

EXHIBIT C

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act as amended, (33 U.S.C. §§ 1251 et seq.; the "CWA"), and the Massachusetts Clean Waters Act, as amended, (M.G.L. Chap. 21, §§26-53),

Town of Northbridge

is authorized to discharge from the facility located at

Wastewater Treatment Plant
644 Providence Road
Whitinsville, MA 01588

to receiving water named

Unnamed Tributary to the Blackstone River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on (See ** below)

This permit and the authorization to discharge expire at midnight, five (5) years from the effective date.

This permit supersedes the permit issued September 30, 1999 and effective on October 30, 1999.

This permit consists of 11 pages in Part I including effluent limitations, monitoring requirements, Attachment A and 35 pages in Part II including General Conditions and Definitions.

Signed this day of

Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

Director
Division of Watershed Management
Department of Environmental Protection
Commonwealth of Massachusetts
Boston, MA

** This permit will become effective on the date of signature if no comments are received during public notice. If comments are received during public notice, this permit will become effective 60 days after signature.

PART I

A.1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge from outfall serial number **001**, treated effluent to an unnamed tributary to the Blackstone River. Such discharges shall be limited and monitored as specified below.

| EFFLUENT CHARACTERISTIC | | | | EFFLUENT LIMITS | | | MONITORING REQUIREMENTS | | |
|---|--|---------------------------------------|-----------------------|-----------------|--------------------------|-----------------------|--------------------------------|------|--|
| PARAMETER | AVERAGE MONTHLY | AVERAGE WEEKLY | AVERAGE MONTHLY | AVERAGE WEEKLY | MAXIMUM DAILY | MEASUREMENT FREQUENCY | SAMPLE TYPE | | |
| FLOW | ***** | ***** | 2.0 MGD ³ | ***** | Report MGD | Continuous | Recorder | | |
| BOD ₅ ⁴ | Report lbs/Day | Report lbs/Day | 10 mg/l | 10 mg/l | Report mg/l | 3/WEEK | 24-HOUR COMPOSITE ⁵ | | |
| TSS ⁴ | Report lbs/Day | Report lbs/Day | 10 mg/l | 10 mg/l | Report mg/l ¹ | 3/WEEK | 24-HOUR COMPOSITE ⁵ | | |
| pH RANGE ¹ | 6.5 - 8.3 SU - SEE PERMIT PAGE 6, PARAGRAPH I.A.1.b. | | | | | | 1/DAY | GRAB | |
| FECAL COLIFORM ^{2,6} | ***** | ***** | 200 cfu per 100 ml | ***** | 400 cfu per 100 ml | 3/WEEK | GRAB | | |
| TOTAL COPPER | ***** | ***** | 6.5 ug/l ⁷ | ***** | 9.1 mg/l ⁷ | 1/MONTH | 24-HOUR COMPOSITE ⁵ | | |
| TOTAL ZINC | ***** | ***** | 82 ug/l | ***** | 82 ug/l | 1/MONTH | 24-HOUR COMPOSITE ⁵ | | |
| TOTAL LEAD | ***** | ***** | 1.8 ug/l ⁷ | ***** | Report ⁷ | 1/MONTH | 24-HOUR COMPOSITE ⁵ | | |
| DISSOLVED OXYGEN April 1 - October 31 | NOT LESS THAN 5.0 mg/l | | | | | | 1/WEEK | GRAB | |
| WHOLE EFFLUENT TOXICITY SEE FOOTNOTES 8 through 11 | Acute | LC ₅₀ ≥ 100% NOEC > 83% | | | | 4/YEAR | 24-HOUR COMPOSITE ⁵ | | |

Footnotes are listed on Pages 4, 5 and 6

Sampling for effluent parameters shall be conducted after ultraviolet disinfection and prior to discharge to the unnamed tributary to the Blackstone River.

