceeds 100% effluent.

**Reasonable Potential Could Be Present Even if a WET Failure Has Not Occurred**

As a result of the WET reasonable potential procedures in s. NR 106.08 (6), Wis. Adm. Code (Figure 6), a limit will be required in almost all cases where a permittee has a WET failure in their dataset. Reasonable potential can also be indicated in situations where no WET failures have occurred, if toxicity was detected near enough to the applicable limit. The examples below demonstrate how this might occur.

*NR 106.08(6)(b)*
*3. The potential to exceed a chronic criterion shall be calculated using the following equation:*

*[(TUc effluent) (B) (IWC)]> 1.0*

*Where: TUc effluent= Maximum calculated TUc from the most sensitive species in the data set*
*B= Reasonable potential multiplication factor determined under par. (c)*
*IWC= Instream waste concentration as defined in s. NR 106.03(6) expressed as a decimal*
*1.0= Numeric chronic WET criterion in chronic toxic units (TUc) derived from narrative criterion in s. NR 102.04(4)(d)*

**Example 1:**

| Date initiated | Chronic results | | Maximum TUc (100/IC25) | Pass/ Fail |
|---|---|---|---|---|
| | C. dubia IC25 | Fathead IC25 | | |
| 12/31/2010 | >100% | >100% | 1.0 | Pass |
| 03/25/2011 | >100% | >100% | 1.0 | Pass |
| 06/10/2012 | >100% | >100% | 1.0 | Pass |
| 09/22/2013 | 85% | >100% | **1.18** | Pass |
| 12/09/2014 | >100% | >100% | 1.0 | Pass |

- IWC = 10% (**0.10**)
- Most sensitive result: IC25 = 85%; Maximum TUc = 100/85 = **1.18** (test passed; toxicity detected well below the limit)
- 5 WET tests, 1 toxicity detect. Multiplication factor (B) from NR 106.08(5)(c), Table 4 = **6.2** (based on # of detects)

**1.18 x 6.2 x 0.10 = 0.73; RP not shown, limit <u>not</u> required**

**Example 2:**

| Date initiated | Chronic results | | Maximum TUc (100/IC25) | Pass/ Fail |
|---|---|---|---|---|
| | C. dubia IC25 | Fathead IC25 | | |
| 12/31/2010 | >100% | >100% | 1.0 | Pass |
| 03/25/2011 | >100% | >100% | 1.0 | Pass |
| 06/10/2012 | >100% | >100% | 1.0 | Pass |
| 09/22/2013 | 55% | >100% | **1.82** | Pass |
| 12/09/2014 | >100% | >100% | 1.0 | Pass |

- IWC = 25% (**0.25**)
- Most sensitive result: IC25 = 55%; Maximum TUc = 100/55 = **1.82** (test passed; toxicity detected nearer to the limit)
- 5 WET tests, 1 toxicity detect. Multiplication factor (B) from NR 106.08(5)(c), Table 4 = **6.2** (based on # of detects)

**1.82 x 6.2 x 0.25 = 2.82; RP is shown, limit is required**

**When Is a Compliance Schedule/Toxicity Reduction Evaluation Recommended?**

Toxicity reduction evaluations include investigations by the permittee and their WET consultant to identify the chemical(s) causing toxicity. The **4th column** in Table 1 below shows when a TRE compliance schedule is recommended by the WET Checklist. (See Chapter 1.12 for more about what is included in a standard TRE compliance schedule.) In order to complete a successful TRE, toxicity has to be present in the effluent often enough so that sample manipulations can be done to characterize the toxicity and/or steps can be taken to trace the source of toxicity. Therefore, the WET Checklist recommends a TRE compliance schedule based on the total number of WET data and the number of failures that have occurred. In cases where data is limited or where toxicity has appeared infrequently, a TRE may not be recommended (the WET Checklist will not recommend a TRE, as shown in column 4). In these cases, the WET Checklist often recommends more frequent monitoring instead, in order to determine whether toxicity reappears over time. Standard language typically included in WPDES permits requires the permittee to conduct a TRE if WET failures occur during the permit term, so repeated bouts of toxicity may still trigger the need for a TRE (see Chapter 1.14: http://dnr.wi.gov/topic/wastewater/WETguidance.html).

The recommendations shown in Table 1 reflect those given by the WET Checklist and should be appropriate in many situations. However, staff should use their judgment to decide whether a TRE is needed in each case, especially where few failures have occurred or where other conditions might exist that make a compliance schedule inappropriate. A TRE should be required in most cases where valid, representative WET data indicates that reasonable potential is present and that the duration, magnitude, and frequency of WET failures is sufficient to be able to determine what is causing toxicity. A general rule of thumb may be that if more than 25% of completed tests have failed, and an explanation for toxicity has not been identified, then a TRE compliance schedule is probably appropriate. Staff should consult with the Biomonitoring Coordinator if they have questions or are uncertain whether a TRE is necessary.

***Table 1. Compliance Schedules and Minimum Monitoring Frequencies***

| # data | # failures | Limit Required? (RP shown) | TRE schedule recommended? | Minimum monitoring frequency | Comments |
|---|---|---|---|---|---|
| 1 | 0 | No | No | NA | No limit or TRE recommended |
| 1 | 0 | Yes | No | 1x annual | See "Reasonable potential may be present when a WET failure has not occurred". |
| 1 | 1 | Yes | No | 1x annual | |
| 2 | 0 | No | No | NA | No limit or TRE recommended |
| 2 | 0 | Yes | No | NA | See "Reasonable potential may be present when a WET failure has not occurred". |
| 2 | 1 | Yes | No | 1x annual | |
| 2 | 2 | Yes | No | 1x annual | |
| 3 | 0 | No | No | NA | No limit or TRE recommended |
| 3 | 0 | Yes | No | 1x annual | See "Reasonable potential may be present when a WET failure has not occurred". |
| 3 | 1 | Yes | No | 1x annual | |
| 3 | 2 | Yes | **Yes** | 2x annual | 2x annual testing would be recommended only for the period after the compliance schedule ends and the WET limit has become effective. |
| 3 | 3 | Yes | **Yes** | Quarterly | Quarterly testing recommended after compliance schedule ends & the limit becomes effective. |
| 4 | 0 | No | No | NA | No limit or TRE recommended |
| 4 | 0 | Yes | No | 1x annual | See "Reasonable potential may be present when a WET failure has not occurred". |
| 4 | 1 | Yes | No | 1x annual | |
| 4 | 2 | Yes | **Yes** | 2x annual | 2x annual testing would be recommended only for the period after the compliance schedule ends and the WET limit has become effective. |
| 4 | 3 | Yes | **Yes** | Quarterly | Quarterly testing recommended after compliance schedule ends & the limit becomes effective. |
| 4 | 4 | Yes | **Yes** | Quarterly | Quarterly testing recommended after compliance schedule ends & the limit becomes effective. |
| ≥ 5 | 0 | No | No | NA | No limit or TRE recommended |
| ≥ 5 | 0 | Yes | No | 1x annual | See "Reasonable potential may be present when a WET failure has not occurred". |
| ≥ 5 | < 25% | Yes | No | 1x annual | |
| ≥ 5 | ≥ 25% and ≤ 75% | Yes | **Yes** | Quarterly | Quarterly testing recommended after compliance schedule ends & the limit becomes effective. |
| ≥ 5 | > 75% | Yes | **Yes** | Quarterly | Quarterly testing recommended after compliance schedule ends & the limit becomes effective. |

**Minimum Monitoring Frequencies When Reasonable Potential is Indicated**

The **5th column** in Table 1 shows the minimum WET monitoring frequencies recommended by the WET Checklist, based on the number of representative WET data available, the number of failures that have occurred, and whether or not reasonable potential has been indicated based on the procedure in s. NR 106.08, Wis. Adm. Code. The Checklist does not assign points based on this information, but instead evaluates whether the points given once the Checklist is complete are enough to satisfy this requirement. Other factors rated by the WET Checklist, such as the use of a large number of chemical additives or industrial contributors to a municipal treatment plant, may cause a higher monitoring frequency to be recommended. If less than the recommended monitoring frequency testing would otherwise be recommended due to point totals, the Checklist recommends the minimum monitoring frequency for these dischargers. According to federal regulations at 40 CFR Part 122.44(i)(2), monitoring must occur at least 1x yearly whenever a limit is present. **Therefore, in no case may staff recommend less than 1x annual monitoring when a WET limit is required.**

The recommendations shown in Table 1 reflect the minimums recommended by the WET Checklist and are intended to be appropriate in most situations. However, staff may decide that more or less monitoring is warranted in specific cases. Staff should use their best professional judgment to determine whether minimum monitoring frequencies given by the Checklist are appropriate. Staff should also use their BPJ to adjust monitoring frequencies if it has been decided that a TRE is not necessary. For example, if a TRE and quarterly monitoring for the period after the TRE was recommended by the WET Checklist, staff will need to decide if quarterly monitoring or some other frequency is appropriate for the entire term of the permit if it is decided that a TRE schedule will not be included in the permit.

**WET Limit Trigger – Confirming Whether WET Data is Still Representative**

WET limit triggers may be included in permits when staff are uncertain about the representativeness of WET data used in reasonable potential determinations. For example, say a permittee completed 4 WET tests between 2010-2014:

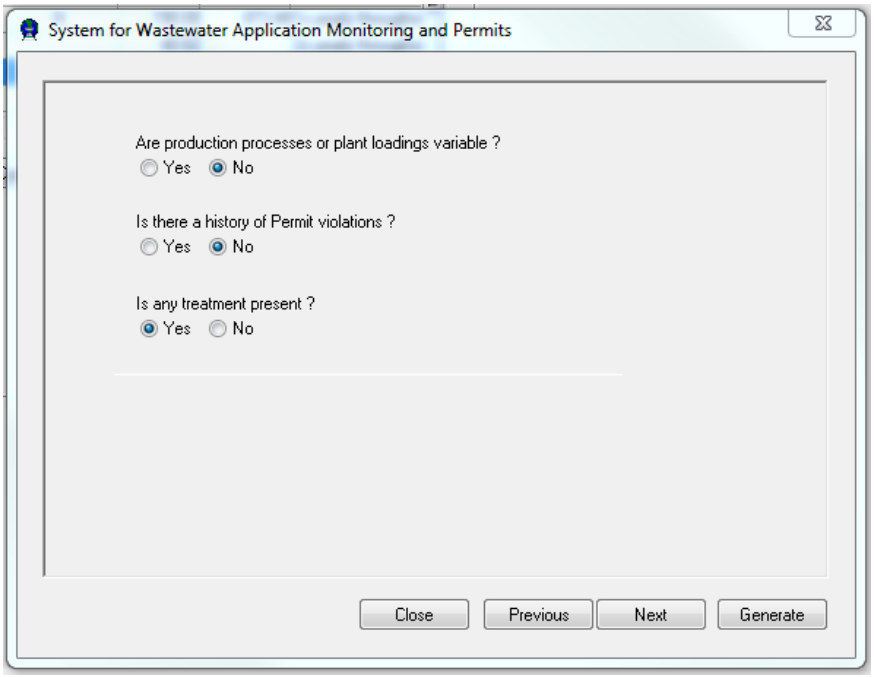
| Date initiated | Chronic results | | Pass/ Fail |
|---|---|---|---|
| | C. dubia IC25 | Fathead IC25 | |
| 12/31/2010 | 25% | >100% | **Fail** |
| 05/25/2011 | >100% | >100% | Pass |
| 06/10/2012 | >100% | >100% | Pass |
| 09/22/2013 | >100% | >100% | Pass |

IWC = 55%

This hypothetical WPDES permit expired on 12/31/14 and is scheduled for reissuance in 2015. The permittee cannot provide definitive information, such as the results of a successful toxicity reduction evaluation, showing that the 2010 result is not representative of the current discharge. However, a local industry which contributes significantly to their influent changed their production process significantly in 2011 and it is likely that they are now sending a much less toxic wastewater to the POTW. Ideally, the permittee would have TRE investigations done before and after the changes were made at the industry which showed that toxicity was caused by that source and changes at the industry resulted in that toxicity being removed. Since the permittee in this example was not able to provide this type of information to the Department before their permit expired and the cause of the original toxicity is still uncertain, the 2010 result probably cannot be thrown out and should be included in the reasonable potential determination.

