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),

Boston Sand and Gravel Company
169 Portland Street
Boston, MA 02114

is authorized to discharge from the facility located at

500 Front Street
Charlestown, MA 02129

to receiving water named Millers River which drains to the Charles River, and subsequently drains to Boston Harbor,

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

This permit shall become effective on the first day of the calendar month following 60 days after signature. If no comments are received, this permit shall become effective following signature.

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

This permit supersedes the last permit issued on December 14, 2001.

This permit consists of 12 pages in Part I including effluent limitations and monitoring requirements, Attachment 1 – Freshwater Chronic Test Procedure and Protocol, and 25 pages in Part II including General Conditions and Definitions.

Signed this day of

_____
Stephen S. Perkins, Director
Office of Ecosystem Protection
Environmental Protection Agency
Boston, MA

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

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning with the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from **Outfall Serial Number 001** to the Millers River. This discharge consists of a combination of storm water runoff, road sweeping water, boiler blowdown water, and truck wash-off and wash-out water. Such discharge shall: 1) be limited and monitored by the permittee as specified below; and 2) not cause a violation of the State Surface Water Quality Standards of the receiving water.

EFFLUENT CHARACTERISTIC	MONITORING REQUIREMENTS			
PARAMETER	**AVERAGE MONTHLY**	**MAXIMUM DAILY**	**SAMPLING FREQUENCY**	**SAMPLE TYPE** [1]
Flow (GPD) [3]	Report	Report	Continuous	Recorder
Total Suspended Solids (TSS) (mg/L)	20	45	1/week[2]	Grab
pH (SU) [4]	6.0 – 8.5		Monthly[2]	Grab
Turbidity (NTU)	25	Report	1/week[2]	Grab
Sulfates, Total (mg/L)	250	Report	Monthly[2]	Grab
Copper (ug/L)	---	Report	Monthly[2]	Grab
Chromium (VI) (ug/L)	---	Report	Monthly[2]	Grab
Aluminum (ug/L)	---	Report	Monthly[2]	Grab
Hardness (mg/L as $CaCO_3$)[5]	---	Report	Monthly[2]	Grab
Hardness of Receiving Water (mg/L as $CaCO_3$)[5]	---	Report	Monthly[2]	Grab

Whole Effluent Toxicity (WET)			
Acute LC_{50} (%)[7,8]	Report	Annually[2]	Composite[6]
Chronic C-NOEC (%)[7,8]	Report	Annually[2]	Composite[6]
Hardness (mg/L)[9]	Report	Annually[2]	Composite[6]
Alkalinity (mg/L)[9]	Report	Annually[2]	Composite[6]
pH (SU)[9]	Report	Annually[2]	Composite[6]
Specific Conductance (µmhos/cm)[9]	Report	Annually[2]	Composite[6]
Total Solids (mg/L)[9]	Report	Annually[2]	Composite[6]
Ammonia (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Organic Carbon (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Residual Chlorine (mg/L)[9]	Report	Annually[2]	Composite[6]
Dissolved Oxygen (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Cadmium (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Chromium (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Lead (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Copper (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Zinc (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Nickel (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Aluminum (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Magnesium (mg/L)[9]	Report	Annually[2]	Composite[6]
Total Calcium (mg/L)[9]	Report	Annually[2]	Composite[6]

(Part I.A.1 continued)
Footnotes:

1. Samples taken in compliance with the monitoring requirements specified above, with the exception of flow, shall be taken at the following location: after treatment through Lagoon 9 and prior to discharge to the Millers River. Flow shall be taken from the flow meter between Lagoon 8 and 9, to be representative of the flow through Outfall 001.

2. Sampling frequency of 1/week is defined as the sampling of one (1) discharge event in one calendar week, when discharge occurs. Sampling frequency of monthly is defined as the sampling of one (1) discharge event in each calendar month, when discharge occurs. Sampling frequency of annually is defined as the sampling of one (1) discharge event in each calendar year, when discharge occurs.

3. The average monthly flow rate shall be calculated as an average of the daily flow rates taken during each month.

4. The pH of the effluent shall not be less than 6.0 or greater than 8.5 standard units, unless these values are exceeded as a result of natural causes (which may be determined by comparison to the upstream pH). The pH of the effluent shall not be more than 0.5 units outside of the naturally occurring range.

