

Colorado
Water Quality Control Division
Biomonitoring Guidance Document

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This document is to serve as Division Guidance for biomonitoring to implement section 61.8(2)(b)(i) of The Colorado Discharge Permit System Regulations with respect to whole effluent toxicity (WET).

TEST AT APPLICATION

At the time of permit application for a new or renewal permit, selected permittees will be required to submit the results of an acute WET test, except for facilities subject to item 4.ii which will be required to conduct a chronic test. The test shall be conducted on 100% effluent and be for both Ceriodaphnia dubia and fathead minnows. Where routine testing has been performed, additional testing at the time of renewal application will not be required. Permittees subject to testing are:

1. All POTWs with design influent flows equal to or greater than one million gallons per day;
2. All POTWs with approved pretreatment programs or POTWs that are required to develop a pretreatment program;
3. All industrial facilities identified as an EPA major;
4. Other POTWs or industrial facilities, based on the following considerations:
 - i) The variability of the pollutants or pollutant parameters in the effluent (based on chemical-specific information, the type of treatment facility, and types of industrial/pollutant contributions);
 - ii) The ratio of stream low flow to effluent design flow (a chronic rather than an acute test is required if dilution is less than 10:1, respectively, and the receiving stream has a Class 1 Aquatic Life use or Class 2 Aquatic Life use with all of the appropriate aquatic life numeric standards);
 - iii) TMDLS and other receiving stream characteristics, including possible or known water quality impairment;
 - iv) TMDLS and other receiving stream characteristics, including possible or known other pertinent considerations, such as facility history and compliance record.

REASONABLE POTENTIAL

The permit rationale shall contain a discussion of the reasons for including, or not including WET limits or monitoring based on reasonable potential for the effluent to be toxic to aquatic life. The justification for the determination to include or exclude should be based upon factors such as:

- a. WET data for the discharge;
- b. Existence of a pretreatment program;
- c. Chemical characteristics of the discharge;
- d. Activity creating the discharge;
- e. Receiving water use classification;

- f. Compliance history;
- g. Number of industrial or commercial taps.

TEST FREQUENCY

WET testing shall normally be on a quarterly basis, although the Division retains authority to vary the frequency as warranted by site specific circumstances. Examples of an alternate frequency may be for a new facility where monthly testing for the first six months is desired, or a facility which has conducted testing and a reduced frequency of once a year is deemed appropriate.

EFFLUENT LIMITS

Acute, Chronic Lethality and Chronic Toxicity WET limits will be written into permits as daily maximum limits. Chronic WET testing requirements will be appropriate where the ratio of the "chronic low flow" to the effluent design flow or flow limit is less than 10:1 and the receiving stream is classified for a Class 1 Aquatic Life use or Class 2 Aquatic Life use with all of the appropriate aquatic life numeric standards. An exception may be made where the receiving stream has a low flow of 0 in all months, and when the discharge is intermittent. This exception is being made as a zero low flow stream will not normally contain water, and the discharge does not flow continuously, therefore, chronic conditions are not likely to occur. The exception shall be granted on a site-specific basis.

The chronic low flow will be determined as follows:

1. If the discharge meets any of the criteria for exemption under section 31.10(2) of the Basic Standards and Methodologies for Surface Waters (Basic Standards), then the chronic low flow is equal to the 30E3 low flow of the receiving stream.
2. If the discharge does not meet any of the criteria for exemption under section 31.10(2) of the Basic Standards, then the chronic low flow shall be determined by multiplying the 30E3 flow by the area of the regulatory mixing zone, as that term is defined at section 31.10(1)(c) of the Basic Standards, and dividing that product by the area of the physical mixing zone, as that term is defined at section 31.10(1)(a) of the Basic Standards.

Acute WET Limits - The limit shall be expressed as the LC50 which represents an estimate of the effluent concentration which is lethal to 50% of the test organisms in the time period prescribed by the test. If no instantaneous mixing is provided, the acute WET limit shall be no LC50 at effluent concentration less than or equal to 100% effluent.