A trigger may be useful in a situation like this, however, to allow for more WET data to verify that reasonable potential still exists. A trigger usually allows for quarterly testing during the first 12 months of the permit to establish whether toxicity is present in the effluent or whether changes at the industry, in this example, truly resulted in the removal of toxicity. (See Chapter 1.12 http://dnr.wi.gov/topic/wastewater/WETguidance.html for example trigger language.) If no WET failures occur during that first 12 months, it is more likely that toxicity was removed and, therefore, a limit would not be necessary in this example situation. If a failure did occur, then a limit would be necessary and the permittee could be required to complete a TRE compliance schedule designed to find and fix the source of toxicity.

**Effluent Variability and WWTP Performance**

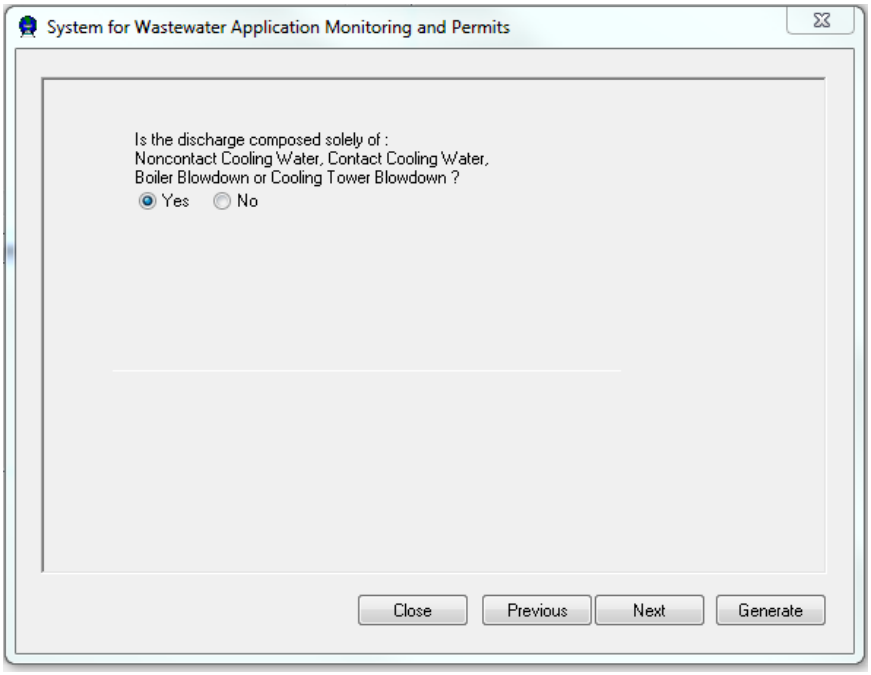



More variable effluents should be monitored more frequently because of the inconsistency of the effluent matrix. Less frequent monitoring may not represent effluent quality during different occurrences. Information requested here is used to assess whether the effluent is variable enough to warrant additional testing. Decisions are subjective and should be based on the knowledge and best professional judgment of the staff most familiar with the permitted facility.

- **Question #1, Loading or Production Variability:** As effluent characteristics change (due to contributing industries, hauled waste, leachate, infiltration, process changes, spills, etc.), so will toxicity. Judgments should be made whether waste entering the system is resulting in a variable effluent, or if the system is handling incoming variability and effluent characteristics are relatively unchanged. Answer "Yes" if the judgment is made that industrial process changes, wastewater inputs, inconsistent treatment efficiency, or other changing conditions are resulting in a variable effluent.

- **Question #2, Compliance History:** A permittee's compliance history may be an indication of the quality and consistency of operations or the ability to handle incoming waste, which effects effluent variability. Staff should enter a "Yes" if the facility has had significant violations (for example, those warranting enforcement actions such as verbal or written NONs). All effluent characteristics should be considered, not just toxics.

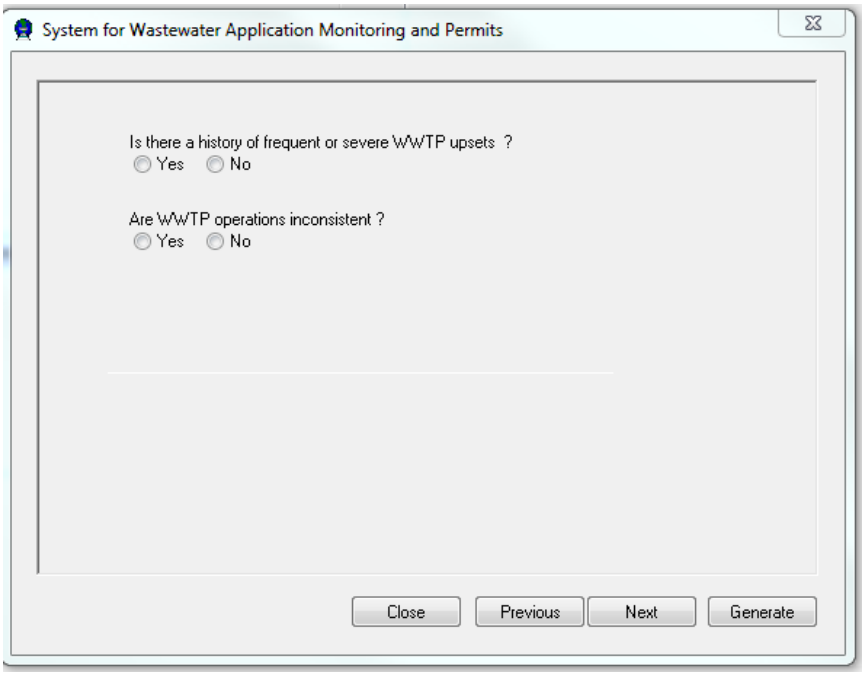
- **Question #3** is used to determine whether variability may be effected by inadequate treatment. A "No" should be given in question #3 for discharges that do not have wastewater treatment. If a no is given, the next screen will appear. If a yes is given to question #3, the next screen will be skipped and the subsequent screen will appear.




- **Question #4:** The screen above allows exemptions from points assessed for no treatment for four discharge categories. For all other discharge categories (including COW water discharges) a "No" should be given.

*In situations where staff feel that points accumulated are not appropriate because the discharge would not otherwise warrant treatment, they should make adjustments to final monitoring recommendations. Staff should NOT adjust points in the electronic Checklist by giving false answers, because this will confuse the record (i.e., others will not be able to tell why answers were given). Adjustments to final recommendations should be justified, shared with the Biomonitoring Coordinator, and well documented so that others can tell why decisions were made.*

| ***POINTS ASSESSED (Both Acute & Chronic)*** | | |
|---|---|---|
| ***Question#*** | ***Answer*** | ***Points*** |
| *1* | *NO* | *0* |
| *1* | *YES* | *5* |
| *2* | *NO* | *0* |
| *2* | *YES* | *5* |
| *3 & 4* | *BOTH YES* | *0* |
| *3 & 4* | *BOTH NO* | *10* |
| *3 & 4* | *3 NO, 4 YES* | *0* |
| *3 & 4* | *3 YES, 4 NO* | *0* |

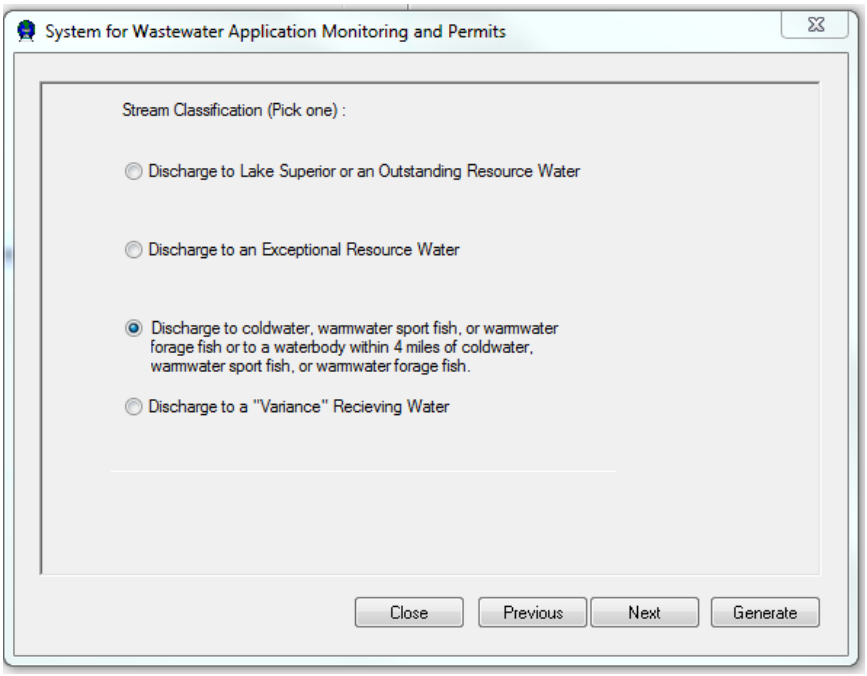



- **Question #1, Upsets:** Frequent or severe upsets may be an indication of poor operations, underdesign of a treatment plant, slug loads within the collection system, or other factors which raise the potential for toxicity. Staff should make judgments whether frequent upsets are unexplained or not handled properly, which may affect effluent variability.