5. The hardness of both the receiving water and effluent shall be analyzed and reported separately on the DMR.

6. A composite sample is a sample consisting of grab samples collected at hourly intervals (two minimum) during a normal discharge.

7. The permittee shall conduct annual chronic (and modified acute) toxicity tests. Two of the first five tests shall be performed during boiler blowdown discharge. The chronic test may be used to calculate the acute LC_{50} at the 48 hour exposure interval. The permittee shall test the daphnid, Ceriodaphnia dubia, and fathead minnow, Pimephales promelas. The test results shall be submitted by the last day of the full month following completion of the test. The tests must be performed in accordance with test procedures and protocols specified in Attachment 1 of this permit.

8. If toxicity test(s) using receiving water as diluent show the receiving water to be toxic or unreliable, the permittee shall follow procedures outlines in Section IV (Dilution Water) of Attachment 1 in order to obtain permission to use an alternate dilution water. In lieu of individual approvals for alternate dilution water required in Attachment 1, EPA-New England has developed a Self-Implementing Alternative Dilution Water Guidance document (called "Guidance Document") which may be used to obtain automatic approval of an alternate dilution water, including the appropriate species for use with that water. If this Guidance Document is revoked, the permittee shall revert to obtaining approval as outlined

in Attachment 1. The "Guidance Document" has been sent to all permittees with their annual set of DMRs and Revised Updated Instructions for Completing EPA's Pre-Printed NPDES Discharge Monitoring Report (DMR) Form 3320-1 and is not intended as a direct attachment to this permit. Any modification or revocation to this "Guidance Document" will be transmitted to the permittees as part of the annual DMR instruction package. However, at any time, the permittee may choose to contact EPA-New England directly using the approach outlined in Attachment 1.

9. For each Whole Effluent Toxicity (WET) test the permittee shall report on the appropriate Discharge Monitoring Report (DMR), the concentrations of the Hardness, Total Ammonia Nitrogen as Nitrogen, Alkalinity, pH, Specific Conductance, Total Solids, Total Organic Carbon, Total Residual Chlorine, Dissolved Oxygen, Total Recoverable Aluminum, Cadmium, Chromium, Copper, Lead, Nickel, Zinc, Magnesium, and Calcium found in the 100 percent effluent sample. The permittee should note that all chemical parameter results must still be reported in the appropriate toxicity report.

2. During the period beginning with the effective date and lasting through expiration, the permittee is authorized to discharge treated effluent from **Internal Outfall Serial Number 002**. This discharge consists of boiler blowdown water. Such discharge shall: 1) be limited and monitored by the permittee as specified below; and 2) not cause a violation of the State Surface Water Quality Standards of the receiving water.

EFFLUENT CHARACTERISTIC	MONITORING REQUIREMENTS			
PARAMETER	**AVERAGE MONTHLY**	**MAXIMUM DAILY**	**SAMPLING FREQUENCY**	**SAMPLE TYPE** [1]
Oil & Grease (O&G)	Report	Report	Quarterly[2]	Grab

(Part I.A.2 continued)
Footnotes:

1. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location: after discharge from the boiler and prior to commingling with any other waste stream.

2. Sampling frequency of quarterly is defined as the sampling of one (1) discharge event in each quarter, when discharge occurs. Quarters are defined as the interval of time between the months of: January through March, inclusive; April through June, inclusive; July through September, inclusive; and October through December, inclusive.

Part I.A. (Continued)

3. The discharge shall not cause objectionable discoloration of the receiving waters.

4. The effluent shall contain no visible oil sheen, foam, nor floating solids at any time.

5. Use of chlorine is not permitted.

6. The permittee shall submit the results to EPA of any additional testing done to that required herein, if it is conducted in accordance with EPA approved methods consistent with the provisions of 40 CFR §122.41(l)(4)(ii).

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

8. All existing manufacturing, commercial, mining and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

   a. That any activity has occurred or will occur which would result in the discharge, on a routine basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

      (1) One hundred micrograms per liter (100 µg/l);

      (2) Two hundred micrograms per liter (200 µg/l) for acrolein and acrylonitrite; five hundred micrograms per liter (500 µg/l) for 2,4-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

      (3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R.§122.21(g)(7); or

      (4) Any other notification level established by the Director in accordance with 40 C.F.R.§122.44(f).

   b. That any activity has occurred or will occur which would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

      (1) Five hundred micrograms per liter (500 µg/l);

      (2) One milligram per liter (1 mg/l) for antimony;

(3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 C.F.R.§122.21(g)(7).