CONTINUED FROM PREVIOUS PAGE

A.1. During the period beginning the effective date and lasting through expiration, the permittee is authorized to discharge from outfall serial number 001, treated effluent to an unnamed tributary to the Blackstone River. Such discharges shall be limited and monitored as specified below.

| PARAMETER | EFFLUENT LIMITS | | | | MONITORING REQUIREMENTS | | | |
|--|-----------------|----------------|---------------------------|----------------|-------------------------|-----------------------|--------------------------------|--|
| | AVERAGE MONTHLY | AVERAGE WEEKLY | AVERAGE MONTHLY | AVERAGE WEEKLY | MAXIMUM DAILY | MEASUREMENT FREQUENCY | SAMPLE TYPE | |
| AMMONIA-NITROGEN, TOTAL May 1 - October 31 | ***** | ***** | 2.0 mg/l | 4.0 mg/l | Report mg/l | 1/WEEK | 24-HOUR COMPOSITE ⁵ | |
| AMMONIA-NITROGEN, TOTAL November 1 - April 30 | ***** | ***** | 9.0 mg/l | 18.0 mg/l | Report mg/l | 1/WEEK | 24-HOUR COMPOSITE ⁵ | |
| TOTAL PHOSPHORUS April 1 - October 31 | Report lbs/Day | ***** | 0.2 mg/l ¹² | ***** | Report mg/l | 2/WEEK | 24-HOUR COMPOSITE ⁵ | |
| TOTAL PHOSPHORUS November 1 - March 31 | Report lbs/Day | ***** | 1.0 mg/l ¹² | ***** | Report mg/l | 2/MONTH | 24-HOUR COMPOSITE ⁵ | |
| PHOSPHORUS, ORTHO November 1 - March 31 | ***** | ***** | Report mg/l ¹² | ***** | Report mg/l | 2/MONTH | 24-HOUR COMPOSITE ⁵ | |
| TOTAL KJELDAHL NITROGEN | Report lbs/Day | ***** | Report mg/l | ***** | Report mg/l | 1/MONTH | 24-HOUR COMPOSITE ⁵ | |
| NITRATE + NITRITE NITROGEN | Report lbs/Day | ***** | Report mg/l | ***** | Report mg/l | 1/MONTH | 24-HOUR COMPOSITE ⁵ | |

Footnotes are listed on Pages 4, 5 and 6

Sampling for effluent parameters shall be conducted after ultraviolet disinfection and prior to discharge to the unnamed tributary to the Blackstone River

Footnotes:

1. All required effluent samples shall be collected after the ultraviolet disinfection system and prior to discharge to the unnamed tributary to the Blackstone River. A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of every month. Any deviations from the routine sampling program shall be documented in correspondence appended to the applicable discharge monitoring report that is submitted to EPA. All samples shall be tested using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. All samples shall be 24 hour composites unless specified as a grab sample in 40 CFR §136.
2. Required for State Certification.
3. For flow, report maximum and minimum daily rates and total flow for each operating date. This is a monthly average limit.
4. Sampling required for influent and effluent.
5. A 24-hour composite sample will consist of at least twenty four (24) grab samples taken during a consecutive 24 hour period (e.g. 7:00 A.M. Monday to 7:00 A.M. Tuesday).
6. Fecal coliform monitoring will be conducted during the period April 1st through October 31st only. This is also a State certification requirement. Fecal coliform discharges shall not exceed a monthly geometric mean of 200 colony forming units (cfu) per 100 ml, nor shall they exceed 400 cfu per 100 ml as a daily maximum.
7. The minimum level (ML) for copper and lead is defined as 3 ug/l. This value is the minimum level for copper and lead using the Furnace Atomic Absorption analytical method (EPA Method 220.2). For effluent limitations of less than 3 ug/l. Compliance or non-compliance will be determined based on the ML from this method, or another approved method that has an equivalent or lower ML, one of which must be used. Sample results of 3 ug/l or less shall be reported as zero on the DMR.
8. The permittee shall conduct acute toxicity tests four times per year. The permittee shall test the fathead minnow, Pimephales promelas, only. Toxicity test samples shall be collected during the second week of the months of January, April, July and October. The test results shall be submitted by the last day of the month following the completion of the test. The results are due no later than February 28th, May 31st, August 31st and November 30th, respectively. The tests must be performed in accordance with test procedures and protocols specified in **Attachment A** of this permit.

