



United States Department of the Interior

U. S. GEOLOGICAL SURVEY
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Office of Water Quality Technical Memorandum 2016.06

Subject: Required participation in the Branch of Quality Systems Standard Reference Sample Semi-Annual Proficiency Testing Project

PURPOSE

The purpose of this memorandum is to update the Office of Water Quality (OWQ) policy for laboratory participation in the Branch of Quality Systems (BQS) Standard Reference Sample (SRS) semi-annual proficiency testing project.

The term “proficiency testing” is defined as a means of evaluating laboratory performance relative to a given set of criteria through analysis of unknown samples provided by an independent external source (The NELAC Institute, 2003). The SRS semi-annual proficiency testing project qualifies as a proficiency testing program because it provides unknown samples for proficiency testing and is independent of the laboratories enrolled in the SRS project.

The OWQ has issued several policies over time related to laboratory participation in the SRS project. Participation in the SRS project is a critical element in evaluating laboratory performance to determine the quality of analytical data from laboratories for Water Mission Area (WMA) funded projects and programs.

POLICY

This policy continues the USGS organizational commitment to laboratory evaluation and data documentation that was developed and strengthened over the last two decades. This policy augments the laboratory-evaluation policy (LEP) detailed in [OWQ 2014.01](#) by furthering the ability of the WMA to collectively document the performance of laboratories over time.

As part of a comprehensive quality-assurance evaluation, laboratories that provide sample analysis and results to WMA-funded projects or programs must participate in the BQS semi-annual SRS proficiency testing project throughout the sample collection and analysis phase of data collection. This requirement applies to WMA laboratories, other USGS laboratories, contract laboratories and their subcontractors, cooperator, academic, and commercial laboratories that provide water-quality data to the WMA. The requirement is limited to those analytes that are available for testing in SRS samples when the concentration range and sample matrix are similar to project samples.

All organizations that provide furnished water-quality sample records to the USGS National Water Information System (NWIS) must participate in the semi-annual SRS project if relevant analytes are included in the furnished records in order to meet [WMA 2008.01](#). WMA offices that upload furnished water-quality records to NWIS are required to verify active participation in the SRS project for any applicable analytes prior to uploading the furnished records to NWIS.

Laboratories accredited by the National Environmental Laboratory Accreditation Program (NELAP) that provide sample results to WMA-funded projects and programs are required to participate in the SRS when the analytes, concentration range, and sample matrix are applicable to their project. NELAP proficiency testing samples are prepared in an artificial matrix of deionized water and are different than most SRS samples which are prepared in a natural-water matrix. As such, SRS samples are more like an environmental sample than proficiency samples prepared in an artificial matrix. Successful performance in the SRS indicates that the laboratory may be successful in analysis of a natural water sample. The complex matrix of a SRS sample can highlight analytical issues that could affect environmental sample analysis.

OWQ [Technical Memorandum 2014.01](#) (OWQ 2014.01) addresses laboratory evaluation and requires the use of project- or program-relevant performance data to document the quality of laboratory results. Project- or program-relevant results from the SRS semi-annual proficiency testing project can be used to meet this performance-data requirement. OWQ 2014.01 also states the need to review performance data over the life of a project during the period of active data collection and laboratory analysis.

Laboratories should contact the [BQS SRS project](#) to enroll in the SRS round robins. The BQS SRS project may be contacted to verify participation status.

EXEMPTIONS

Several exemptions to SRS participation have been identified. Laboratories for which the SRS samples are not relevant by analyte, concentration range, or sample matrix are not required to participate in the SRS semi-annual proficiency testing project. In such cases, relevant performance data from analysis of reference standards from the commercial and other sources listed on the BQS [Laboratory Evaluation Project website](#) should be substituted and specifically documented project or program LEP package.

Analytical methods in development that are not stable in performance and not yet published are exempt from required participation in the SRS semi-annual proficiency testing project. Laboratories that are developing analytical methods are encouraged but not required to participate in the SRS to document new-method performance. Laboratories are not required but are welcome to continue participating in the SRS project even if they are no longer providing results to the WMA projects or programs. The BQS [Laboratory Evaluation Project](#) can assist laboratories and laboratory users with these decisions.

Donna N. Myers
Chief, Office of Water Quality

This memorandum supersedes the following OWQ Technical Memoranda: 98.03, 2002.05, and 2007.01.