- **Question #2, Operations:** The ability to maintain or restore quality treatment can impact effluent variability. If an operator is able to react quickly and effectively when treatment is upset, effluent characteristics are less likely to be altered for long periods. Conditions such as bulking and foaming, lost ability to nitrify, etc., may indicate poor treatment and impact toxicity. Concurrent cases of treatment problems and toxicity have been noted in many cases.

| ***POINTS ASSESSED (Both Acute & Chronic)*** | | |
|---|---|---|
| ***Question#*** | ***Answer*** | ***Points*** |
| *1* | *NO* | *0* |
| *1* | *YES* | *5* |
| *2* | *NO* | *0* |
| *2* | *YES* | *5* |

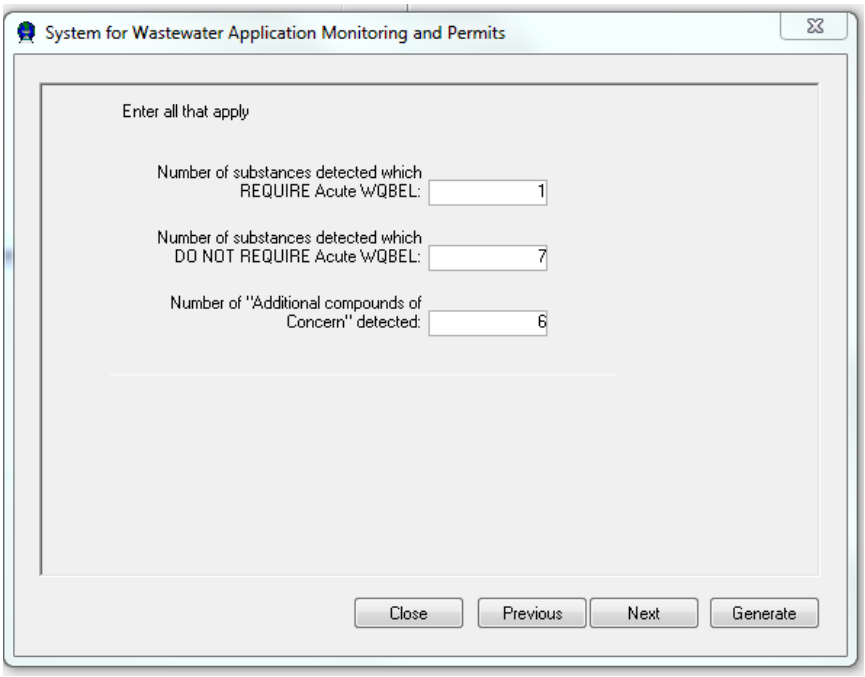
**Stream Classification**




WET tests use “indicator organisms” to mimic what happens in the environment when an effluent is introduced, to estimate the effluent concentration that may produce a harmful effect, and to predict concentrations that may interfere with the growth, development, and reproductive potential of aquatic organisms. Since “higher” classifications (e.g., exceptional/outstanding resource waters) designate waters where more sensitive populations or water quality exists, more monitoring is necessary to insure protection of these waters and the Checklist assigns points accordingly.

| ***POINTS ASSESSED (Both Acute & Chronic)*** | |
|---|---|
| ***Answer*** | ***Points*** |
| *Lake Superior or Outstanding Resource Water* | *15* |
| *Exceptional Resource Water* | *12* |
| *Full Fish & Aquatic Life or < 4 mi from FFAL* | *5* |
| *Variance* | *0* |

**Chemical Specific Data – Acute**

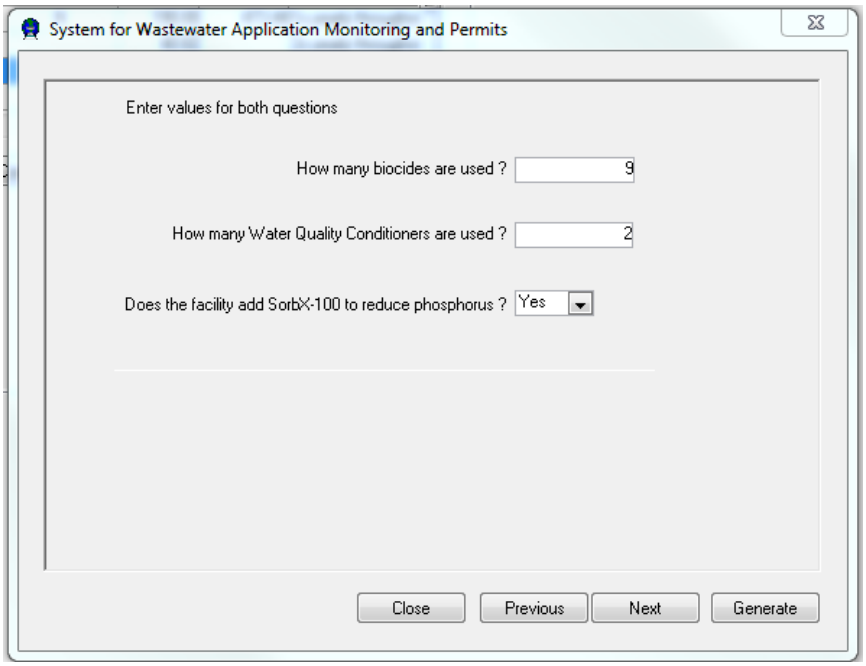



Water quality criteria are designed to be protective of aquatic life for the compounds that they limit. Chemical-specific limits alone can't account for additive or synergistic effects that occur when compounds are combined in an effluent. The more compounds present, the greater the potential is for additive or synergistic effects to occur. Staff should document which limits and/or detects were considered so it is clear to others why point totals were assigned. For a list of ch. NR 105, Tables 1 & 2, substances (i.e., those which may require acute WQBELs), and for a table of "Additional Compounds of Concern", see attachment 2 at the end of this chapter.

*As mentioned in attachment 2, ammonia limits should be counted only if representative effluent data demonstrates the need for a WQBEL (limits that are simply "carried over" from a previous permit term should not be counted). However, if ammonia has been detected in the effluent, it should be counted in that category.*

| ***POINTS ASSESSED (Acute only)*** | |
|---|---|
| ***Answer*** | ***Points*** |
| *Acute WQBELs* | *5 for 1st + 1 for ea. additional, not to exceed 10 pts.* |
| *Detects w/out WQBELs* | *1 for 1st + 1 for add. not to exceed 3* |
| *Additional Cmpds of Concern* | *2 (for ≥ 1 substance)* |

**Additives – Acute**




Additives come in a wide variety of mixtures and forms and are used in a number of applications (e.g., biocides, corrosion inhibitors, boiler water treatments, scale control, pH control, clarifying agents, industrial process polymers, and other solids control products). Most additives have not undergone the level of toxicity testing needed to calculate water quality criteria, therefore secondary values should be derived according to s. NR 105.05, Wis. Adm. Code, and the *Water Quality Review Procedures For Additives* guidance (http://dnr.wi.gov/topic/wastewater/Guidance.html) followed, whenever an additive is discharged directly into a surface water without receiving treatment or an additive is used in the treatment process and is not expected to be removed before discharge.

The WET Checklist is used where more complex wastewaters are being evaluated, such as industrial process wastewaters and municipal POTW effluents. The more additives that are present in an effluent, the more complex that wastewater becomes and the greater the potential for toxic impacts due to the mixture. Additives should be counted in the WET Checklist analysis shown above if they are added during or after the wastewater treatment process (or if no treatment is present). If they are added prior to treatment (e.g., a production additive at an industrial facility) they should be included in the evaluation only when wastewater treatment is not expected to remove or significantly alter the toxicity of these chemicals (for example, if less than secondary treatment is present). Chemicals added at the WWTP or to the final effluent should be included in this evaluation, regardless of the treatment type.

*Special attention should be paid in all cases where permittees are adding chemicals to remove phosphorus (FeCl, alum, SorbX-100, etc.), especially those that are optimizing treatment to meet more stringent or interim phosphorus limits. Overuse of these chemicals may cause effluent toxicity – care should be taken to use only the amount of chemical that is necessary and no more. DNR field staff should provide assistance, where needed, to help permittees determine the proper amount of chemical to be used.*

**SorbX-100 and Other New P Treatment Chemicals.** In 2015-16, several permittees in Wisconsin were piloting the use of SorbX-100 (a cerium chloride + lanthanum chloride mixture) in their treatment plants, to see if this product could help them to meet lower phosphorus limits (0.075 mg/l in many cases). Due to concerns raised by DNR staff, WET consultants, and permittees about the potential risks of adding significant amounts of a new, unknown product into the wastestream, the DNR asked for toxicity information from the maker of the product. Using the information submitted by

the manufacturer, staff were able to calculate secondary values, which can be used in place of water quality criteria when calculating water quality-based effluent limits. Those values for SorbX-100 are as follows:

- Secondary Acute Value = 3.88 mg/L
- Secondary Chronic Value = 0.216 mg/L

If used correctly (not over-applied), this product should remain with the solids and not reach the surface water. However, for the purposes of determining whether or not a WQBEL may be warranted, DNR assumes that all that is added will reach the final effluent. Since the effective levels being added at the time of this guidance were all reportedly well below these secondary value concentrations (and therefore discharged at even lower levels), no WQBELs appear to be required in most situations (i.e., if there is no reasonable potential to exceed the limit, no limit is needed). However, in cases where a permittee is at risk of the product at levels above the secondary value, a WQBEL should be included in the permit. When WQBELs are determined not to be necessary, staff should share the secondary value numbers with permittees in order to inform them about potentially toxic levels to be avoided at all costs.

In addition to calculating secondary values, the Department asked the State Lab of Hygiene to conduct WET tests at facilities where this product was being piloted. All acute and chronic WET tests conducted before this guidance was written had passed. Though promising, this data was limited to only a few facilities.

Given that this product is not expected to be discharged into surface waters at significant amounts and information collected before the date of this guidance does not indicate a risk to aquatic life at expected usage levels, the Department concluded that its use in WWTPs should be handled as other phosphorus treatment products (FeCl, alum) have been handled to date. That is, the product should not be treated as an "additive" as defined in the *Water Quality Review Procedures for Additives* guidance (see http://dnr.wi.gov/topic/wastewater/Guidance.html) and no effluent limits will be necessary in most places where it is used. However, the following should be done in the near term to insure that problems do not occur:

1. Compliance staff should ask permittees to conduct WET tests during treatment pilots using SorbX-100 or other new treatment chemicals.
2. Compliance staff should share secondary values with permittees and advise them to keep usage rates/effluent concentrations below these levels.
3. The WET Checklist will add points for using SorbX-100, to collect additional effluent data and to further protect against toxicity under different use/discharge situations.

If other new treatment chemicals come onto the market in response to the need for meeting lower phosphorus limits, a similar process should be used to evaluate whether significant toxicity concerns exist. If staff have questions related to the use of these types of products or other treatment chemicals and their potential for toxicity, they should contact the Biomonitoring Coordinator.

**Toxicity potential from treatment chemicals.** Some question whether the Checklist "penalizes" permittees for using treatment chemicals. While chemicals are often chosen as alternatives in wastewater treatment (i.e., chlorine to disinfect, chemicals to remove phosphorus, polymers to improve settling, etc.), they are not required and there may be alternatives which are less likely to cause toxicity. Points are added for treatment chemicals because they add to the potential for toxicity. It is important to realize that the use of treatment chemicals increases the potential for toxicity in wastewater.