| Test Dates Second Week of | Submit Results By: | Test Species | Acute Limit LC ₅₀ | C-NOEC limit |
|-------------------------------------|---|--|---------------------------------|-----------------|
| January April July October | February 28 May 31 August 31 November 30 | <u>Pimephales promelas</u> (Fathead Minnow) | ≥ 100% | ≥ 83% |

After submitting **one year** and a **minimum** of four consecutive sets of WET test results, all of which demonstrate compliance with the WET permit limits, the permittee may request a reduction in the WET testing requirements. The permittee is required to continue testing at the frequency specified in the permit until notice is received by certified mail from the EPA that the WET testing requirement has been changed.

9. The permittee may use laboratory water as diluent and such diluent shall have characteristics such as hardness, pH, conductivity, alkalinity, organic carbon, and total suspended solids similar to those of the receiving water and shall not illicit a toxic response. Alternate dilution water tests must be run with a minimum of two controls: a receiving water (unnamed tributary to the Blackstone River) control and a toxic free alternate dilution water control. Chemical data of the receiving water and dilution water samples must be included in the whole effluent toxicity (WET) report. The analytical results from the WET tests for copper, lead and zinc may be used to satisfy this requirement for the months that WET testing is conducted.
10. The LC₅₀ is the concentration of effluent which causes mortality to 50% of the test organisms. Therefore, a 100% limit means that a sample of 100% effluent (no dilution) shall cause no more than a 50% mortality rate.
11. C-NOEC (chronic-no observed effect concentration) is defined as the highest concentration of toxicant or effluent to which organisms are exposed in a life cycle or partial life cycle test which causes no adverse effect on growth, survival, or reproduction at a specific time of observation as determined from hypothesis testing where the test results exhibit a linear dose-response relationship. However, where the test results do not exhibit a linear dose-response relationship, the permittee must report the lowest concentration where there is no observable effect. The final limit of "83% or greater" is defined as a sample which is composed of 83% (or greater) effluent, the remainder being dilution water. This is a maximum daily limit derived as a percentage of the inverse of the dilution factor of 1.2.

12. The permittee shall comply with the 0.2 mg/l and 1.0 mg/l total phosphorus limits upon the effective date of the permit. These limits are monthly average limits. The maximum daily value must be reported for each month. The monthly average mass loading shall also be reported. Consistent with Section B.1 of Part II of the Permit, the Permittee shall properly operate and maintain the phosphorus removal facilities in order to obtain the lowest effluent concentration possible. The maximum daily concentration values reported for ortho phosphorus shall be the values from the same day that the maximum daily total phosphorus concentration values were measured.

Part I.A.1. (Continued)

- a. The discharge shall not cause a violation of the water quality standards of the receiving waters.
 - b. The pH of the effluent shall not be less than 6.5 nor greater than 8.3 at any time, and not more than 0.5 units outside of the background range. There shall be no change from background conditions that would impair any use assigned to this Class.
 - c. The discharge shall not cause objectionable discoloration of the receiving waters.
 - d. The effluent shall contain neither a visible oil sheen, foam, nor floating solids at any time.
 - e. The permittee's treatment facility shall maintain a minimum of 85 percent removal of both total suspended solids and biochemical oxygen demand. The percent removal shall be based on monthly average values.
 - f. The results of sampling for any parameter above its required frequency must also be reported.
2. All POTWs must provide adequate notice to the Director of the following:
- a. Any new introduction of pollutants into that POTW from an indirect discharger in a primary industry category discharging process water; and
 - b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
 - c. For purposes of this paragraph, adequate notice shall include information on:
 - (1) the quantity and quality of effluent introduced into the POTW; and
 - (2) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

3. Prohibitions Concerning Interference and Pass Through:

- a. Pollutants introduced into POTW's by a non-domestic source (user) shall not pass through the POTW or interfere with the operation or performance of the works.

4. Toxics Control

- a. The permittee shall not discharge any pollutant or combination of pollutants in toxic amounts.
- b. Any toxic components of the effluent shall not result in any demonstrable harm to aquatic life or violate any state or federal water quality standard which has been or may be promulgated. Upon promulgation of any such standard, this permit may be revised or amended in accordance with such standards.

