

How to Establish a Drinking Water Monitoring Program using the Microtox Test System:

In order to begin using a Microtox Toxicity Test System to test drinking water for toxicity, the answers to a number of questions need to be determined. Answer the questions in Section 1. If the answer to any of the questions is “No” or “Don’t Know,” proceed to Section 2.

Section 1 - Initial Questions:

1. “Is the level of toxicity in the water sample to be tested known?”
2. “What is the normal level of toxicity of the water to be tested?”
3. “How does the level of toxicity vary with the time of day, seasons, etc.? (See “Sources of Variability”).
4. “What level of toxicity would indicate a problem?”

Section 2 – Initial Sample Characterization

If the answer to any of the questions in Section 1 is “No” or “Don’t know”, continue as instructed below. If all of the answers to the questions in Section 1 are known, proceed to Section 3.

1. If you expect that your samples will show a low level of toxicity, test your water sample(s) using the *81.9% Basic Test*. If you have reason to expect that your sample will have a moderate (or higher) level of toxicity, use the *Microtox Basic Test*.
2. In general, most raw water samples exhibit low levels of toxicity and should be initially run using the *81.9% Basic Test*. If it is determined that the light loss is significant (i.e., total light loss in less than 5 minutes), the sample has a moderate to high level of toxicity and the sample should be re-analyzed using the *Basic Test*.
3. Samples should be taken from all of the sample points – from the water source through the treatment process to the treated water in the distribution system - that you wish to test. Samples should be collected in a manner that as many potential sources of variability in toxicity levels are accounted for. Each sample should be tested separately using the *81.9% Basic Test* or *Basic Test*, as appropriate.
4. Confirm questionable or ambiguous sample results using the *Comparison Test*. This test allows to user to run multiple controls and samples, thus isolating and eliminating various sources of error (i.e. reagent problems, user error, etc.) in the results.



5. Once the level of toxicity at each of your sample points is known, you can now establish criteria for determining a toxic event by generating a baseline toxicity level for each point. This baseline process is imperative for successful site management.
6. A baseline can be established manually by plotting your toxicity data as a graph or by using the MicrotoxOmni software that can be set up to automatically calculate a baseline. It is generally recommended that at least 20 data points be used to calculate a baseline average, which can be a fixed average or a moving average depending upon your particular needs. Maximum and minimum limits can be set in the software (at 1, 2, or 3 standard deviations).

Section 3 – Routine Analysis

If the answers to all of the questions in Section 1 are “Yes,” or if you have completed all of the steps in Section 2, continue as follows:

1. Establish a baseline level of toxicity by analyzing a statistically significant number of samples using the *81.9% Basic Test*. This testing should be conducted in such a way as to allow the user to quantify normal variations (See Table Below) related to toxicity of sample, method, and user. Generally, normal method variability is approximately 15-25%.
2. Once a baseline level of toxicity is established for a testing point (along with maximum and minimum control limits), use the *81.9% Basic Screening Test* to run normal screening. Baseline data can be stored and compared using the *Trend Monitoring* function in the MicrotoxOmni software. The *Trend Monitoring* function can be set up to automatically import and display the results of your current test as compared to the established baseline.
3. Questionable or ambiguous results should be confirmed using the *Comparison Test*.
4. Samples that are outside the established baseline control limits for a testing point are an indication that one or more compounds that exhibit a level of toxicity (as detected by the bacterial biosensor) are present in the water. Additional analytical testing should be conducted to determine the compound(s) causing the toxicity.

NOTE: Samples that are chlorinated, colored, turbid or are not pH neutral (pH 6.5 – 7.5) will have to undergo sample preparation steps prior to testing. See the Microtox User’s Manual for set-by-step instructions.



Sources of Variability

Sources of variability of toxicity levels in natural waters would include (but are not limited to):

time of day, month, or year
temperature
weather
surrounding soil conditions
historical uses
recreational activities

water velocity
freshwater vs. saltwater
industrial activities
salinity, pH, color
flora and fauna
highway runoff

sampling methods / storage
industrial discharge
river vs. lake
stormwater runoff