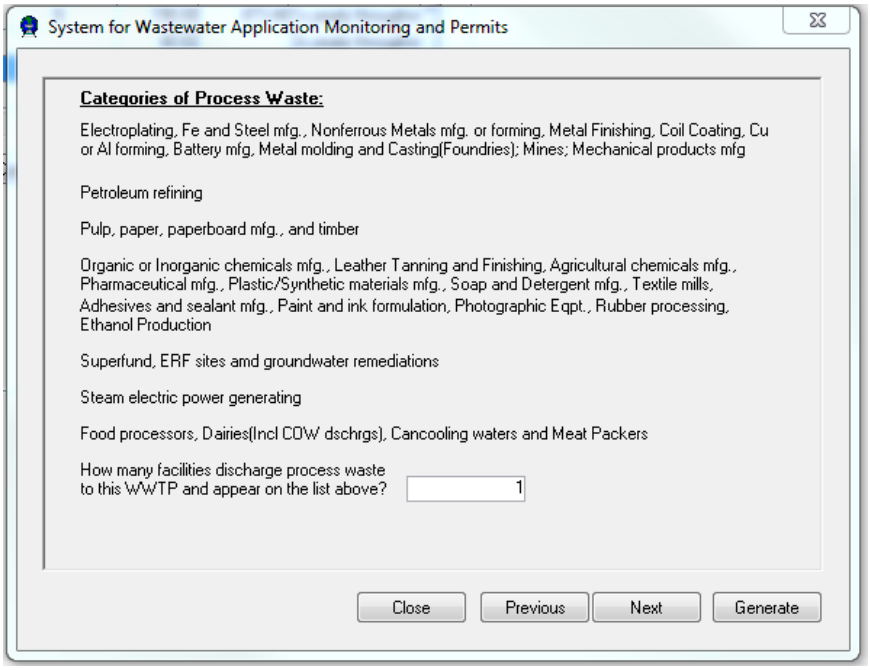
**Examples:**

- ***Biocides*** - chlorine & other halogens, fungicides, herbicides, algaecides, bactericides, etc.
- ***Water Quality Conditioners*** - dechlorination chemicals, alum, ferric chloride, polymers, dyes, anti-scale, corrosion-inhibitors, pH adjustment chemicals, conditioning agents, etc. *Note: SorbX-100 is counted separately (see above) and should not also be counted as a water quality conditioner.*

If chlorination and dechlorination chemicals are added, points should be assessed for both (i.e., chlorine as a biocide, dechlorination chemicals as WQC). Points are also assessed if WQBELs for these substances are given.

| ***POINTS ASSESSED (Acute only)*** | |
|---|---|
| ***Type*** | ***Points*** |
| *Biocides* | *3 pts. each (not to exceed 20 pts when combined w/WQC)* |
| *Water Quality Conditioners* | *1 pt. each (not to exceed 20 pts when combined w/biocides)* |
| *SorbX-100* | *15 points* |

**Industrial Contributors**



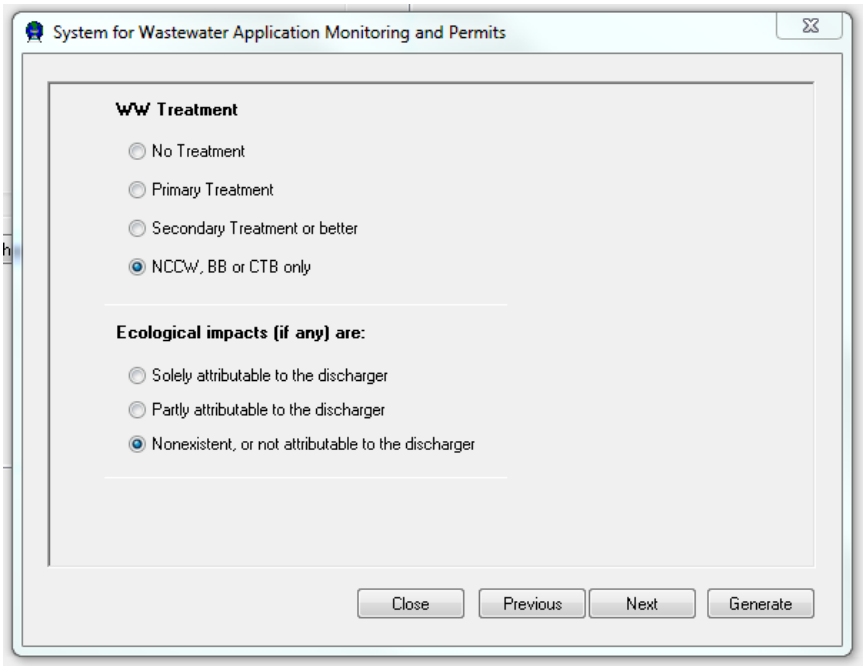

Some industrial categories have more potential for causing effluent toxicity and industrial contributors to municipal treatment plants can increase their potential for toxicity, therefore, the Checklist asks for information related to industrial type and amounts of wastewater present. If the facility being evaluated is a municipality, the screen above will appear, asking for the number of industrial contributors. If the facility is industrial, the next screen will appear asking for the type of industrial discharger. In the screen below, points should be assessed only if the discharge contains **PROCESS** wastewater. Users should not include points for outfalls that contain only sanitary or other non-process wastewater.

Staff should use their judgment to include dischargers that do not fall strictly into one of the above categories. If staff feel that a discharger warrants the same points as one of the categories above, based on toxicity potential related to discharge type, they should assign points accordingly.

**Industrial Discharge Category**

| ***POINTS ASSESSED (Acute & Chronic)*** | |
|---|---|
| ***Type*** | ***Points*** |
| *Municipalities* | *5 pts for 1st + 1 for ea. additional (not to exceed 15)* |
| *Groups in bullets 1-3* | *15* |
| *Groups in 4th bullet* | *10* |
| *Groups in 5th bullet* | *8* |
| *Groups in 6th and 7th bullets* | *5* |
| *Groups in last bullet* | *0* |

**Wastewater Treatment Type**




Untreated wastewater has a higher potential for toxicity and therefore is assigned more points using information from the screen above. (No points are assigned for category 4.) Staff should assign points here for all discharges that do not have wastewater treatment (including those with cancooling waters, condensate of whey, etc.). In those situations where staff feel that points accumulated here are not entirely appropriate because the discharge would not otherwise warrant wastewater treatment, they should recommend adjustments to final monitoring recommendations instead of putting incorrect information into the Checklist. If combined outfalls are being addressed and treatment differs, the most conservative points should be given (for example, if one is treated & the other isn't, 10 points should be given due to the presence of untreated wastewater). **Adjustments to final recommendations should be justified, shared with the Biomonitoring Coordinator, and documented so that others can tell why decisions were made.**

| ***POINTS ASSESSED (Acute & Chronic)*** | |
|---|---|
| ***Type*** | ***Points*** |
| *No Treatment* | *10* |
| *Primary Treatment Only* | *8* |
| *Secondary or Better* | *0* |
| *NCCW, Boiler or Cooling Tower Blowdown* | *0* |

**Ecological Impacts**

In situations where aquatic populations are under stress due to poor ecological conditions, toxicity from an effluent has a greater potential of causing environmental harm. Stressed individuals and populations may be less able to adapt or adjust to a toxic effluent. Since impacted areas could be more susceptible to toxicity, more severe impacts may occur to populations that are already stressed due to existing conditions, and past discharge problems may cause populations to be more sensitive to toxicity, it is appropriate to assign more monitoring to discharges that occur in areas where these concerns exist.

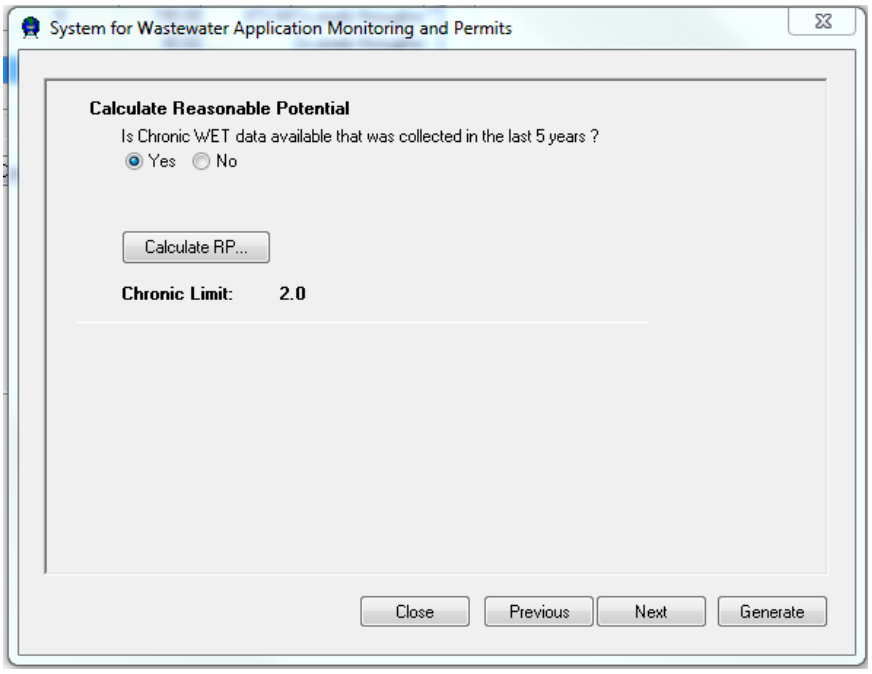
The second question in the screen above is designed to account for situations where data shows that a facility has contributed to problems in the receiving water (for example, fish kills or other impacts to benthic, macrophytic or aquatic

organisms). More points are given to discharges that are thought to be the sole source causing an ecological impact; less are given to those who may be a partial contributor. Water quality impacts caused by compounds typically characterized as toxics may be the easiest to determine points for in this category, however, staff should also consider situations where impacts may be present that are not necessarily caused by toxics. For example, low dissolved oxygen levels or impacts due to excessive nutrient levels may also cause concern in these situations. Staff should determine whether past receiving water problems have been addressed and assign points accordingly.

| ***POINTS ASSESSED (Acute & Chronic)*** | |
|---|---|
| ***Type*** | ***Points*** |
| *Impacts solely due to discharger* | *20* |
| *Impacts contributed to by discharger* | *5* |
| *No impacts known* | *0* |

If it isn't necessary to evaluate the need for chronic WET monitoring because available dilution is high (see p. 12), the Checklist ends here.

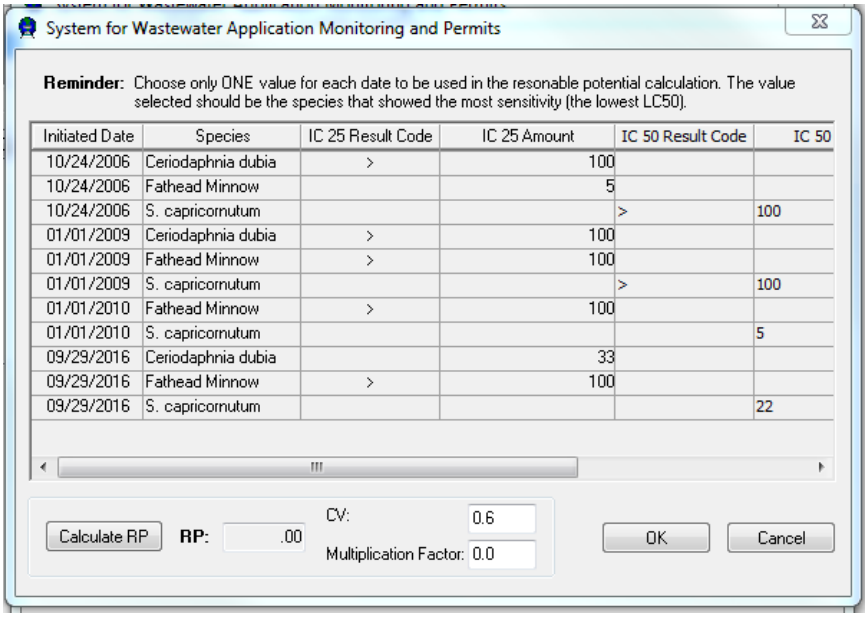
**Chronic WET Limit Determinations**




In the screen above, the user states whether there is representative chronic WET data available from the most recent 5 years for the discharge being evaluated. If no recent data is available, the Checklist assigns 5 points. This is done because more uncertainty exists in situations where testing has not been done in recent times than at those facilities that have produced recent data which shows toxicity problems are not a concern.

The chronic WET limit, calculated using the appropriate flow information indicated for the facility, is shown on this screen (Chronic limit = 100/IWC).

