

# Fact Sheet: Acute & Chronic Toxicity Assessments of NY Streams & Rivers

## A. Microtox®

- 1) **Bottom Sediments:** This bioassay method uses bioluminescent bacteria to assess the toxicity of aquatic bottom sediments. In a method developed by the NYSDEC’s Toxicity Testing Unit, sediment samples are first centrifuged to remove the porewater, and then extracted with methanol. A reduction in light levels compared to a control sample following a 15-minute exposure is a measure of the acute toxicity of the sample, and expressed as an EC50. Results are categorized according to a four-tiered system (non, slight, moderate or severe) per Tables 1-3 below (note that changes in methanol quality over time have necessitated revisions to the rating system). Specific screening test methods follow NYSDEC Standard Operating Procedure: Microtox® Acute Toxicity Test for Sediments, Porewaters and Effluents (SOP#403-16), which is available for download from the agency.

**Table 1:** Rating system applied to Microtox® analyzed bottom sediments from 2001-12.

15-minute EC50 (%)	Toxicity Category
< 1.00	Severely Toxic
≥ 1.00 to < 20.00	Moderately Toxic
≥ 20.00 to < 40.00	Slightly Toxic
≥ 40.00	Non-Toxic

**Table 2:** Rating system applied to Microtox® analyzed bottom sediments from 2013-14.

15-minute EC50 (%)	Toxicity Category
< 40.00	Severely Toxic
≥ 40.00 to < 60.00	Moderately Toxic
≥ 60.00 to < 80.00	Slightly Toxic
≥ 80.00	Non-Toxic

**Table 3:** Rating system applied to Microtox® analyzed bottom sediments from 2015-present.

15-minute EC50 (%)	Toxicity Category
< 20.00	Severely Toxic
≥ 20.00 to < 40.00	Moderately Toxic
≥ 40.00 to < 60.00	Slightly Toxic
≥ 60.00	Non-Toxic

- 2) **Porewaters:** Microtox® is also used to assess the toxicity of the resulting porewaters. The EC50 results are categorized according to a two-tiered system (non-toxic or toxic) per Table 4 below. Specific screening test methods follow NYSDEC Standard Operating Procedure: Microtox® Acute Toxicity Test for Sediments, Porewaters and Effluents (SOP#403-16), which is available for download from the agency.

**Table 4:** Rating system applied to Microtox® analyzed porewater samples.

15-minute EC50 (%)	Toxicity Category
< 100	Toxic
≥ 100	Non-Toxic

## **B. Water Fleas (*Ceriodaphnia*)**

This bioassay method uses water fleas, a freshwater invertebrate, to assess the toxicity of stream and river samples. Reductions in survival and/or reproductive rate compared to a control sample following a 7-day exposure is a measure of the chronic toxicity of the sample. Results are statistically categorized according to a four-tiered system (non, slight, moderate or severe) per Table 5 below. Specific test methods and conditions follow US EPA’s Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4<sup>th</sup> ed., October 2002 (EPA-821-R-02-013), as well as NYSDEC Standard Operating Procedure: *Ceriodaphnia dubia* (*C. dubia*) 7-day Chronic Screening Test for Toxicity of Ambient Water Samples or Effluents (SOP#402-16), both documents which are available for download from each respective agency.

**Table 5:** Rating system applied to *Ceriodaphnia*.

Toxicity Category	7-day Statistical Test Definition
Severely Toxic	Statistically significant mortality <b>AND</b> reproductive effects
Moderately Toxic	Statistically significant mortality effect
Slightly Toxic	Statistically significant reproductive effect
Non-Toxic	No statistically significant mortality <b>OR</b> reproductive effects

## GLOSSARY

**Acute Toxicity:** A short-term lethal or other toxic effect, such as reduced light output or immobilization.

**Bioassay:** Uses live test organisms to determine the relative strength or toxicity of a sample.

**Bioluminescent Bacteria:** The production and emission of light by single celled microorganisms. The same phenomenon is also observed in fireflies.

***Ceriodaphnia*:** A small invertebrate, about the size of the head of a pin, that inhabits aquatic freshwater habitats. A popular organism for ecotoxicology studies.

**Chronic Toxicity:** A long-term non-lethal toxic effect, such as reduced reproduction or growth.

**EC50:** The effective concentration of a sample that causes an adverse effect to 50% of the test population.

**Invertebrate:** An animal without a backbone.

**Microtox®:** A commercially available bacteria-based toxicity detection system.

**Porewater:** The water located between sediment particles.