5. Numerical Effluent Limitations for Toxicants

EPA or DEP may use the results of the toxicity tests and chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act (CWA), state water quality criteria, and any other appropriate information or data, to develop numerical effluent limitations for any pollutants, including but not limited to those pollutants listed in Appendix D of 40 CFR Part 122.

C. UNAUTHORIZED DISCHARGES

The permittee is authorized to discharge only in accordance with the terms and conditions of this permit and only from the outfalls listed in Part I A.1. of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs) are not authorized by this permit and shall be reported in accordance with Section D.1.e. (1) of the General Requirements of this permit (Twenty-four hour reporting).

D. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance of the sewer system shall be in compliance with the General Requirements of Part II and the following terms and conditions:

1. Maintenance Staff

The permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit.

2. Preventative Maintenance Program

The permittee shall maintain an ongoing preventative maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges.

3. Infiltration/Inflow Control Plan:

The permittee shall continue to implement a plan to control infiltration and inflow (I/I) to the separate sewer system. This plan shall describe the permittee's program for preventing infiltration/inflow related effluent limit violations, and all unauthorized discharges of wastewater, including overflows and by-passes due to excessive infiltration/inflow.

The plan shall include:

- An ongoing program to identify and remove sources of infiltration and inflow. The program shall include the necessary funding level and the source(s) of funding.
- An inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts. Priority should be given to removal of public and private inflow sources that are upstream from, and potentially contribute to, known areas of sewer system backups and/or overflows.
- Identification and prioritization of areas that will provide increased aquifer recharge as the result of reduction/elimination of infiltration and inflow to the system.
- An educational public outreach program for all aspects of I/I control, particularly private inflow.

Reporting Requirements:

A summary report of all actions taken to minimize I/I during the previous calendar year shall be submitted to EPA and the MA DEP annually, **no later than April 1st**.

The summary report shall, at a minimum, include:

- A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year.
- Expenditures for any infiltration/inflow related maintenance activities and corrective actions taken during the previous year.
- A map with areas identified for I/I-related investigation/action in the coming year.

- A calculation of the annual average *LI*, the maximum month *LI* for the reporting year.
- A report of any infiltration/inflow related corrective actions taken as a result of unauthorized discharges reported pursuant to 314 CMR 3.19(20) and reported pursuant to the Unauthorized Discharges section of this permit.

4. Alternate Power Source

In order to maintain compliance with the terms and conditions of this permit, the permittee shall continue to provide an alternative power source with which to sufficiently operate its treatment works (as defined at 40 CFR §122.2).

E. SLUDGE CONDITIONS

1. The permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices and with the CWA Section 405(d) technical standards.
2. The permittee shall comply with the more stringent of either the state or federal (40 CFR part 503), requirements.
3. The requirements and technical standards of 40 CFR part 503 apply to facilities which perform one or more of the following use or disposal practices.
 - a. Land application - the use of sewage sludge to condition or fertilize the soil
 - b. Surface disposal - the placement of sewage sludge in a sludge only landfill
 - c. Sewage sludge incineration in a sludge only incinerator
4. The 40 CFR part 503 conditions do not apply to facilities which place sludge within a municipal solid waste landfill. These conditions also do not apply to facilities which do not dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g. lagoons- reed beds), or are otherwise excluded under 40 CFR 503.6.
5. The permittee shall use and comply with the attached compliance guidance document to determine appropriate conditions. Appropriate conditions contain the following elements.
 - General requirements
 - Pollutant limitations
 - Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
 - Management practices
 - Record keeping

- Monitoring
- Reporting

Depending upon the quality of material produced by a facility, all conditions may not apply to the facility.