Distribution: All WMA Employees

REFERENCES

Office of Water Quality Technical Memorandum, 2014.01, Updated Policy for the Evaluation and Approval of Analytical Laboratory Performance for Water Mission Area Projects and Programs, June 25, 2014.

Water Resources Discipline Policy Memorandum, 2008.01, Water Resources Discipline Policy on Accepting Furnished Records, July 1, 2008.

Attachment

GUIDANCE FOR INTERPRETATION OF SRS RESULTS

The Branch of Quality Systems (BQS) Standard Reference Sample (SRS) project evaluates the performance of each participating laboratory on an analyte by analyte basis. Statistical data for each reported analyte, for each laboratory, and for each SRS semi-annual proficiency test are available in tabular and graphical forms from the [SRS website](#). Tabulated data for each semi-annual proficiency test include the laboratory-reported value, most probable value (MPV), number of reported analyses excluding censored values (n), F-pseudosigma, percent difference, and Z-value.

The F-pseudosigma is a nonparametric statistic that approximates the standard deviation of traditional statistics when the data have a Gaussian distribution (Hoaglin and others, 1983). The percent difference is a comparison between the laboratory-reported value and the MPV (median). The Z-value is the number of F-pseudosigas that the result deviates from the MPV. The Z-value is dimensionless and enables easy comparison of laboratory performance across different analytes. Ideally, the absolute value of the Z-value should fall between 0 and 1.00. The smaller the absolute Z-value, the closer the laboratory's result is to that achieved by most of the laboratories participating in the SRS round. Any absolute Z-value greater than 1.5 warrants some explanation as to why the result is so different from the MPV. Laboratory users should use this information to guide laboratory selection and strive to avoid using laboratories whose performance falls far outside the typical performance that is, results with an absolute Z-value that is greater than 2.0. However, if an absolute Z-value of 2.0 or greater is less than +/-10% of the MPV, the laboratory result may still be acceptable depending on data-quality objectives.

Woodworth and Connor (2003) and the SRS website have more information about how these measures are determined. On the SRS website, see "Explanation of Statistics" once a specific SRS round is selected.

The BQS does not rate the overall performance of participating laboratories or approve laboratories for the Water Mission Area (WMA) project or program use. Laboratory users are responsible for determining if the performance data and other quality information meet project or program data-quality objectives with respect to specific laboratory analytical-performance (see [OWQ 2014.01](#) for more information). The [SRS project chief](#) is available to assist laboratories, lab users, and data users in use and interpretation of the [SRS round-robin results](#).

BACKGROUND AND HISTORY

The OWQ has a long history of policies regarding laboratory participation in the SRS project. The SRS project is a critical element in evaluating laboratory performance to determine the quality of analytical data from laboratories providing sample analysis results for WMA-funded projects and programs.

[Office of Water Quality Technical Memorandum 1998.03](#) (Revised) required analytical laboratory participation in the SRS round robins. Each production laboratory used by the then USGS Water Resources Division had to analyze, at a minimum, the appropriate SRS sample to cover the constituents requested by the USGS office. This required performance component was part of the overall [policy](#) that any production laboratory that provided chemical, radiochemical, or biological analyses to the then USGS Water Resources Division would be regularly reviewed, evaluated, and approved.

[Office of Water Quality Technical Memorandum 2002.05](#) continued to require SRS participation by laboratories. NELAC PT-sample results could be used to supplement USGS performance data. However, analysis of SRS samples remained a necessary component of USGS laboratory evaluation and approval.

[Office of Water Quality Technical Memorandum 2007.01](#) introduced a new approach for the evaluation and approval of analytical laboratories. This policy assigned the responsibility of evaluating laboratory performance directly to USGS District (now Water Science Center) projects and national programs. This policy also affirmed the need for project-relevant external performance data to evaluate the quality of analytical results for all analytical laboratories. This policy required evaluation of analytical laboratory performance at project or program start and throughout the duration of each project or program's sampling and analytical phase but did not explicitly require participation in the SRS round robins.

[Water Resources Discipline Policy Memorandum 2008.01](#) addressed the acceptance of furnished records (hydrologic data collected by other agencies) into NWIS. It is a long-standing policy and practice that the USGS will accept data into NWIS that are collected in all or in part by other agencies, provided that the USGS quality assures the data; can attest that the data are collected using methods that result in data that have an accuracy comparable to the data collected by the USGS; and the data contribute useful information about the water resources of the Nation.