Chronic Lethality WET Limits - Effluent discharged shall not result in both; 1) a statistically significant difference in lethality (at the 95% confidence level) between the control and any effluent concentration less than or equal to the instream waste concentration (IWC) and 2) an IC25 less than or equal to the IWC. The IWC shall be determined by dividing the effluent flow limit by the sum of the chronic low flow, as determined above, and the design flow or effluent flow limit, as appropriate. The IC25 refers to the "inhibition concentration" and represents an estimate of the effluent concentration at which 25% of the test organisms demonstrate inhibition as reflected by lethality. The IWC is the relationship between the permit flow limit and the chronic low flow of the receiving stream, expressed as a percentage.

Chronic Toxicity WET Limits - Chronic toxicity refers to WET related to lethality, growth or reproduction. A reopener clause will be placed in permits which contain chronic monitoring or chronic lethality limits. The reopener clause will allow the Division to place chronic toxicity limits in a permit where chronic toxicity is identified. The chronic toxicity limit will be the same as that for chronic lethality, with the expansion to include growth and reproduction.

MONITORING VS. LIMITS

Based upon the results of the application screening test or Division judgement of other pertinent information relative to reasonable potential, the following will generally apply;

1. Where there is no demonstrated WET or known pollutants of significance, monitoring will not be required in the permit.
2. Where there is not demonstrated WET but there are some pollutants of significance or a variable quality effluent, monitoring for some period will be appropriate.
3. Where there is demonstrated WET or factors which lead the Division to determine that there is reasonable potential for WET in a discharge, an effluent limit for WET will be contained in the permit and shall become effective within a reasonable time not to exceed 3 years for existing discharges and not to exceed 90 days for new discharges.

TESTING RELIEF

After one year of WET testing during which no toxicity has been demonstrated, the permittee may request relief relative to future monitoring. The Division may at that time maintain the level of monitoring, reduce the frequency, allow alternate species or drop monitoring completely. The Division judgement will be made based upon conditions such as the chemical characteristics of the effluent, activities creating the discharge, variability of effluent quality, other factor as are deemed appropriate.

PATTERN OF TOXICITY

If a routine acute or chronic WET test is failed, as a part of an automatic compliance schedule the permittee:

- a. shall proceed to conducting the PTI/TIE investigation, or
- b. may choose to conduct accelerated testing using the single species found to be more sensitive. Testing will be at least once every 2 weeks for up to 5 tests until 1) 2 consecutive tests fail or 3 of 5 tests fail, in which case a pattern of toxicity has been demonstrated or, 2) 2 consecutive tests pass or 3 of 5 tests pass, in which case no pattern of toxicity has been found. If no pattern of toxicity is found the toxicity episode is considered to be ended and routine testing is to resume. If a pattern of toxicity is found, a PTI/TIE investigation is to be performed. If a pattern of toxicity is not demonstrated but a significant level of erratic toxicity is found, the Division may require an increased frequency of routine monitoring or some modified approach in an attempt to allow toxicant identification and control.

DIVISION NOTIFICATION

Within 14 calendar days of the demonstration of acute WET or within 21 calendar days of the demonstration of chronic WET, in the routine required test, the permittee is to provide written notification of the fact to the Division, along with a statement as to whether the PTI/TIE investigation or accelerated testing is being performed. If accelerated testing is being performed, the permittee shall provide written notification of the results within 14 calendar days of completion of the "Pattern of Toxicity"/No Toxicity demonstration. "Demonstration" for this item means no later than the last day of the laboratory test.

PTI/TIE INVESTIGATION

The permittee may use the time for investigation to conduct a Preliminary Toxicity Investigation "PTI" or move directly into the Toxicity Identification Evaluation "TIE". A PTI consists of a brief search for possible sources of WET, which search might reveal causes of such toxicity and appropriate corrective actions more simply and cost effectively than a formal TIE. If the PTI allows resolution of the WET incident, the TIE need not necessarily be conducted. If however, WET is not identified or resolved the TIE must be conducted within the allowed 120 day time frame, as described below.

