

US EPA ARCHIVE DOCUMENT

THE ENVIRONMENTAL TECHNOLOGY VERIFICATION  
PROGRAM



## ETV Joint Verification Statement

**TECHNOLOGY TYPE:** Atrazine Test Kit

**APPLICATION:** ANALYSIS OF ATRAZINE IN WATER

**TECHNOLOGY NAME:** Watersafe<sup>®</sup> Pesticide Test

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The U.S. Environmental Protection Agency (EPA) has created the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high-quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies. Information and ETV documents are available at [www.epa.gov/etv](http://www.epa.gov/etv).

ETV works in partnership with recognized standards and testing organizations; with stakeholder groups that consist of buyers, vendor organizations, and permittees; and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

The Advanced Monitoring Systems (AMS) Center, one of seven technology areas under ETV, is operated by Battelle in cooperation with EPA's National Exposure Research Laboratory. The AMS Center has recently evaluated the performance of test kits for the analysis of atrazine in water. This verification statement provides a summary of the test results for the Silver Lake Research Corporation Watersafe<sup>®</sup> Pesticide Test for detecting atrazine in water.

## VERIFICATION TEST DESCRIPTION

The Watersafe<sup>®</sup> Pesticide Test was verified in terms of its performance on the following parameters: accuracy, precision, cross-reactivity of hydroxylatrazine and desethyl atrazine, matrix interference effects, and rate of false positives/false negatives. Qualitative factors including ease of use, reliability, and sample throughput were also evaluated. Method detection limit and linearity were not evaluated because the technology provides qualitative results only.

All analyses were performed according to the vendor's recommended procedures. The verification test involved challenging the Watersafe<sup>®</sup> Pesticide Test with seven performance test (PT) samples and four types of environmental samples. The PT samples consisted of ASTM Type I water samples fortified with atrazine or an atrazine degradation product. Five of the PT samples contained atrazine at concentrations ranging from 0.1 to 5 parts per billion (ppb), and two of the samples contained 3 ppb of a cross-reactive compound, but no atrazine. Four types of environmental samples also were analyzed: fresh pond water, brackish pond water, groundwater, and chlorinated drinking water. Environmental samples were filtered prior to test kit analysis. The background atrazine concentration in each environmental sample was less than 0.062 ppb. Each environmental sample was fortified in the laboratory at concentrations of 1 ppb and 3 ppb atrazine. All laboratory-fortified samples were prepared using certified, commercially available standards. All samples were analyzed by the Watersafe<sup>®</sup> Pesticide Test and by gas chromatography/mass spectrometry (GC/MS) according to modified EPA Method 525.2. Each sample was analyzed in triplicate using the test kit. Samples were given to the analyst blind and in random order.

The verification test was conducted in September 2003 at the Battelle laboratory in Duxbury, Massachusetts. Environmental samples were provided by the National Oceanic and Atmospheric Administration, National Ocean Service's Center for Coastal Environmental Health and Biomolecular Research Center at Charleston, and the University of Missouri - Rolla. Reference laboratory analyses were provided by the EPA's Office of Pesticide Programs, Environmental Chemistry Branch at the John C. Stennis Space Center. Test kit analyses were conducted by the Texas Commission on Environmental Quality.

The Watersafe<sup>®</sup> Pesticide Test and reference method results were used to assess accuracy. Replicate sample results were used to assess precision. Cross-reactivity of hydroxyatrazine and desethyl atrazine were assessed by evaluating the Watersafe<sup>®</sup> Pesticide Test results for samples that contain only one of the degradation compounds, but not atrazine. Potential matrix effects were assessed by comparing accuracy and precision results for environmental samples (i.e., chlorinated drinking water, fresh surface water, brackish surface water, and groundwater) to those for ASTM Type I water samples. Performance parameters, such as ease of use and reliability, were based on documented observations of the analyst. Sample throughput was estimated based on the time required to analyze a sample set.

QA oversight of verification testing was provided by Battelle and EPA. Battelle QA staff conducted a data quality audit of 10% of the test data, a performance evaluation audit, and a technical systems audit of the procedures used in this verification. This verification statement, the full report on which it is based, and the test/QA plan for this verification are all available at [www.epa.gov/etv/centers/center1.html](http://www.epa.gov/etv/centers/center1.html).

## TECHNOLOGY DESCRIPTION

The following description of the Watersafe<sup>®</sup> Pesticide Test is based on information provided by the vendor. This information was not verified in this test. The Watersafe<sup>®</sup> Pesticide Test (Model WS-289) is a one-step qualitative immunoassay for detecting the presence of unsafe levels of atrazine or simazine in water samples. The test cannot differentiate between atrazine and simazine. The qualitative test procedure takes about 10 minutes and informs the user whether the levels of these common indicator pesticides exceed EPA maximum contaminant levels (MCLs) of 3 parts per billion (ppb) for atrazine and 4 ppb for simazine. The Watersafe<sup>®</sup> Pesticide Test can be used on samples of surface water, groundwater, and treated or untreated drinking water. The test is designed for field use, requiring no instrumentation or other equipment, no power sources, and no refrigerated storage.

The Watersafe<sup>®</sup> Pesticide Test contains a test vial and a pipette for easy sample collection and handling. Exposing the test strip to a small sample of water triggers the binding of antibodies to atrazine or simazine molecules, resulting in a change in color intensity in the result window of the test strip. If the bottom line on the test strip is darker than the top line, then the sample result is negative. If the top line is darker than the bottom line, or the lines are equally dark, then the test result is positive. The test reaction is completely contained within the test strip. The Watersafe<sup>®</sup> Pesticide Test comes in 1.5-inch x 2.9-inch x 8-inch packets. Each test packet costs \$5.99, and a case of ten packets costs \$59.99.

## VERIFICATION OF PERFORMANCE

Performance results for all parameters except ease of use, reliability, and sample throughput are summarized in the following table:

Parameter	Performance Results	Comments
Accuracy (number of accurate results out of total number of tests) PT samples, 0.1 – 5 ppb atrazine and cross-reactivity samples  Environmental samples: Fresh pond water Brackish pond water Groundwater Chlorinated drinking water	18 out of 21  9 out of 9 7 out of 9 8 out of 9 7 out of 9	Samples with inaccurate results contained ~1 ppb atrazine.  Samples with inaccurate results contained ~1 ppb atrazine.
Precision (number of consistent sets of replicate sample results out of total number of sets) PT samples, 0.1 – 5 ppb atrazine and cross-reactivity samples Environmental samples: Fresh pond water Brackish pond water Groundwater Chlorinated drinking water	7 out of 7  3 out of 3 2 out of 3 2 out of 3 2 out of 3	Samples with inconsistent replicate results contained ~1 ppb atrazine.
Cross-reactivity 3 ppb hydroxyatrazine 3 ppb desethyl atrazine	Negative Negative	Cross-reactivity samples did not contain atrazine.
Matrix interference effects	No apparent matrix effects	
False positive results	8 false positive results out of 56 tests	Evaluated relative to 3 ppb test threshold level. False positive results were for samples with ~1 ppb atrazine.
False negative results	None	Evaluated relative to 3 ppb test threshold level.

During the test, the analyst recorded observations regarding ease of use, reliability, and sample throughput. The Watersafe<sup>®</sup> Pesticide Test was easy to use, with simple instructions. All materials were provided in the small test packets. In some cases, the intensity and color of the lines on the test strips were difficult to discern and interpret. These difficulties were minimized by ensuring adequate lighting and placing the test strips on a light-colored background. The Watersafe<sup>®</sup> Pesticide Test operated without failure throughout the test.