6. The permittee shall monitor the pollutant concentrations, pathogen reduction and vector attraction reduction at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year

| | |
|-------------------------|------------|
| less than 290 | 1/ year |
| 290 to less than 1500 | 1 /quarter |
| 1500 to less than 15000 | 6 /year |
| 15000 + | 1 /month |

7. The permittee shall sample the sewage sludge using the procedures detailed in 40 CFR 503.8.

8. The permittee shall submit an **annual report** containing the information specified in the guidance by **February 19**. Reports shall be submitted to the address contained in the reporting section of the permit. Sludge monitoring is not required by the permittee when the permittee is not responsible for the ultimate sludge disposal. The permittee must be assured that any third party contractor is in compliance with appropriate regulatory requirements. In such case, the permittee is required only to submit an annual report by February 19 containing the following information:

- Name and address of contractor responsible for sludge disposal
- Quantity of sludge in dry metric tons removed from the facility by the sludge contractor

F. MONITORING AND REPORTING

1. Reporting

Monitoring results obtained during each calendar month shall be summarized and reported on Discharge Monitoring Report Form(s) postmarked no later than the 15th day of the following month.

Signed and dated originals of these, and all other reports required herein, shall be submitted to the Director and the State at the following addresses:

Environmental Protection Agency
 Water Technical Unit (SEW)
 P.O. Box 8127
 Boston, Massachusetts 02114

The State Agency is:

Massachusetts Department of Environmental Protection
Central Regional Office
Bureau of Resource Protection
627 Main Street
Worcester, MA 01608

Signed and dated Discharge Monitoring Report Forms and toxicity test reports required by this permit shall also be submitted to the State at:

Massachusetts Department of Environmental Protection
Division of Watershed Management
Surface Water Discharge Permit Program
627 Main Street, 2nd Floor
Worcester, Massachusetts 01608

G. STATE PERMIT CONDITIONS

This discharge permit is issued jointly by the U. S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP) under Federal and State law, respectively. As such, all the terms and conditions of this permit are hereby incorporated into and constitute a discharge permit issued by the Commissioner of the MA DEP pursuant to M.G.L. Chap.21, §43.

Each Agency shall have the independent right to enforce the terms and conditions of this permit. Any modification, suspension or revocation of this permit shall be effective only with respect to the Agency taking such action, and shall not affect the validity or status of this permit as issued by the other Agency, unless and until each Agency has concurred in writing with such modification, suspension or revocation. In the event any portion of this permit is declared, invalid, illegal or otherwise issued in violation of State law such permit shall remain in full force and effect under Federal law as an NPDES permit issued by the U.S. Environmental Protection Agency. In the event this permit is declared invalid, illegal or otherwise issued in violation of Federal law, this permit shall remain in full force and effect under State law as a permit issued by the Commonwealth of Massachusetts.

ATTACHMENT A
FRESHWATER ACUTE
TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable acute toxicity tests in accordance with the appropriate test protocols described below:

- **Daphnid (Ceriodaphnia dubia) definitive 48 hour test.**

Acute toxicity test data shall be reported as outlined in Section VIII.

II. METHODS

Methods should follow those recommended by EPA in:

Weber, C.I. et al. Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, Fourth Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH. August 1993, EPA/600/4-90/C27F.

Any exceptions are stated herein.

III. SAMPLE COLLECTION

A discharge sample shall be collected. Aliquots shall be split from the sample, containerized and preserved (as per 40 CFR Part 136) for chemical and physical analyses required. The remaining sample shall be measured for total residual chlorine and dechlorinated (if detected) in the laboratory using sodium thiosulfate for subsequent toxicity testing. (Note that EPA approved test methods require that samples collected for metals analyses be preserved immediately after collection.) Grab samples must be used for pH, temperature, and total residual chlorine (as per 40 CFR Part 122.21).

Standard Methods for the Examination of Water and Wastewater describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1.0 mg/L chlorine. A thiosulfate control (maximum amount of thiosulfate in lab control or receiving water) should also be run.

All samples held overnight shall be refrigerated at 4°C.

IV. DILUTION WATER

A grab sample of dilution water used for acute toxicity testing shall be collected from the receiving water at a point upstream of the discharge free from toxicity or other sources of contamination. Avoid collecting near areas of obvious road or agricultural runoff, storm sewers or other point source discharges. An additional control (0% effluent) of a standard laboratory water of known quality shall also be tested.

