United States Department of the Interior

U.S. GEOLOGICAL SURVEY
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IN REPLY REFER TO:

NATIONAL WATER QUALITY LABORATORY TECHNICAL MEMORANDUM 1995.10

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To: Assistant Chief Hydrologist for Technical Support
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Assistant Chief, Office of Water Quality
Acting Chief, NAWQA
Area Hydrologists
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Chief, Yucca Mountain Project Office
QA Manager, Yucca Mountain Project
Chief, Branch of Technical Development & Quality Systems
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From: Peter F. Rogerson, Chief
National Water Quality Laboratory
Branch of Analytical Services

Subject: Overview of the QA/QC plan for the Radchem/Stable Isotope contracts at the NWQL

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Revision: None

SCOPE

The Districts are frequently asked by cooperators to submit a quality assurance/quality control (QA/QC) plan for the analytical work listed in the proposals. The purpose of this memo is to describe QA procedures and standards in place at the National Water Quality Laboratory (NWQL) to monitor the performance of the contract laboratories. This information may be useful to the Districts in preparation of their QA/QC plans.

The NWQL has agreements with the Reston Stable Isotope Laboratory (RSIL) for determining D/H, O-18/O-16, and S-34/S-32 and with the Menlo Park Isotope Laboratory (MPIL) for determining tritium. The Reston lab also analyzes O-18/O-16 and C-13/C-12 in samples of calcite and CO. The NWQL has commercial contracts for determination of N-15/N-14 with Global Geochemistry in California; C-14 and C-13/C-12 with the University of Waterloo in Ontario, Canada; low-level tritium with the University of Miami in Florida; and radiochemical constituents excluding C-14 and H-3 which are covered in other contracts and excluding the in-house work gross alpha, gross beta, radon, and laser uranium--with Quanterra-Richland in Washington.

A comprehensive QA/QC program is maintained by the NWQL for samples submitted to the laboratories listed above. Blind QC samples are included in each batch of samples analyzed by the RSIL--a minimum of 2 percent for 0-18/0-16 and D/H and a minimum of 5 percent for S-34/S-32. In addition, all of the oxygen and deuterium samples are analyzed in duplicate on different days.

Double-blind QC samples are submitted with each batch sent to MPIL and the commercial laboratories. Duplicate samples for radiochemical analyses (which includes tritium) must be within 2 sigma of one another. Spiked samples for radiochemical analyses (which includes tritium) must be within 2 sigma of the known value. For stable isotopes, the precision requirements are 1 sigma, as follows:

0-18/0-16	within 0.15 permil*
Deuterium	within 1.5 permil
C-13/C-12	within 0.15 permil
S-34/S-32	within 0.2 permil
N-15/N-14	within 0.2 permil

*Permil is parts per thousand

The contract labs run internal standards, duplicates, and blinds with each batch of USGS samples. If these internal QC samples indicate a bias or problem, corrective action is taken by the lab before data are reported. If there is sufficient sample, the samples are re-run. If not, the samples are reported "ruined during analysis."

If a District requests a rerun and the second value is not within 2 sigma of the original value, a third run would be requested, providing that there is sufficient sample. If there is not sufficient sample, the District will be notified.

For radiochemical analyses at the contract lab, in addition to assessing the data from the blind samples, the Radchem Unit at the NWQL also reviews (1) the quarterly report from Quanterra listing data for all duplicate, blank, and spiked samples that are analyzed with USGS samples; (2) Quanterra's results for the U.S. Department of Energy Quality Assurance Program; and (3) Quanterra's results for the U.S. Environmental Protection Agency Performance Evaluation Study (EPA) to ensure that Quanterra is within acceptable limits and is maintaining EPA certification.

The NWQL does not have standards for solid samples for radiochemical or stable isotope analysis. Also, no method is available for accurately spiking a suspended sample. For these types of samples, the NWQL relies on duplicates submitted by the Districts. These duplicates check the precision of the methods.

On occasion, District personnel will contact the NWQL with concerns about possible interferences with samples for specific radiochemical analyses. In these cases, the NWQL will submit duplicate samples to check the precision and will spike some of the duplicates to check recoveries and the method accuracy. The duplicates and spiked samples are considered part of the NWQL QC plan and costs are built into the District charges for the analytical work.

Districts with large radiochemical or stable isotope projects sometimes contact the Radchem Unit requesting permission to submit some of their samples in duplicate to be used as part of the NWQL QC plan. Such requests are accommodated on a limited basis at no charge to the Districts. Because the samples are analyzed in outside labs, the integrity of the results to be used as part of the Districts' QC plans is not compromised.

There are advantages when the Districts to submit their radiochemical and stable isotope samples through the NWQL. National programs such as National Water Quality Assessment require use of the NWQL to ensure consistency. Other WRD programs, such as Yucca Mountain, are required to use laboratories that are on the USGS Branch of Technical Development & Quality Systems approved list. The NWQL in-house and contract operations are on this approved list. However, on the basis of QA/QC, there are two main advantages. First, QC samples with known values are not always readily available to the Districts. Radiochemical standards, when available, usually require a nuclear license with the NRC. Thus the Districts typically have to rely on blanks and duplicate samples that check only the precision, not the accuracy, of the method. As previously noted, the NWQL adds blind QC samples to shipments, thereby enabling Districts to also evaluate method accuracy. Second, costs for QC sample analysis and interpretation are covered by the Radchem Unit. The costs for these QC activities would have to be covered by the District projects if they were to submit samples directly.

All QA/QC data produced by contract labs (both commercial and USGS) are validated by the NWQL and are available to the Districts on request.

References: Prescribed Procedures for Measurement of Radioactivity in Drinking Water EPA-600/4-80-032, August 1980

Impact on Database: None

Supersedes: None

Key Words: isotope, blind samples, radiochemical, permil, QA/QC

Distribution: See above plus the continua USGS.labnews, .waterquality & .radchem; WRD Secretaries; Field and Project Offices