



# Water Pollution and Water Supply Study Performance Data

## Summary

*Performance data from Water Pollution (WP) and Water Supply (WS) studies conducted by EPA from 1993 to 1999 are now available on the EPA Office of Science and Technology web page. EPA started the WP and WS studies in the late 1970s to support laboratory accreditation programs. EPA maintained WP and WS study data in a database and have used these data to evaluate performance of chemical methods used in compliance monitoring programs. To develop method performance data, EPA developed regression equations that characterize the interlaboratory precision and accuracy of hundreds of chemical methods over a range of concentrations.*

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## Background

EPA initiated WP and WS studies in the late 1970's. EPA sponsored the studies through 1999, and now supports private sector operation of this program. We undertook the WP and WS studies mainly to support state and other laboratory accreditation programs. Thanks to the participation of more than 4,900 laboratories, the WP and WS studies produced a large database of information that demonstrates the performance of chemical methods used in compliance monitoring programs perform across the analytical community. The performance data posted today comes from WP Series WP031 to WP040, and WS Series WS032 to WS041.

## How the Studies Worked : 1993-1999

Twice a year, we sent participant laboratories "performance evaluation" (PE) samples. PE samples were concentrates containing high purity chemical compounds (analytes) of interest. The PE samples were provided as "single blind" samples. In other words, laboratories knew that the samples were PE samples, but did not know the concentrations of the analytes in the samples. Upon receiving a PE sample, the laboratory selected an appropriate method, diluted the PE sample per EPA specifications, analyzed the sample, and reported the measured concentration to EPA.

EPA scientists compared the reported values to the true concentrations of analytes in the PE samples to determine how closely the

laboratory was in determining the correct concentration. The accuracy of analyte recovery was used in accreditation programs to determine whether the laboratory performed at an acceptable level.

## Method Performance and Regression Equations

The values reported from WP and WS studies provided an enormous database of interlaboratory data for hundreds of chemical methods. EPA used these data to develop interlaboratory precision and accuracy statements that indicate how methods perform across the analytical community.

EPA chose to use data collected between 1993 and 1999 because these data were the best available. EPA screened for "outliers" to remove data that were biased due to analyst error or other factors unrelated to the method. This screening step ensured that the remaining data represented the actual interlaboratory performance of the method.

Using available data, EPA was able to determine how the precision and accuracy of the methods varied as a factor of concentration. We used regression equations to summarize this variability. You can use these equations to predict recovery and precision in reagent water based on concentration, provided that the concentration falls within the data used to generate the equation.

### **Analytes and Methods**

WP and WS data exist for many analytes including:

1. Trace metals
2. Nutrients
3. Insecticides/pesticides/herbicides
4. Carbamates
5. Polychlorinated biphenyls (PCBs)
6. Polyaromatic hydrocarbons (PAH's)
7. Volatile organic compounds (VOCs)
8. Disinfection by-products
9. Minerals
10. Nutrients

The technologies used include:

11. Graphite Furnace Atomic Absorption Spectroscopy (GFAAS)
12. Inductively Coupled Plasma - Mass Spectrometry (ICP-MS)
13. Gas Chromatography (GC)
14. Ion Chromatography
15. Spectrophotometry

Methods sources include:

16. EPA
17. ASTM
18. Hach Company
19. Standard Methods
20. U.S. Geological Survey

### **What is Happening Now**

Since October 24, 1999, all WP and WS studies except for whole effluent toxicity testing have performed by private companies. The National Institute of Standards and Technology (NIST) certifies non-EPA proficiency testing providers to prepare PE samples and evaluate laboratory performance. EPA continues to issue standard operating procedures used in the WS and WP program.

### **Additional Information and Copies**

Method performance data from the 1993-1999 WP and WS studies are available through the Internet at <http://www.epa.gov/ost/methods>.

For further information concerning WS and WP studies, please contact the Analytical Methods Staff in EPA's Office of Water. They can be reached by telephone at 202-260-7120 or at the following mailing address:

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A complete explanation of the data in the WS and WP performance evaluation tables and the statistical procedures used to develop the related regressions will be available in the following articles:

Britton, P.W., "Method-Specific Precision and Bias Relationships Developed from Data Submitted During USEPA Wastewater Laboratory Performance Studies". Journal of Testing and Evaluation, JTEVA, Volume 28, Number 6, November 2000, pp. 526-245.

and

Britton, P.W., "Method-Specific Precision and Bias Relationships Developed from Data Submitted During USEPA Drinking Water Laboratory Performance Studies," Journal of Testing and Evaluation, JTEVA, Volume 29, Number 1, January 2001, pp.79-112.