The user then clicks on “Calculate RP” if any representative data is available (even if $\geq$ 5 years old), in order to choose the data that is to be used to calculate the chronic reasonable potential.




| Initiated Date | Species | IC 25 Result Code | IC 25 Amount | IC 50 Result Code | IC 50 |
|---|---|---|---|---|---|
| 10/24/2006 | Ceriodaphnia dubia | > | 100 | | |
| 10/24/2006 | Fathead Minnow | | 5 | | |
| 10/24/2006 | S. capricornutum | | | > | 100 |
| 01/01/2009 | Ceriodaphnia dubia | > | 100 | | |
| 01/01/2009 | Fathead Minnow | > | 100 | | |
| 01/01/2009 | S. capricornutum | | | > | 100 |
| 01/01/2010 | Fathead Minnow | > | 100 | | |
| 01/01/2010 | S. capricornutum | | | | 5 |
| 09/29/2016 | Ceriodaphnia dubia | | 33 | | |
| 09/29/2016 | Fathead Minnow | > | 100 | | |
| 09/29/2016 | S. capricornutum | | | | 22 |

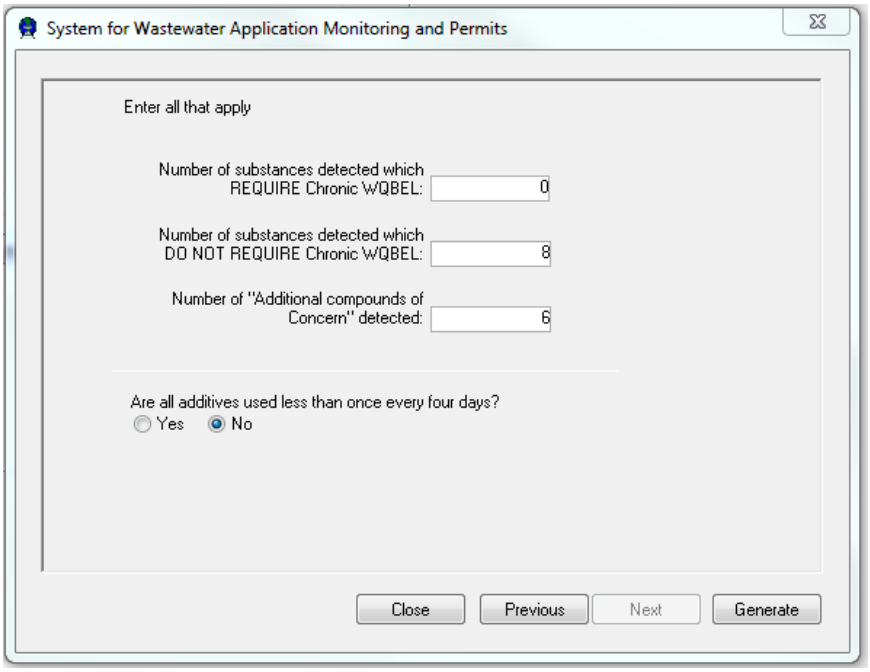
The Checklist uses data selected in the screen above to determine reasonable potential. Reasonable potential is defined as where an effluent "*is projected or calculated to cause an excursion above a water quality standard*" according to s. NR 106.08(6)(b), Wis. Adm. Code. (see page 19). WET limits should be given whenever representative, facility-specific data shows the effluent may be discharged at a level that has the potential to cause or contribute to an excursion above the WET criterion. Example reasonable potential decisions are shown in Attachment 1, at the end of this chapter.

**Which data to use.** When first opened, the WET data that appears in the screen above will include all data for that outfall in the WET Database. $IC_{25}$s are shown in the $IC_{25}$ column for *Ceriodaphnia dubia* and fathead minnow tests; $IC_{50}$s are shown in the $IC_{50}$ column for *Selenastrum* (green algae) tests. The user selects representative WET data that should be used in the reasonable potential determination, by highlighting one species from each test date that is to be used (the most sensitive species, or lowest IC value, from each test should be selected). Once the most sensitive species from each representative test has been highlighted, the user clicks the "calculate RP" button to determine the appropriate value.

*Selenastrum capricornutum* tests are often not included in the standard permit-required WET test battery. However, this species is included in chronic tests conducted by the UW-Madison State Lab of Hygiene and other labs. If *S. capricornutum* data has been collected for the discharge being evaluated, and it is believed to be representative of the discharge, it should be included in the RP analysis as described above (i.e., that species' test value should be selected, if it is the most sensitive endpoint). If this species is consistently the most sensitive in WET test failures, it may be appropriate to add it to the permit-required test battery. If staff have questions, they should contact the Biomonitoring Coordinator.

The same principles apply to the selection of chronic data, CV, and multiplication factors as that described in the section on acute data. Minimum monitoring frequencies, compliance schedules, and/or WET limit triggers are also recommended in similar situations for chronic as for acute (see p. 16 - 22).

**Chemical Specific Data – Chronic**




Water quality criteria are designed to be protective of aquatic life for the compounds that they regulate. However, chemical-specific limits are not designed to account for additive or synergistic effects that chemicals may have when they are combined in an effluent. WET testing can be used to determine whether additive or synergistic effects are occurring. The more compounds that are present in an effluent, the greater the potential may be for that effluent to exhibit these effects. Staff should document which limits and/or detects were considered (if any) so it is clear to others why point totals were assigned. Substances present at levels that cause chronic concerns (even if chronic limits are not given because acute limits are more restrictive) should be counted. For lists of substances found in ch. NR 105, Wis. Adm. Code, Tables 3 & 4 (i.e., substances which may require chronic WQBELs), and for a table of "Additional Compounds of Concern", see Attachment 2 at the end of this chapter.

*As noted in Attachment 2, limits for ammonia should be counted as such in the WET Checklist only if effluent data shows the need for a WQBEL. Limits that are carried over from a previous permit, even though data suggests a limit is not needed, should not be counted as a limit in this evaluation. If ammonia has been detected in the effluent, it should be counted in that category.*

| ***POINTS ASSESSED (Chronic only)*** | |
|---|---|
| ***Answer*** | ***Points*** |
| *Chronic WQBELs* | *5 for 1st + 1 for ea. additional, not to exceed 10 pts.* |
| *Detects w/out WQBELs* | *1 for 1st + 1 for add. not to exceed 3* |
| *Additional Cmpds of Concern* | *2 (for ≥ 1 substance)* |

**Additives – Chronic**

Are all additives used less than once every four days? Additives used less than 1 in 4 days are not given points towards chronic testing because less potential for chronic impacts is believed present. If a "No" is given here, points are given based on the answers given previously in the biocides/water quality conditioners screen (see p. 28).

| ***POINTS ASSESSED (Chronic only)*** | |
|---|---|
| ***Answer*** | ***Points*** |
| *YES* | *0* |
| *NO* | *same points as acute* |

**Final WET Checklist Summary**

Once answers are entered into the last screen, the Checklist is complete. The user clicks on the "Generate" button to complete the Checklist and preview a summary of answers, points assessed, and WET recommendations. The summary shows recommendations for limits and monitoring based on Checklist answers, the calculated AMZ and IWC and acute and chronic limits (as appropriate). Final WET limit and monitoring recommendations should be included in WQBEL memos and considered by permit drafters when putting WET monitoring and limits into the WPDES permit.

**In cases where a WET limit is being recommended or where staff have made determinations that deviate significantly from this guidance, the Biomonitoring Coordinator should be copied on draft and final WQBEL memos** (Kari.Fleming@wisconsin.gov; 608-267-7663). This information may be used for future WET program management decisions or guidance revisions.

*WET Checklist recommendations are intended to apply in most situations, but there may be situations where the general assumptions it is based on do not apply and deviations will be necessary. Decisions that are made contrary to the guidance suggested here should be clearly documented, so others can tell why decisions were made. Specific examples and reasons for deviating from WET Checklist recommendations are given on pages 38-40.*

## Final Monitoring Frequency Recommendations

Monitoring recommendations based on point totals calculated by the WET Checklist are shown in Figure 7 below. As noted throughout this guidance chapter, final WET recommendations (monitoring frequencies, TRE schedules, etc.) should be made by WQBEL staff, using their best professional judgment and the advice provided by this chapter and the WET Checklist.

Standard permit language available in SWAMP (see Chapter 1.14) requires that WET monitoring continue until the permit is reissued. Standard language also requires that two retests be completed within 90 days of a failure, so staff should encourage permittees to schedule original tests so that retests can occur within the required period, when needed. Standard compliance schedule language which can be used when limits are required, is also included in SWAMP and is further described in Chapter 1.12.

*Figure 7. Checklist Point Totals and Associated Monitoring Frequencies*

| Point Totals | Checklist Monitoring Recommendation | Comments |
|---|---|---|
| ≤ 14 (ACUTE)<br>≤ 19 (CHRONIC) | **No WET Tests Recommended** | WET testing is not usually recommended, since the potential for effluent toxicity is low. |
| **15 - 24 (ACUTE)**<br>**20 - 24 (CHRONIC)** | **2 tests, per 5 year term** | Two tests each 5 years are recommended, since a few factors are present which cause concern. In order to insure that testing continues until permit reissuance, permit language should require that testing be done every other year, starting in year 2, until the permit is reissued (i.e., year 2, year 4, year 6, etc.). Tests should be required in different seasons, where possible. |
| **25 - 34** | **3 tests, per 5 year term** | 3 tests each 5 years are recommended, due to a modest level of concern about toxicity. In order to insure that testing continues until permit reissuance, permit language should require that testing be done every other year, starting in year 1, until the permit is reissued (i.e., year 1, year 3, year 5, year 7, etc.). Tests should be required in different seasons, where possible. |
| **35 - 44** | **1x yearly** | One test is recommended each year during the permit term, due to a moderate level of concern about toxicity. Tests should be performed once each year, in successive quarters. |
| **45 - 64** | **2x yearly** | Two tests are recommended for each year during the permit term, due to a medium level of concern about toxicity. Tests should be performed during the 1st & 3rd quarters in odd numbered permit years (i.e., year 1, year 3, etc.) and the 2nd & 4th quarters in even numbered years (i.e., year 2, year 4, etc.). |
| **65 - 84** | **Quarterly** | Quarterly testing is recommended, due to a significant level of concern about effluent toxicity. Facilities that fall into this category usually have data that shows toxicity has been present. |
| **≥ 85** | **Bimonthly** | Testing every other month is recommended during the permit term, due to a substantial level of concern about toxicity. Facilities that fall into this category have historical data that shows toxicity to be present, and possibly data which shows an environmental impact has occurred due to the discharge. Tests should be performed at least 30 days apart, where possible. |

**Exceptions/special cases**. Regardless of point totals, the following are true (see p. 11 for more discussion of each)

- If a major municipal or a primary industry, **a minimum** of annual acute & chronic (based on dilution) is recommended.
- If secondary values are considered and no WET data is available, **at least** 2x annual acute & chronic (based on dilution) is recommended.
- If WQBELs are recommended (or drop out) based on dissolved WQC, **at least** annual acute & chronic is recommended.
- If a limit is given, **minimum** monitoring frequencies apply (see page 22).