The current [Office of Water Quality Technical Memorandum 2014.01 \(OWQ 2014.01\)](#) requires WMA projects and programs to document quality of laboratory results by obtaining relevant external performance data for the expected environmental-result range (or type) and in the corresponding sample matrix throughout the project or program for all laboratories used by the WMA.

The [BQS SRS project](#) currently conducts semi-annual single-blind inter-laboratory comparisons (round robins) to evaluate and document the analytical performance of laboratories used by the WMA and other non-USGS participating laboratories for selected inorganic analytes. Six SRS types currently are available (Major Ions, Precipitation [select inorganics in low ionic strength precipitation], Mercury, Low-level Nutrients, Standard-level Nutrients, and Trace Elements [including Rare Earths]). All but the low-level nutrient SRSs have a natural-water matrix; the low-level nutrient SRSs have a spiked deionized-water matrix. The SRS round robins currently provide adequate performance-assessment information for most analyses of inorganic constituents. Other benefits of laboratory participation in the BQS SRS round robins to WMA projects and programs include:

- Inexpensive biannual laboratory-performance testing for natural-water-matrix samples.
- Meets the past and current requirements for external performance testing of laboratories if the SRS analytes, concentration ranges, and matrix are relevant to project or program samples.
- Attainment of USGS documentation requirements for data quality as set forth in the Survey Manual ([SM502.2](#)) and archival of laboratory-performance data in accordance with the Survey Manual ([SM431.1](#)).
- Accessible data for current and historic laboratory performance.
- Availability of performance-comparison information for different laboratories for the same analytes to facilitate evaluation and selection of laboratories for project/program use.
- Availability of post-round-robin samples for submittal as blind or double-blind samples from a project directly to an analytical laboratory (analyte-specific MPV concentrations and statistical variability are determined from the round-robin data).
- Generation of a national, USGS-curated, long-term, continuous quality-assurance (QA) data set to supplement water-quality data in NWIS.
- Generation of a national QA data set that can be used to evaluate changes in laboratory use, method use, and laboratory performance, as well as to help screen data for inclusion in networks.

The SRS project maintains a stock of historical round-robin reference samples that are available for use by projects as double-blind QA samples or by laboratories as internal check samples. A list of currently available SRSs may be accessed from the SRS website (see “SRS samples available for purchase”).

Results from the SRS round robins for each laboratory are available on the external (publicly available) SRS project website (<https://bqs.usgs.gov/srs>). On this website, laboratories are, and will continue to be, identified by a BQS-assigned number rather than the actual laboratory name. To facilitate laboratory-performance evaluation and laboratory selection, the laboratory names that match the SRS round-robin laboratory numbers will be available by contacting the SRS Project Chief within the BQS.

REFERENCES

[Fundamental Science Practices 502.2: Planning and Conducting Data Collection and Research](#), last updated December 16, 2011.

Hoaglin, D.C., Mosteller, F., and Tukey, J.W., eds., 1983, Understanding robust and exploratory data analysis: New York, John Wiley, Inc., p. 38–41.

National Environmental Laboratory Accreditation Conference (NELAC), June 5, 2003, 2003 NELAC Standard; Report EPA/600/R-04/003, p. 61 of 324.

[Office of Water Quality Technical Memorandum, 98.03R](#), Policy for the Evaluation and Approval of Production Analytical Laboratories, April 16, 1998.

[Office of Water Quality Technical Memorandum, 2002.05](#), Approval of Laboratories with existing National Environmental Laboratory Accreditation Conference (NELAC) accreditation, January 9, 2002.

[Office of Water Quality Technical Memorandum, 2007.01](#), Policy for the Evaluation and Approval of Analytical Laboratories, November 14, 2006.

[Office of Water Quality Technical Memorandum, 2014.01](#), Updated Policy for the Evaluation and Approval of Analytical Laboratory Performance for Water Mission Area Projects and Programs, June 25, 2014.

[Water Resources Discipline Policy Memorandum, 2008.01](#), Water Resources Discipline Policy on Accepting Furnished Records, July 1, 2008.

Woodworth, M.T., and Connor, B.F., 2003, Results of the U.S. Geological Survey’s Analytical Evaluation Program for Standard Reference Samples Distributed in March 2003; U.S. Geological Survey Open-File Report 03-261, p. 10.