Any permittee that is required to conduct a TIE investigation shall do so in conformance with procedures identified in the following documents, or as subsequently updated: 1) Methods for Aquatic Toxicity Identification Evaluations, Phase I Toxicity Characterization Procedures, EPA/600/6-91/003 Feb. 91; 2) Methods for Aquatic Toxicity Identification Evaluations, Phase II Toxicity Identification Procedures, EPA/600/3-88/035 Feb. 1989; and 3) Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I, EPA/600/6-91/005F May 1992.

A fourth document in this series is Methods for Aquatic Toxicity Identification Evaluations, Phase III Toxicity Confirmation Procedures, EPA/600/3-88/036 Feb. 1989. As indicated by the title, this procedure is intended to confirm that the suspected toxicant is truly the toxicant. This investigation is optional as it is assumed that because of the cost of the procedure or certainty as to the toxicant, some permittees will ask to proceed with eliminating the toxicant without conducting the Phase III procedure. Should a permittee opt out of doing the Phase III confirmation procedure and should toxicity remain after completion of efforts to eliminate the toxicant, the Division will give this action due consideration in any subsequent enforcement action. Due consideration will likely not be in favor of the permittee.

The results of the TIE investigation is to be submitted to the Division within 120 days of the demonstration of acute or chronic WET in the routine test, as defined above, or if accelerated testing is performed, the date the pattern of toxicity is demonstrated. A status report is to be provided to the Division at the 30, 60 and 90 day points of the TIE investigation. The division may extend the time frame for investigation where reasonable justification exists. An example of reasonable justification may be a situation where the toxicant is sporadic or seasonal in appearance and the recurrence interval is beyond the 120 days.

TEST SPECIES

For acute testing, the Division may allow the use of those 6 organisms identified in EPA document, Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms, Section 6.1.2 (EPA/600/4-90/027 Sept 91). The six organisms are Ceriodaphnia dubia, Daphnia pulex, Daphnia magna, fathead minnows, rainbow trout and brook trout. The Division, however will specify Ceriodaphnia dubia and fathead minnows, when a permittee has not requested use of an alternate species. Random alternating of species by permittee is not allowed. Trading of species is restricted to those within the common family, vertebrate and invertebrate. It is acceptable to seek a species that is more resistant to a toxicant, such as D. magna which is slightly more resistant to salinity toxicity, although prior test failures are not erased from the record. Any change in species is subject to Division approval and must be reflected in the permit. For chronic testing, the only allowable test species are Ceriodaphnia dubia and fathead minnows.

TEST METHODOLOGIES

WET testing shall be conducted in accordance with "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms" Fourth Edition (EPA/600/4-90/027F August 1993) and "Short Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Water to Freshwater Organisms" Third Edition (EPA-600-4-91-002 July 1994) or most current editions, except as modified by the most current Division version of "Guidelines for Conducting Whole Effluent Toxicity Tests".

ALTERING OF TEST METHODS

Altering of test methods by a permittee will only be allowed upon written approval by the Division, as reflected in the permit. This document will be periodically updated and new alternatives will be added at those times. Currently approved alternatives are:

pH Creep for Ammonia - where ammonia toxicity is resulting because of sample CO₂ loss due to sample aeration, testing in a CO₂ atmosphere may be site specifically acceptable. The appropriate procedure to be followed is specified in the "Alternative Test Methods" section of the Division's "Laboratory Guidelines for Conducting Whole Effluent Toxicity Tests."

