Analytical Measurement Estimation for Environmental Sampling and Testing Data

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Biographical Sketch of Author

William Ingersoll is a chemist with Department of Navy, Navy Sea Systems Command (NAVSEA), Laboratory Programs Office located in Goose Creek, South Carolina. He has over 20 years experience in research, quality assurance, and federal government laboratories. For the past 15 year, Mr. Ingersoll has worked in environmental laboratory analysis and field sampling programs with Departments of Navy, Clemson Research Center, and Department of Air Force. He began working for NAVSEA in 1998 to support Navy Installation Restoration Program. He is an environmental laboratory assessor for Navy laboratory quality and accreditation programs.

Abstract

To make the right environmental decisions requires understanding the quality of the data. Data comparability is an important component in data quality and ensuring data comparability requires estimating analytical measurement uncertainty. Strategies for estimating and minimizing data uncertainty are explored in this presentation. The concept of analytical measurement uncertainty is widely recognized among analytical chemists. Replicate preparation and testing of an environmental sample will generate a range of results. This variability of results represents the analytical measurement uncertainty. The strategy that will be presented uses existing data routinely generated by a laboratory to estimate analytical measurement uncertainty.

Environmental data may be censored, qualified, or quantified. Managing the uncertainty associated with each of these data categories requires estimating the analytical measurement uncertainty and modeling the sample data to represent the population parameter. The uncertainty of quantified data can be estimated by replicate sampling strategies. However, because nonquantified data (including nondetects and detects) are swamped by background fluctuation interferences, these data must be managed using a different model, such as a maximum uncertainty model, to represent the underlying population distribution.