If the receiving water diluent is found to be, or suspected to be toxic or unreliable, an alternate standard dilution water of known quality with a hardness, pH, conductivity, alkalinity, organic carbon, and total suspended solids similar to that of the receiving water may be substituted AFTER RECEIVING WRITTEN APPROVAL FROM THE PERMIT ISSUING AGENCY(S). Written requests for use of an alternate dilution water should be mailed with supporting documentation to the following address:

Director
Office of Ecosystem Protection
U.S. Environmental Protection Agency-New England
JFK Federal Building (CAA)
Boston, MA 02203

It may prove beneficial to have the proposed dilution water source screened for suitability prior to toxicity testing. EPA strongly urges that screening be done prior to set up of a full definitive toxicity test any time there is question about the dilution water's ability to support acceptable performance as outlined in the 'test acceptability' section of the protocol.

V. TEST CONDITIONS

The following tables summarize the accepted daphnid and fathead minnow toxicity test conditions and test acceptability criteria:

(December 1995)

EPA NEW ENGLAND RECOMMENDED EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNID, CERIODAPHNIA DUBIA 48 HOUR ACUTE TESTS¹

| | |
|---|--|
| 1. Test type | Static, non-renewal |
| 2. Temperature (°C) | 20 ± 1° c or 25 ± 1°c |
| 3. Light quality | Ambient laboratory illumination |
| 4. Photoperiod | 16 hour light, 8 Hour dark |
| 5. Test chamber size | Minimum 30 ml |
| 6. Test solution volume | Minimum 25 ml |
| 7. Age of test organisms | 1-24 hours (neonates) |
| 8. No. daphnids per test chamber | 5 |
| 9. No. of replicate test chambers per treatment | 4 |
| 10. Total no. daphnids per test concentration | 20 |
| 11. Feeding regime | Feed YCT and <u>Selenastrum</u> while holding organisms prior to initiating test as per manual. |
| 12. Aeration | None |
| 13. Dilution water ² | Receiving water, other surface water, synthetic soft water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q ^R or equivalent deionized water and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness. |
| 14. Dilution factor | ≥ 0.5 |

15. Number of dilutions³ 5 plus a control. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16. Effect measured Mortality-no movement of body or appendages on gentle prodding
17. Test acceptability 90% or greater survival of test organisms in control solution
18. Sampling requirements For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples must first be used within 36 hours of collection.
19. Sample volume required Minimum 1 liter

Footnotes:

1. Adapted from EPA/600/4-90/027F.
2. Standard prepared dilution water must have hardness requirements to generally reflect the characteristics of the receiving water.
3. When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

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**EPA NEW ENGLAND RECOMMENDED TEST CONDITIONS FOR THE FATHEAD
MINNOW (PIMEPHALES PROMELAS) 48 HOUR ACUTE TEST**

- | | |
|--|---|
| 1. Test Type | Static, non-renewal |
| 2. Temperature (°C): | 20 ± 1 ° C or 25 ± 1°C |
| 3. Light quality: | Ambient laboratory illumination |
| 4. Photoperiod: | 16 hr light, 8 hr dark |
| 5. Size of test vessels: | 250 mL minimum |
| 6. Volume of test solution: | Minimum 200 mL/replicate |
| 7. Age of fish: | 1-14 days old and age within 24 hrs of the others |
| 8. No. of fish per chamber | 10 (not to exceed loading limits) |
| 9. No. of replicate test vessels per treatment | 4 |
| 10. Total no. organisms per concentration: | 40 |
| 11. Feeding regime: | Light feeding using concentrated brine shrimp nauplii while holding prior to initiating the test as per manual |
| 12. Aeration: | None, unless dissolved oxygen (D.O.) concentration falls below 4.0 mg/L, at which time gentle single bubble aeration should be started at a rate of less than 100 bubbles/min. (Routine D.O. check is recommended.) |