(4) Any other notification level established by the Director in accordance with 40 C.F.R.§122.44(f).

c. That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the permit application.

9. 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.

c. EPA or MassDEP may use the results of chemical analyses conducted pursuant to this permit, as well as national water quality criteria developed pursuant to 304(a)(a) 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.

B. STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

1. The permittee shall maintain, update and implement a Storm Water Pollution Prevention Plan (SWPPP) to reduce the discharge of pollutants to the receiving waters identified in this permit. The permittee shall update and amend the SWPPP when necessary to account for any changes effecting the SWPPP including, but limited to whenever the following occur: a change in design, construction, operation, or maintenance, which has a significant effect on the potential for the discharge of pollutants to the waters of the United States; a release of reportable quantities of hazardous substances or oil; or the SWPPP appears to be ineffective in achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity.

2. An updated and amended SWPPP shall be completed and signed by the permittee within 90 days after the effective date of this permit. Each amended SWPPP shall be certified by the permittee. The certification shall be signed in accordance with the requirements identified in 40 CFR §122.22, and a copy of the current certification shall be sent each year to EPA

and MassDEP within thirty (30) days of the annual anniversary of the effective date of the final permit. The certification should document that the previous year's inspections and maintenance activities were conducted, results were recorded, records were maintained, and that the facility is in compliance with the SWPPP. The permittee shall keep a copy of the most recent SWPPP and certification at the facility and shall make it available for inspection by EPA and MassDEP.

3. The permittee shall assure that the SWPPP is consistent with the requirements outlined in Part 4 of EPA's NPDES Storm Water Multi-Sector General Permit for Industrial Activities, issued by EPA on October 30, 2000 (See 65 FR 64812-64815). The SWPPP shall refer to all of the outfalls, the priority pollutants, the conventional pollutants and the monitoring requirements at each outfall. Additionally, the SWPPP shall include the best management practices (BMPs) appropriate for this specific facility to control storm water discharges from activities that could contribute pollutants to waters of the United States through storm water. Specifically the SWPPP shall contain the elements listed below.

    a. Pollution Prevention Team
    b. Site Description
    c. Receiving Waters and Wetlands
    d. Summary of Potential Pollutant Sources
    e. Spills and Leaks
    f. Sampling Data
    g. Storm Water Controls

4. The permittee shall develop and implement a study to identify the source of copper, chromium, and aluminum in the discharge from the facility. Based on this study, the permittee shall develop and implement BMPs, developed pursuant to the SWPPP, in order to reduce the amount of these metals in the discharge from the facility. The study, any sampling results, and the results of implementing BMPs shall be submitted to EPA with the permittee's next NPDES permit application.

C. REOPENER CLAUSES

1. This permit shall be modified, or alternately, revoked and reissued, to comply with any applicable standard or limitation promulgated or approved under sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:

    a. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or

    b. Controls any pollutants not limited in the permit.

D. MONITORING AND REPORTING

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

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

Environmental Protection Agency, Region 1
Water Technical Unit (SEW)
P.O. Box 8127
Boston, Massachusetts 02114

Signed and dated Discharge Monitoring Report Form(s) and all other reports required by this permit shall also be submitted to the State at the following addresses:

Massachusetts Department of Environmental Protection
Northeast Regional Office
Bureau of Waste Prevention
205B Lowell Street
Wilmington, Massachusetts 01887

and

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

E. STATE PERMIT CONDITIONS

1. This discharge permit is issued jointly by the EPA and the MassDEP 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 MassDEP pursuant to M.G.L. Chap. 21, §43.