NUMERIC LIMITS VS. NARRATIVE LIMITS

In those situations where a WET failure, as demonstrated by a PTI or a TIE, is caused by a toxicant controlled by a WQS based effluent limit, the Division will use enforcement discretion as long as the permittee is in compliance with the numeric limit. Additionally, the permittee will be required to: 1a) conduct an investigation which demonstrates actual instream aquatic life conditions upstream and downstream of the discharge, or 1b) identify, for Division approval, and conduct an equally protective approach which demonstrates the actual instream impact and 1c) identify the control program to eliminate the WET toxicity and its cost; or 2) identify the control program and proceed with elimination of the toxicity so as to meet the WET effluent limit. Data from item 1 is for use by the WQCC at the next appropriate triennial review of the stream standards, unless the timing is insufficient to allow generation of responsible data, in which case it will be presented to the WQCC no later than the subsequent triennial review.

In those situations where a WET failure is caused by a toxicant not controlled by a WQS set by the WQCC, the Division shall impose an effluent limit in the permit which will protect the aquatic life use of the receiving stream. In those cases where instream impact is not apparent, the derived effluent limit should maintain existing conditions. In those cases where instream impact is apparent, the Division shall establish a numeric limitation at an appropriate level so as to provide reasonable protection for the aquatic life use of the segment. In either case the permittee will also be required to conduct the appropriate work identified in item 1 in the preceding paragraph for later consideration by the WQCC or develop the control program and eliminate the toxicant(s) so as to meet the WET effluent limit, as per item 2 in the preceding paragraph.

Once the toxicant has been identified and the numeric limit is being met, the Division will attempt to provide relief on the routine analytical test, until such time as the situation has been reviewed by the WQCC. Such relief will likely need to be developed on a pollutant specific basis.

BEYOND PHASE I, II, AND III TIE'S

In the event the permittee has completed the required TIE investigations in accordance with the EPA procedures and the toxicant cannot be identified, the Division may amend the permit and extend the compliance schedule for continued investigation or development of a control program.

SPONTANEOUS DISAPPEARANCE OF TOXICITY

If toxicity spontaneously disappears at any time after a test failure, such as in the midst of a PTI/TIE, the Division may require the permittee to conduct accelerated testing to demonstrate that no pattern of toxicity exists, or simply testing at an increased frequency for some period of time. If no pattern is demonstrated or recurring toxicity is not identified, the toxicity incident response is closed and normal WET testing shall resume.

CONTROL PROGRAM

The control program consists of the measures determined to be the most feasible measures to eliminate whole effluent toxicity through the identification and elimination of toxicant(s) responsible for WET and the source(s) of such toxicant(s) or through the identification of toxicant treatability processes. Unless otherwise modified in the permit, a control program is to be developed and submitted to the WQCD within 90 days of successfully identifying the toxicant(s), either from the PTI/TIE investigation or other appropriate WQCD directed investigation.

At any time that the permittee opts to or is required to implement the control program, the compliance schedule for such action is to be incorporated into the permit, unless the timing is so short as to be completed prior to completion of an amendment.

REQUEST FOR RELIEF

Upon satisfactory completion of the required PTI/TIE investigation, compliance with other permit conditions and proper operation and maintenance of treatment facilities, the permittee may request relief from further investigation and testing. In requesting such relief, the permittee shall submit material sufficient to establish the following:

- (a) It has complied with terms and conditions of the permit compliance schedule for the PTI/TIE investigation and other appropriate conditions as may have been required by the WQCD;
- (b) During the period of the toxicity incident it has been in compliance with all other permit conditions, including, in the case of a POTW, pre-treatment requirements;
- (c) During the period of the toxicity incident it has properly maintained and operated all facilities and systems of treatment and control; and
- (d) Despite the circumstances described in paragraphs (a) and (c) above, the source and/or cause of toxicity could not be located or resolved.

If deemed appropriate by the Division, the permit or the compliance schedule may be modified to revise the ongoing monitoring and toxicity investigation requirements to avoid an unproductive expenditure of the permittee's resources, provided that the underlying obligation to eliminate any continuing exceedance of the toxicity limit shall remain.

DIVISION DIRECTED TESTING

The Division may require additional testing when it concludes that the routine testing frequency is inadequate to properly reflect effluent conditions or the Division feels that routine test violations in combination with compliance schedule requirement are not creating an adequate incentive for prompt resolution of a serious pollution problem.