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- | | |
|--------------------------------------|--|
| 13. dilution water: ² | Receiving water, other surface water, synthetic soft water adjusted to the hardness and alkalinity of the receiving water (prepared using either Millipore Milli-Q [®] or equivalent deionized and reagent grade chemicals according to EPA acute toxicity test manual) or deionized water combined with mineral water to appropriate hardness. |
| 14. Dilution factor | ≥ 0.5 |
| 15. Number of dilutions ³ | 5 plus a control. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series. |
| 16. Effect measured | Mortality-no movement on gentle prodding |
| 17. Test acceptability | 90% or greater survival of test organisms in control solution |
| 18. Sampling requirements | For on-site tests, samples must be used within 24 hours of the time that they are removed from the sampling device. For off-site tests, samples are used within 36 hours of collection. |
| 19. Sample volume required | Minimum 2 liters |

Footnotes:

1. Adapted from EPA-600/4-90/027F.
2. Standard dilution water must have hardness requirements to generally reflect characteristics of the receiving water.
3. When receiving water is used for dilution, an additional control made up of standard laboratory dilution water (0% effluent) is required.

(December 1995)

VI. CHEMICAL ANALYSIS

At the beginning of a static acute toxicity test, pH, conductivity, total residual chlorine, and temperature must be measured in the highest effluent concentration and the dilution water. Dissolved oxygen, pH and temperature are also measured at 24 and 48 hour intervals. It is also recommended that total alkalinity and total hardness be measured in the control and highest effluent concentration at the beginning of the test. The following chemical analyses shall be performed for each sampling event.

| <u>Parameter</u> | <u>Effluent</u> | <u>Diluent</u> | <u>Minimum</u> |
|---|-----------------|----------------|--|
| | | | <u>Quanti- fication Level (mg/L)</u> |
| Hardness* ¹ | X | X | 0.5 |
| Alkalinity | X | X | 2.0 |
| pH | X | X | --- |
| Specific Conductance | X | X | --- |
| Total Solids and Suspended Solids | X | X | --- |
| Ammonia | X | X | 0.1 |
| Total Organic Carbon | X | X | 0.5 |
| Total Residual Chlorine (TRC)* ² | X | X | 0.05 |
| Dissolved Oxygen | X | X | 1.0 |
| <u>Total Metals</u> | | | |
| Cd | X | | 0.001 |
| Cr | X | | 0.005 |
| Pb | X | X | 0.005 |
| Cu | X | X | 0.0025 |
| Zn | X | X | 0.0025 |
| Ni | X | X | 0.004 |
| Al | X | X | 0.02 |
| Mg, Ca | X | X | 0.05 |

Superscripts:

*¹ Method 2340 B (hardness by calculation) from APHA (1992) Standard Methods for the Examination of Water and Wastewater. 18th Edition.

*² Total Residual Chlorine

Either of the following methods the 18th Edition of the APHA Standard Methods for the Examination of Water and Wastewater must be used for these analyses.

-Method 4500-CL E Low Level Amperometric Titration Method (the preferred method); or

-Method 4500-CL G DPD Colorimetric Method

or use USEPA Manual of Methods Analysis of Water and Wastes, Method 330.5

(December 1995)

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration (Determined at 48 Hours)

Methods of Estimation:

- Probit Method
- Spearman-Kärber
- Trimmed Spearman-Kärber
- Graphical

See the flow chart in Figure 6 on p. 77 of EPA 600/4-90/027F for appropriate method to use on a given data set.

No Observed Acute Effect Level (NOAEL)

See the flow chart in Figure 13 on p. 94 of EPA 600/4-90/027F.

VIII. TOXICITY TEST REPORTING

A report of the results will include the following:

- Description of sample collection procedures, site description;
- Names of individuals collecting and transporting samples, times and dates of sample collection and analysis on chain-of-custody; and
- General description of tests: age of test organisms, origin, dates and results of standard toxicant tests; light and temperature regime; other information on test conditions if different than procedures recommended. Reference toxicant test data should be included.
- All chemical/physical data generated. (Include minimum detection levels and minimum quantification levels.)
- Raw data and bench sheets.
- Provide a description of dechlorination procedures (as applicable).
- Any other observations or test conditions affecting test outcome.

(December 1995)

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TOTAL P.05