2. 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 a 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 1

FRESHWATER CHRONIC TOXICITY TEST PROCEDURE AND PROTOCOL

FRESHWATER CHRONIC
TOXICITY TEST PROCEDURE AND PROTOCOL

I. GENERAL REQUIREMENTS

The permittee shall conduct acceptable chronic (and modified acute) toxicity tests on three samples collected during the test period. The following tests shall be performed in accordance with the appropriate test protocols described below:

- **Daphnid (Ceriodaphnia dubia) Survival and Reproduction Test.**
- **Fathead Minnow (Pimephales promelas) Larval Growth and Survival Test.**

Chronic and acute toxicity data shall be reported as outlined in Section VIII. The chronic fathead minnow and daphnid tests can be used to calculate an LC50 at the end of 48 hours of exposure when both an acute (LC50) and a chronic (C-NOEC) test is specified in the permit.

II. METHODS

Methods to follow are those recommended by EPA in:

Lewis, P.A. et al. Short Term Methods For Estimating The Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms, Third Edition. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinnati, OH. July 1994, EPA/600/4-91/002.

Any exceptions are stated herein.

III. SAMPLE COLLECTION

For each sampling event, three discharge samples shall be collected. Fresh samples are necessary for Days 1, 3, and 5 (see Section V. for holding times). The initial sample is used to start the test on Day 1, and for test solution renewal on Day 2. The second sample is collected for use at the start of Day 3, and for renewal on Day 4. The third sample is used for renewal on Days 5, 6, and 7 (or until termination for the Ceriodaphnia dubia test). The initial (Day 1) sample will be analyzed chemically (see Section VI). Day 3 and 5 samples will be held until test

completion. If either the Day 3 or 5 renewal sample is of sufficient potency to cause lethality to 50 percent or more test organisms in any of the dilutions for either species, then a chemical analysis shall be performed on the appropriate sample(s) as well.

Aliquots shall be split from the samples, containerized and preserved (as per 40 CFR Part 136) for chemical and physical analyses. The remaining samples 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 also describes dechlorination of samples (APHA, 1992). Dechlorination can be achieved using a ratio of 6.7 mg/L anhydrous sodium thiosulfate to reduce 1 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

Grab samples of dilution water used for chronic 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 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. See Section 7 of EPA/600/4-89/001 for further information.

V. TEST CONDITIONS AND TEST ACCEPTABILITY CRITERIA

EPA New England requires that fathead minnow tests be performed using four (not three) replicates of each control and effluent concentration because the non-parametric statistical tests cannot be used with data from only three replicates. Also, if a reference toxicant test was being performed concurrently with an effluent or receiving water test and fails, both tests must be repeated.

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

EPA NEW ENGLAND RECOMMENDED EFFLUENT TOXICITY TEST CONDITIONS FOR THE DAPHNID, CERIODAPHNIA DUBIA, SURVIVAL AND REPRODUCTION TEST[1]

1.	Test type:	Static, renewal
2.	Temperature (°C):	25 ± 1°C
3.	Light quality: laboratory illumination	Ambient
4.	Photoperiod:	16 hr. light, 8 hr. dark
5.	Test chamber size:	30 mL
6.	Test solution volume:	15 mL
7.	Renewal of test solutions:	Daily using most recently collected sample
8.	Age of test organisms:	Less than 24 hr.; and all released within an 8 hr. period of each other.

9.	Number of neonates per test chamber:	1
10.	Number of replicate test chambers per treatment:	10
11.	Number of neonates per test concentration:	10
12.	Feeding regime:	Feed 0.1 ml each of YCT and concentrated algal suspension per exposure chamber daily.
13.	Aeration:	None
14.	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 chronic toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
15.	Effluent concentrations:[3]	5 effluent concentrations and a control. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
16.	Dilution factor:	$\geq$ 0.5
17.	Test duration:	Until 60% of control females have three broods (generally 7 days and a maximum of 8 days).

18. End points:	Survival and reproduction
19. Test acceptability:	80% or greater survival and an average of 15 or more young/surviving female in the control solutions. At least 60% of surviving females in controls must produce three broods.
20. Sampling requirements:	For on-site tests, samples are collected daily and used within 24 hr. of the time they are removed from the sampling device. For off-site tests a minimum of three samples are collected (i.e. days 1, 3, 5) and used for renewal (see Sec. III). Off-site tests samples must be first used within 36 hours of collection.
21. Sample volume required:	Minimum 1 liter/day

Footnotes:

1. Adapted from EPA/600/4-91/002.
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.

EPA NEW ENGLAND RECOMMENDED EFFLUENT TEST CONDITIONS FOR THE FATHEAD MINNOW (PIMEPHALES PROMELAS) LARVAL SURVIVAL AND GROWTH TEST[1]

1.	Test type:	Static, renewal
2.	Temperature (°C):	25 ± 1°C
3.	Light quality:	Ambient laboratory illumination
4.	Photoperiod:	16 hr. light, 8 hr. dark
5.	Test chamber size:	500 mL minimum
6.	Test solution volume:	Minimum 250 mL/replicate
7.	Renewal of test concentrations:	Daily using most recently collected sample.
8.	Age of test organisms:	Newly hatched larvae less than 24 hr. old
9.	No. larvae/test chamber and control:	15 (minimum of 10)
10.	No. of replicate chambers/ concentration:	4
11.	No. of larvae/concentration:	60 (minimum of 40)
12.	Feeding regime:	Feed 0.1 g newly hatched, distilled water-rinsed Artemia nauplii at least 3 times daily at 4 hr. intervals or, as a minimum, 0.15 g twice daily, 6 hrs. between feedings (at the beginning of the work day prior to renewal, and at the end of the work day following renewal). Sufficient larvae are added to provide an excess. Larvae fish are not fed during the final 12 hr. of the test.

13. Cleaning:	Siphon daily, immediately before test solution renewal.
14. Aeration:	None, unless dissolved oxygen (D.O.) concentration falls below 4.0 mg/L. Rate should be less than 100 bubbles/min.

15. 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 and reagent grade chemicals according to EPA chronic toxicity test manual) or deionized water combined with mineral water to appropriate hardness.
16. Effluent concentrations:[3]	5 and a control. An additional dilution at the permitted effluent concentration (% effluent) is required if it is not included in the dilution series.
17. Dilution factor:	$\geq$ 0.5
18. Test duration:	7 days
19. End points:	Survival and growth (weight)
20. Test acceptability:	80% or greater survival in controls: average dry weight per control larvae equals or exceeds 0.25 mg.
21. Sampling requirements:	For on-site tests samples are collected and used within 24 hours of the time they are removed from the sampling device. For off-site tests a minimum of three samples are collected (i.e. days 1, 3, 5) and used for renewal (see Sec.IV). Off-site tests samples must be first used within 36 hours of collection.
22. Sample volume required:	Minimum 2.5 liters/day

Footnotes:

1. Adapted from EPA/600/4-91/002.
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 or culture water (0% effluent) is required.

VI. CHEMICAL ANALYSIS

As part of each daily renewal procedure, pH, specific conductance, dissolved oxygen, and temperature must be measured at the beginning and end of each 24-hour period in each dilution and the controls. It is also recommended that total alkalinity and total hardness be measured in the control and highest effluent concentration on the Day 1, 3, and 5 samples. The following chemical analyses shall be performed for each sampling event.

Parameter	Effluent	Diluent	Minimum Quantification Level (mg/l)
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
Total Metals			
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:

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

Total Residual Chlorine

Either of the following methods from 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 (the preferred method);
-Method 4500-CL G DPD Colorimetric Method.
or use USEPA Manual of Methods Analysis of Water and Wastes, Method 330.5.

VII. TOXICITY TEST DATA ANALYSIS

LC50 Median Lethal Concentration (Determined at 48 Hours)
Methods of Estimation:

- Probit Method
- Spearman-Karber
- Trimmed Spearman-Karber
- Graphical

Reference the flow chart on page 84 or page 172 of EPA 600/4-91/002 for the appropriate method to use on a given data set.

Chronic No Observed Effects Concentration (C-NOEC)
Methods of Estimation:

- Dunnett's Procedure
- Bonferroni's T-Test
- Steel's Many-One Rank Test
- Wilcoxin Rank Sum Test

Reference the flow charts on pages 50, 83, 96, 172, and 176 of EPA 600/4-91/002 for the appropriate method to use on a given data set.

In the case of two tested concentrations causing adverse effects but an intermediate concentration not causing a statistically significant effect, report the C-NOEC as the lowest concentration where there is no observable effect. The definition of NOEC in the EPA Technical Support Document only applies to linear dose-response data.

VIII. TOXICITY TEST REPORTING

A report of 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.