**UW-Madison's State Laboratory of Hygiene (SLH) Environmental Toxicology Section**

The SLH serves as a source of technical expertise and testing for WDNR staff. In situations where the Checklist recommends little or no monitoring, but staff determine during the permit term that more data is needed, the Environmental Toxicology Section can be asked to do testing in addition to that required in the permit. WET tests conducted at the SLH may be used to generate additional data for use in WET determinations, but cannot be used as a replacement or credit towards permit-required testing. You may contact the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov; 608-267-7663) or the SLH directly (biomonitoring@mail.slh.wisc.edu; 608-224-6230) to request a WET test.

## Calculation and Expression of WET Limits

The following shows how acute and chronic WET limits are calculated. In most cases, acute WET requirements are applied at "end of pipe" (no mixing is allowed) and the acute WET limit will equal 1.0 Acute Toxic Units ($TU_a$). In cases where mixing zone studies or other information has been submitted and a zone of initial dilution (ZID) has been approved for the outfall, the acute WET limit should be set at the edge of the approved acute mixing zone, as described below. Acute WET limits must be expressed as a daily maximum, as specified in s. NR 106.09(2)(f), Wis. Adm. Code.

- **Acute WET Limit = 1.0 Toxic Unit ($TU_a$)**
  Note: an acute WET limit = 100/AMZ $TU_a$, if a zone of initial dilution is allowed pursuant to s. NR 106.06 (3) (c), Wis. Adm. Code.
  AMZ = acute mixing zone concentration (see s. NR 106.09(2)(e), Wis. Adm. Code)

Chronic WET limits are set at the edge of the chronic mixing zone, using the applicable instream waste concentration. Chronic WET limits must be expressed as a monthly average, as specified in NR 106.09(3)(d), Wis. Adm. Code.

- **Chronic WET Limit = 100/IWC Toxic Units ($TU_c$)**
  IWC = instream waste concentration

## Reasons For Changing Monitoring Frequencies

At times, there may be reason to delay testing until later in the permit or site-specific reasons for deviating from general Checklist recommendations. As stated before in this chapter, recommendations in this guidance are intended to apply in most situations, but there may be times when the assumptions it is based on do not apply and deviations from the suggested criteria are necessary. Some reasons why staff might decide to change recommendations are given below. Reasons for changes to guidance recommendations should be documented and shared with the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov; 608-267-7663), so that others can tell why decisions were made.

**Previous permit's tests.** Tests that were required but not completed during the last permit term (e.g., postponed during a toxicity reduction evaluation, retests not completed, etc.) should be added to the next permit term's recommendations.

**Delay at permit reissuance.** A period of 1-3 months may be allowed between reissuance and the first required test, in order to provide time for laboratory scheduling. Other reasons may exist, such as an upgrade or significant modification, which may warrant a delay between reissuance and WET testing. Staff should use their judgment to determine when adjustments are needed and document their reasons in the permit file (for example, in WQBEL or fact sheets).

**Seasonal discharges.** If a discharge is noncontinuous or seasonal, tests should occur when the factors of concern listed in the Checklist are present. For example, if the use of additives is a primary reason driving the need for WET monitoring, then WET testing should be required during periods of additive use. If the discharge does not occur long enough in a given year for the recommended monitoring frequency to be completed, the amount of required testing may be reduced accordingly. Additional guidance regarding monitoring frequencies and sampling schedules for seasonal or intermittent dischargers is given in Chapter 1.6: http://dnr.wi.gov/topic/wastewater/WETguidance.html.

**Distance from a non-variance waterbody or higher amounts of available dilution.** As discussed earlier in this chapter and in Ch. 1.2 (http://dnr.wi.gov/topic/wastewater/WETguidance.html), chronic WET monitoring may not be recommended if the discharge is located greater than 4 miles from the nearest downstream non-variance classified waterbody or if available dilution is high (> 100 : 1 stream flow to effluent flow ratio). However, it is important to realize that this may not be appropriate in all situations. If data exists which suggests a higher potential for chronic toxicity (for example, if previously performed chronic WET tests have failed), it may be necessary to require chronic monitoring to insure that receiving water impacts are not occurring. If staff feel there are reasons to require chronic monitoring in these situations, they should make appropriate adjustments to the monitoring recommendations and document their reasons for doing so.

**Groundwater remediation and other remediation type discharges.** Where it has been determined that there is a need for WET testing of a discharge of this type, testing should begin as soon as possible after the discharge commences (first test usually within 90 days). These discharges are often of a short duration and any delays in testing may make testing difficult.

**WWTP upgrades or other modifications.** If a compliance schedule requires an upgrade, process change, or WWTP expansion that is expected to significantly change toxicity, WET monitoring may be postponed until construction is completed and the system is up and running. The WET Checklist should be completed based on WET data and toxicity potential as it exists at the time of permit issuance (since it is necessary for the permittee to demonstrate that the upgrade has reduced their potential), unless data is present which shows that the WWTP improvements will remove toxicity.

**Compliance Schedules/Toxicity Reduction Evaluations.** WET monitoring may be delayed during a WET limit compliance schedule and/or when a toxicity reduction evaluation (TRE) is being conducted. Chapter 1.12 provides guidance related to compliance schedules. Chapter 2.2 discusses TREs: http://dnr.wi.gov/topic/wastewater/WETguidance.html.

**Permit terms of less than 5 years.** The WET Checklist was designed for assessing discharges at the time of a standard permit reissuance, therefore recommended monitoring frequencies are based on a 5 year permit term. Staff may use the Checklist during permit modifications or when permits are to be reissued for shorter than 5 year terms to assess a discharge's toxicity potential, however, judgment should be used to adjust recommended frequencies to fit into the term of the reissued or modified permit. For example, if a modification is occurring with only 1 year left in the permit term and 3 tests are recommended, staff should determine whether 3 tests should be done during that year or if less testing would be sufficient to characterize the toxicity of the discharge.

**Water quality variances.** It may be appropriate to modify monitoring frequencies, test methods, or other WET requirements when a permittee has been granted a variance for a toxic compound that has the potential to cause (or may have already caused) WET failures. Changes to WET requirements should only be allowed if the permittee can demonstrate to the Department that the substance for which they were granted a variance is the only source of toxicity (i.e., the permittee would not be exempt from other toxicity sources) and should only be granted for the period for which the variance has been granted. All proposed WET monitoring, limit, or method changes due to variances should be discussed with the Biomonitoring Coordinator and documented in the permit file so that others can tell why changes were made.

**Water quality variance for chloride.** See Chapter 2.10 for a discussion related to WET monitoring and limits when a variance has been granted for chloride (http://dnr.wi.gov/topic/wastewater/WETguidance.html).

**WET Limits as an Alternative to Secondary Values.** Section NR 106.07(7), Wis. Adm. Code, states that the Department may establish a WET limitation according to s. NR 106.09, Wis. Adm. Code, as an alternative to a chemical-specific WQBEL based on a fish and aquatic life secondary acute or secondary chronic value determined according to ss.NR 105.05(4) and 105.06(6). The alternative WET limit has to meet all the following conditions:

1. The fathead minnow (*Pimephales promelas*) or the cladoceran *Ceriodaphnia dubia* were represented in the toxicological database used to generate the secondary value;
2. The permittee has requested the alternative WET limitation; and
3. WET testing shall be conducted at least once every three months during the entire term of the permit.

**Deficiency Toxicity.** Deficiency toxicity is defined as a condition where organisms are unable to survive because the surrounding water is lacking the necessary ions (e.g., sodium, calcium, magnesium, potassium, etc.) that must be available for them to survive. It is the opinion of DNR toxicologists that deficiency toxicity presented in a WET test will not have deleterious effects on receiving water organisms, as long as the necessary ions are introduced as soon as the effluent contacts receiving water, soils, or sediments. If it can be demonstrated that positive WET results are due to deficiency

toxicity only, it is reasonable to allow WET monitoring frequencies to be reduced. The following guidance is provided for those who wish to make such a demonstration:

In order to show that toxicity is caused by deficiency toxicity, the following may be demonstrated:

1. Hardness (as $CaCO_3$) in the unaltered sample (i.e., the wastewater as it is discharged) is < 45 mg/l;
2. Mortality in the *Ceriodaphnia dubia* test, in unaltered sample, is > 50%; and
3. The permittee has WET data, involving *C. dubia*, from at least 2 tests that includes the following:
   a) parallel tests with unadjusted vs. adjusted (to 45 mg/l hardness) sample, using reagents that have been added proportionally according to Figure 8:

**Figure 8. Deficiency Toxicity Hardness Adjustment**

**RECIPE FOR EFFLUENT SAMPLE HARDNESS ADJUSTMENT**

| REAGENT ADDED (mg/l) | | | |
|---|---|---|---|
| $NaHCO_3$ | $CaSO_4H_2O$ | $MgSO_4$ | KCl |
| 48.0 | 30.0 | 30.0 | 2.0 |

   b) Tests should include 4 replicates of at least 5 organisms in each; and
   c) The observed mortality in the altered sample is $\leq$ 10%.

If staff believe that deficiency toxicity exists, language may be placed in the permit allowing for a study similar to that above and for the dropping of WET monitoring after a successful demonstration. This demonstration should be made for each reissuance (exemptions from WET testing should only apply to one permit term).

**Deficiency toxicity in condensate of whey (COW) discharges.** Historically, it was believed that deficiency toxicity was responsible for results from WET tests at COW water discharges. Since the wastewater in these situations was thought to be only made up of condensate, the necessary ions were believed absent. In 1994-95, a study was conducted at the State Laboratory of Hygiene (SLH), in cooperation with the WDNR and 17 dairies, in an attempt to identify the cause of COW water toxicity. Study results showed: 1 not acutely toxic, 4 acutely toxic due to deficiency toxicity, 4 acutely toxic due to deficiency toxicity and ammonia, and 8 acutely toxic for unknown reasons (i.e., it was not deficiency or ammonia toxicity). Based on these results, it is obvious that it is necessary to continue to evaluate the potential for WET in COW water, however, we may allow COW water dischargers to demonstrate that WET results are impacted by deficiency toxicity, as described above. The following language may be used to allow demonstrations in COW discharge permits (this language is available as a standard requirement choice in SWAMP):

> *"If discharges consisting of condensate of whey (COW) wastewater only or non-contact cooling water mixed with COW waters (NCCW/COW) pass the first two acute toxicity tests and the first two chronic toxicity tests (if chronic toxicity testing is required) then the permittee is not required to perform additional toxicity testing during this permit term. If positive toxicity is experienced in any of the first two acute or chronic toxicity tests, the permittee may attempt to demonstrate that toxicity is due to ion deficiency. If it can be demonstrated that ion deficiency is the sole cause of toxicity in at least two consecutive positive tests, and the Department agrees in writing, the permittee will not be required to perform additional toxicity testing during this permit term. If it cannot be demonstrated that ion deficiency is the sole cause of toxicity in these tests, the permittee must complete the remaining toxicity tests."*

# ATTACHMENT 1: Example Reasonable Potential Calculations

**Example 1: Acute WET Reasonable Potential Evaluation (no approved ZID, WET failure present)**

| Date initiated | Acute WET Results | | Maximum TUc (100/LC50) | Pass/ Fail |
|---|---|---|---|---|
| | C. dubia LC50 | Fathead LC50 | | |
| 12/31/2010 | >100% | >100% | 1.0 | Pass |
| 03/25/2011 | >100% | >100% | 1.0 | Pass |
| 06/10/2012 | >100% | >100% | 1.0 | Pass |
| 09/22/2013 | 85% | >100% | 1.18 | Fail |
| 12/09/2014 | >100% | >100% | 1.0 | Pass |

According to NR 106.08(6)(b), if a zone of initial dilution (ZID) has not been approved, reasonable potential to exceed the acute WET criterion is present when: (TUa effluent) (B) > 1.0, where TUa effluent is the most sensitive TUa in the data set and B is the multiplication factor from NR 106.08(5)(c), Table 4 (see page 19).

- Most sensitive result: LC50 = 85%; Maximum TUc = 100/85 = 1.18
- 5 WET tests in dataset, 1 toxicity detect. Multiplication factor (B) from NR 106.08(5)(c), Table 4 = 6.2 (based on # of detects)

1.18 x 6.2 = 7.32

**7.32 > 1.0, RP shown, limit is required** (limit = 1.0 TUa)

**Example 2: Acute WET Reasonable Potential Evaluation (no approved ZID, no WET failure present)**

| Date initiated | Acute WET Results | | Maximum TUc (100/LC50) | Pass/ Fail |
|---|---|---|---|---|
| | C. dubia LC50 | Fathead LC50 | | |
| 12/31/2010 | >100% | >100% | 1.0 | Pass |
| 06/10/2012 | >100% | >100% | 1.0 | Pass |
| 09/22/2013 | >100% | >100% | 1.0 | Pass |
| 12/09/2014 | >100% | >100% | 1.0 | Pass |

According to NR 106.08(6)(d), TUc and TUa effluent values are equal to zero whenever toxicity is not detected (i.e., when the LC50, IC25, or IC50 > 100%).

**0 < 1.0, RP not shown, no limit is required**

**Example 3: Acute WET Reasonable Potential Evaluation (with an approved ZID)**

| Date initiated | Chronic results | | Maximum TUc (100/LC50) | Pass/ Fail |
|---|---|---|---|---|
| | C. dubia LC50 | Fathead LC50 | | |
| 12/31/2010 | >100% | >100% | 1.0 | Pass |
| 03/25/2011 | >100% | >100% | 1.0 | Pass |
| 06/10/2012 | 65% | >100% | 1.54 | Pass |
| 09/22/2013 | 35% | >100% | 2.85 | Fail |
| 12/09/2014 | >100% | >100% | 1.0 | Pass |

According to NR 106.08(6)(b), if a zone of initial dilution has been approved, reasonable potential to exceed the acute WET criterion is present when: [(TUa effluent) (B) (AMZ)] > 1.0, where TUa effluent is the most sensitive TUa in the data set and B is the multiplication factor from NR 106.08(5)(c), Table 4 (see page 19), and AMZ is the acute mixing zone concentration based on the zone of initial dilution approved according to NR 106.06 (3)(c).

- AMZ = 57% (0.57)

- Most sensitive result: LC50 = 35%; Maximum TUc = 100/35 = 2.85
- 5 WET tests in dataset, 2 toxicity detects. Multiplication factor (B) from NR 106.08(5)(c), Table 4 = 3.8 (based on # of detects)

2.85 x 3.8 x 0.57 = 6.17

**6.17 > 1.0, RP shown, limit is required** (limit = 100/AMZ = 1.75 TUa)

**Example 4: Chronic WET Reasonable Potential Evaluation (toxicity detected well below the limit, no WET failures)**

| Date initiated | Chronic results | | Maximum TUc (100/IC25) | Pass/ Fail |
|---|---|---|---|---|
| | C. dubia IC25 | Fathead IC25 | | |
| 12/31/2010 | >100% | >100% | 1.0 | Pass |
| 03/25/2011 | >100% | >100% | 1.0 | Pass |
| 06/10/2012 | >100% | >100% | 1.0 | Pass |
| 09/22/2013 | 85% | 90% | 1.18 | Pass |
| 12/09/2014 | >100% | >100% | 1.0 | Pass |

According to NR 106.08(6)(b), reasonable potential to exceed the chronic WET criterion is present when: [(TUc effluent) (B) (IWC)]> 1.0, where TUc effluent is the most sensitive TUc in the data set, B is the multiplication factor from NR 106.08(5)(c), Table 4 (see page 19), and IWC is the instream waste concentration calculated according to NR 106.03(6), Wis. Adm. Code.

- IWC = 10% (0.10)
- Most sensitive result: IC25 = 85%; Maximum TUc = 100/85 = 1.18 (test passed; toxicity detected well above the IWC)
- 5 WET tests in dataset, 1 toxicity detect. Multiplication factor (B) from NR 106.08(5)(c), Table 4 = 6.2 (based on # of detects)

1.18 x 6.2 x 0.10 = 0.73

**RP <u>not</u> shown, limit is not required**

**Example 5: Chronic WET Reasonable Potential Evaluation (toxicity detected near to the limit, but no WET failures)**

| Date initiated | Chronic results | | Maximum TUc (100/IC25) | Pass/ Fail |
|---|---|---|---|---|
| | C. dubia IC25 | Fathead IC25 | | |
| 12/31/2010 | >100% | >100% | 1.0 | Pass |
| 03/25/2011 | >100% | >100% | 1.0 | Pass |
| 06/10/2012 | >100% | >100% | 1.0 | Pass |
| 09/22/2013 | 55% | 90% | 1.82 | Pass |
| 12/09/2014 | >100% | >100% | 1.0 | Pass |

- IWC = 25% (0.25)
- Most sensitive result: IC25 = 55%; Maximum TUc = 100/55 = 1.82 (test passed; toxicity detected nearer to the IWC)
- 5 WET tests in dataset, 1 toxicity detect. Multiplication factor (B) from NR 106.08(5)(c), Table 4 = 6.2 (based on # of detects)

1.82 x 6.2 x 0.25 = 2.82

**RP shown, limit is required** (limit = 100/IWC = 4.0 TUc)

# ATTACHMENT 2: NR 105 and Additional Compounds of Concern

| CATEGORY | SUBSTANCES | |
|---|---|---|
| | ACUTE | CHRONIC |
| **WQBEL required**<br>5 pts for 1st + 1 for each additional, not to exceed 15 pts. | Ammonia[1], Arsenic, Cadmium, Chloride, Chlorine, Chlorpyrifos, Chromium, Copper, Cyanide, Dieldrin, Endrin, Gamma-BHC, Lead, Mercury, Nickel, Parathion, Pentachlorophenol, Toxaphene, Zinc | Ammonia[1,2], Arsenic, Cadmium, Chloride, Chlorine, Chromium, Copper, Cyanide, Dieldrin, Endrin, Lead, Mercury, Nickel, Parathion, Pentachlorophenol, Zinc |
| **Substance detected, but no WQBEL needed**<br>1 point each, not to exceed 3 pts | Substances above detected in the effluent (including those given chronic WQBEL), but not given acute WQBEL | Substances above detected in the effluent (including those given acute WQBEL), but not given chronic WQBEL |
| **"Additional Compounds of Concern" detected**<br>2 points given if any detected | Any substances in "Additional Compounds of Concern" table below detected in the effluent | Any substances in "Additional Compounds of Concern" table below detected in the effluent |

[1] Ammonia limits should be counted only if representative effluent data demonstrates the need for a WQBEL (limits that are simply "carried over" from a previous permit term, even though effluent data suggests they are no longer needed, should not be counted as WQBEL limits). If ammonia has been detected in the effluent, it should be counted as described in the second row of the table above.

[2] Ammonia WQBELs based on 4-day chronic toxicity criteria and expressed in permits as weekly average limitations should be counted. WQBELs based on 30-day criteria and expressed as monthly averages are not indicative of conditions in chronic WET tests (since chronic tests last 7 days) and should not be counted. If ammonia has been detected in the effluent, it should be counted as described in the table above.

Information given above is from Tables 1 & 2 (acute) and Tables 3 & 4 (chronic), in ch. NR 105, Wis. Adm. Code, March 2004. Users should check recent versions of the code to make sure that they are using the most up-to-date lists.

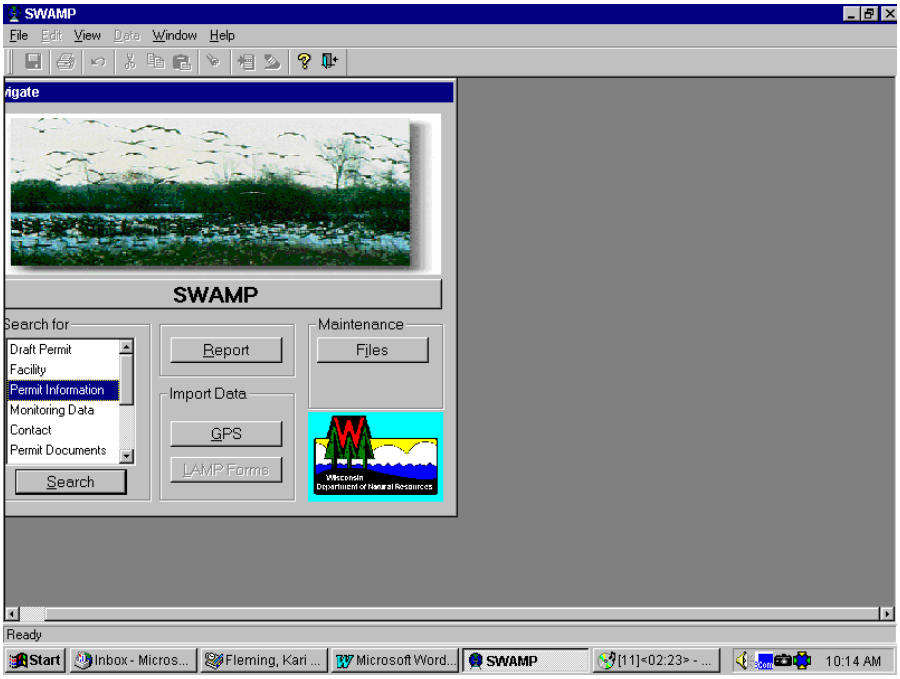
## ADDITIONAL COMPOUNDS OF CONCERN (ACC)

| | | | |
|---|---|---|---|
| **Metals**: | **Acid-Extractable Compounds:** | 2,6-Dinitrotoluene | 2,4-Dichlorophenoxyacetic acid |
| Antimony | P-Chloro-M-Cresol | Di-n-octyl Phthalate | Endosulfan |
| Beryllium | 2-Chlorophenol | 1,2-Diphenylhydrazine | Endosulfan Sulfate |
| Selenium | 2,4-Dichlorophenol | Fluoranthene | Endrin Aldehyde |
| Silver | 2,4-Dimethylphenol | Fluorene | Guthion |
| Thallium | 4,6-Dinitro-O-Cresol | Hexachlorobenzene | Heptachlor |
| | 2,4-Dinitrophenol | Hexachlorobutadiene | Heptachlor Epoxide |
| **Volatile Organic Compounds:** | 2-Nitrophenol | Hexachlorocyclopentadiene | Malathion |
| Acrolein | 4-Nitrophenol | Hexachloroethane | Methoxychlor |
| Acrylonitrile | Phenol | Indeno(1,2,3-cd)pyrene | PCBs |
| Benzene | 2,4,6-Trichlorophenol | Isophorone | |
| Bromoform | | Naphthalene | **Dioxin:** |
| Carbon Tetrachloride | **Base-Neutral Compounds:** | Nitrobenzene | 2,3,7,8-TCDD (dioxin) |
| Chlorobenzene | Acenaphthene | N-Nitrosodimethylamine | |
| Chlorodibromomethane | Acenaphthylene | N-Nitrosodiphenylamine | **Other Non-Priority Pollutants:** |
| Chloroethane | Anthracene | N-Nitrosodipropylamine | Aluminum |
| 2-Chloroethyl vinyl ether | Benzidine | N-Nitrosodiethylamine | Asbestos |
| Chloroform | Benzo(a)anthracene | N-Nitrosodi-n-butylamine | BHC-tech. grade |
| 1,2-Cisdichloroethylene | Benzo(a)pyrene | N-Nitrosopyrrolidine | Bis(2-chloromethyl)ether |
| Dichlorobromomethane | 3,4-Benzofluoranthene | Octachlorostyrene | 3-Chlorophenol |
| 1,1-Dichloroethane | Benzo(ghi)perylene | Pentachlorobenzene | 4-Chlorophenol |
| 1,2-Dichloroethane | Benzo(k)fluoranthene | Phenanthrene | Dichlorodifluoromethane |
| 1,1-Dichloroethylene (vinylidene | Bis(2-chloroethoxy)methane | Pyrene | 2,3-Dichlorophenol |
| chloride) | Bis(2-chloroethyl)ether | 1,2,3,4-Tetrachlorobenzene | 2,5-Dichlorophenol |
| 1,2-Transdichloroethylene | Bis(2-chlorisopropyl)ether | 1,2,4,5-Tetrachlorobenzene | 2,6-Dichlorophenol |
| 1,2-Dichloropropane | Di(2-ethylhexyl)phthalate (DEHP) | 1,2,4-Trichlorobenzene | 3,4-Dichlorophenol |
| 1,1-Dichloropropene | 4-Bromophenyl Phenyl Ether | | 1,3-Dichloropropane |
| 2,3-Dichloropropene | Butyl benzyl phthalate | **Pesticides:** | 2,3-Dinitrophenol |
| 1,3-Dichloropropene | 2-Chloronaphthalene | Aldrin | Fluoride |
| Ethylbenzene | 4-Chlorophenyl Phenyl Ether | Alpha-BHC | Formalin |
| Methyl Bromide | Chrysene | Beta-BHC | Iron |

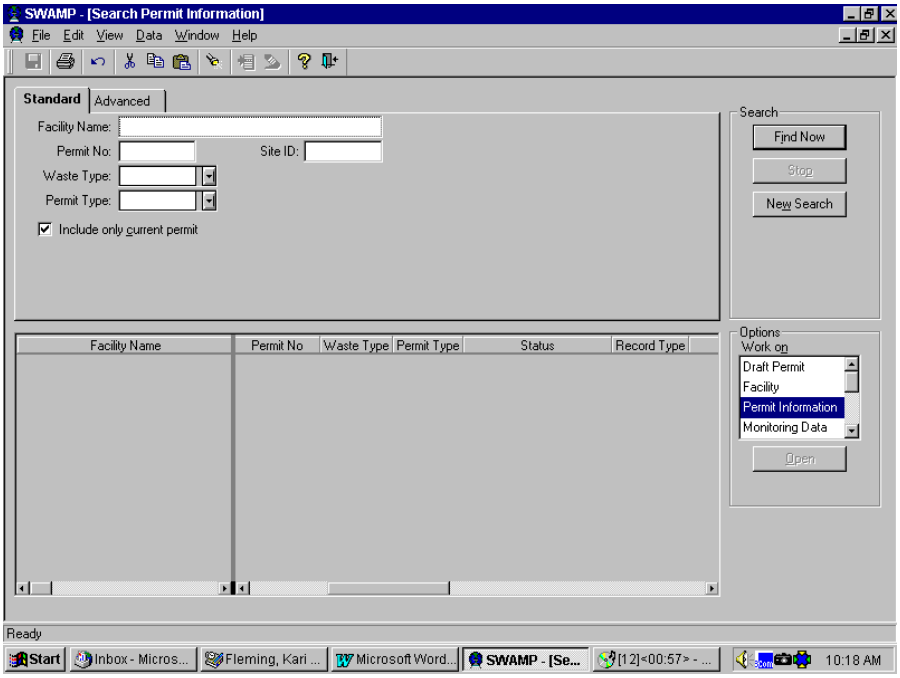
| | | | |
|---|---|---|---|
| Methyl Chloride<br>Methylene Chloride<br>1,1,2,2-Tetrachloroethane<br>Tetrachloroethylene<br>Toluene<br>1,1,1-Trichloroethane<br>1,1,2-Trichloroethane<br>Trichloroethylene<br>Vinyl Chloride | Dibenzo(a,h)anthracene<br>1,2-Dichlorobenzene<br>1,3-Dichlorobenzene<br>1,4-Dichlorobenzene<br>3,3'-Dichlorobenzidine<br>Diethyl Phthalate<br>Dimethyl Phthalate<br>Di-n-butyl Phthalate<br>2,4-Dinitrotoluene | Delta-BHC<br>Chlordane<br>Chlorpyrifos<br>4,4'-DDD<br>4,4'-DDE<br>4,4'-DDT<br>Diazinon | 2-Methyl-4-Chlorophenol<br>3-Methyl-6-Chlorophenol<br>Mirex<br>Photomirex<br>2,3,4,6-Tetrachlorophenol<br>Trichlorofluoromethane<br>2,4,5-Trichlorophenol |

# ATTACHMENT 3: Changing Data in the Sample Point Table of SWAMP

In order for the WET Checklist to make decisions regarding the instream waste concentration (IWC), stream flow to effluent flow ratios, and other WET determinations, information regarding effluent flow (Qe), the fraction of Qe withdrawn from the receiving water (RW), RW flow ($Q_{7,10}$), and RW classification must be entered in the "Sample Point" table. This information must be entered before creating a new Checklist or revising an existing Checklist. This attachment includes instructions on how to enter this data into the Sample Point table.

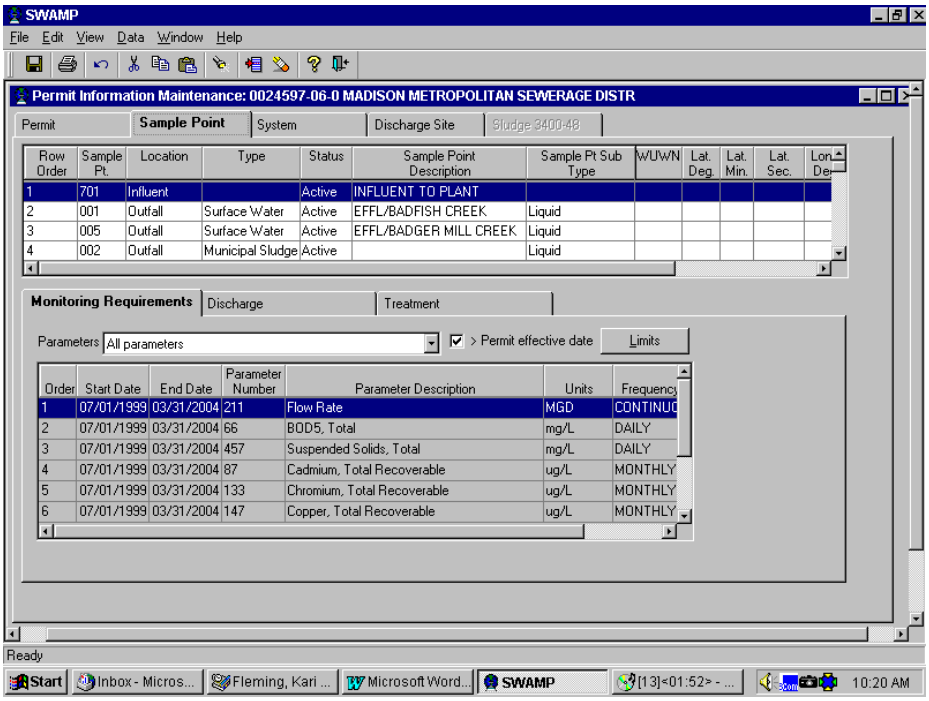



At the Navigate screen, click on "Permit Information" in the "Search for:" box, then click on the "Search" button.

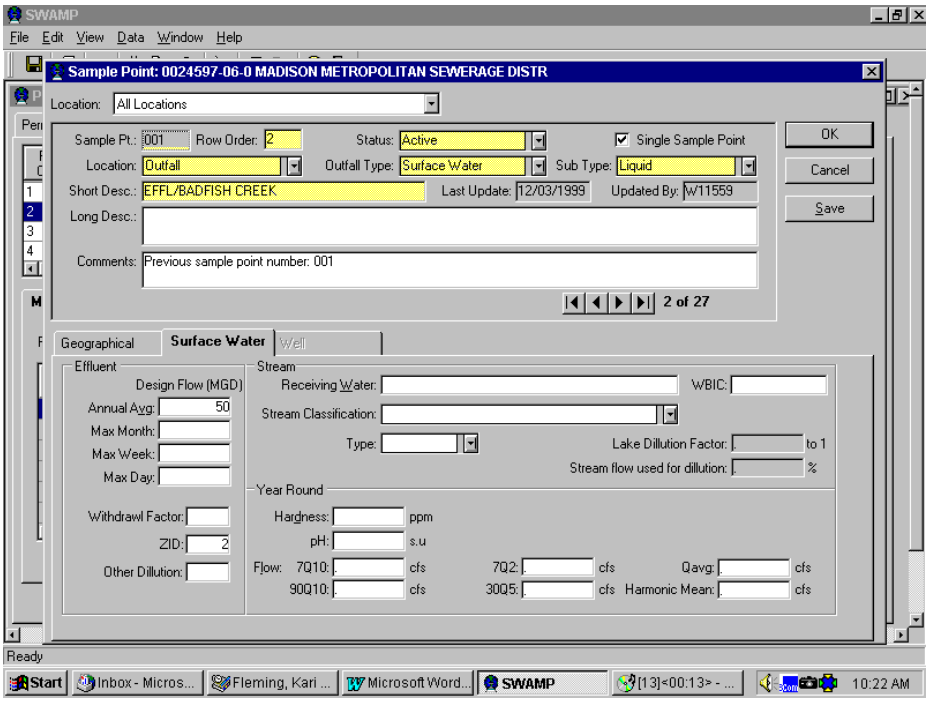


When this “Search Permit Information” screen appears, enter the facility name, FIN, Site ID, or permit number and then click on the “Find Now” button. The facility name and permit number will appear in the “Facility Name” box on the bottom half of the screen. Click on the name or permit number for the facility you are interested in and then click on the “Open” button.

In the “Permit Information Maintenance” screen (below), click on the “Sample Point” tab.




Double-click on the surface water outfall that you are interested in, then click on the “surface water” tab.



The effluent flow ($Q_e$) used in the WET Checklist is usually the annual average design flow for municipals or average annual actual flow for industrial dischargers. The Checklist will use this $Q_e$ to determine the appropriate $Q_{7,10}$:$Q_e$ ratio, IWC, and chronic dilution series (more discussion of these values are given later in this chapter). The withdrawal factor (f) should be entered as a decimal (for example, if the facility withdraws and uses 1/2 of the receiving water flow, enter 0.5). This value will be used as "f" in the IWC calculation (discussed later in this chapter). The $Q_{7,10}$ entered here is also used to determine the $Q_{7,10}$:$Q_e$ ratio (used to determine need for acute and/or chronic testing), IWC, and to choose the chronic dilution series. Once the $Q_e$, $Q_{7,10}$, and f values are entered in the sample point table, return to the previously discussed screen in the WET Checklist.