8 QUALITY ASSURANCE

The Savannah River Site (SRS) Quality Assurance (QA)/Quality Control (QC) program objectives are to ensure that SRS products and services meet or exceed customers' requirements and expectations. The SRS QA/QC objectives associated with the Environmental Monitoring program are to ensure the environmental data collected through the program accurately represent SRS discharges and the surrounding environment. The SRS QA program is implemented and is conducted to comply with DOE Order 414.1D, "Quality Assurance", ASME NQA-1-2008 with the NQA-1a-2009 Addenda, "QA Requirements for Nuclear Facility Applications, and with 10CFR830 Nuclear Safety Management. In addition, specific programs may have additional QA requirements from outside organizations. For example, under the tank closure program and area closure projects, EPA and the State of South Carolina require DOE to develop and follow a project specific sampling and analysis plan and quality assurance program plan. The Environmental Monitoring program has multiple QA requirements representing sample collection, analyses and reporting, and data management. DOE has other QA programs in place to verify the integrity of analyses determined by onsite and subcontracted offsite environmental laboratories, and to ensure compliance with the quality control program requirements. It is important to ensure that sample results are accurate so that SRS can assess with confidence the impacts SRS activities may have on human health and the environment.

2015 Highlights

Analytical Laboratory Quality Assurance

SRS uses laboratories certified by the South Carolina Department of Health and Environmental Control (SCDHEC) Office of Environmental Laboratory Certification for those environmental monitoring program parameters that are reportable to SCDHEC.

In 2015, the U.S. Department of Energy Consolidated Audit Program (DOECAP) conducted audits at three SRS subcontract laboratories, resulting in no findings of sufficient magnitude to render the audited facility unacceptable to provide service to the DOE.

Quality Control Activities

The results of the 2015 quality control samples identified no defects affecting the analytical results of the surveillance and monitoring programs. Onsite and subcontract laboratories reported acceptable proficiency and maintained SCDHEC certification for all analyses.

8.1 INTRODUCTION

The environmental monitoring QA/QC program is a process designed to improve the methods and techniques used to collect and analyze the environmental data that are the basis for this annual report and to prevent errors in the generation of those data. The QA/QC program includes continuous assessment activities, precision checks, and accuracy checks, as shown in Figure 8-1. The results of activities in one area provide input to assessments or checks conducted in the other two areas in an ongoing process resulting in high quality data. By combining continuous assessment of field, laboratory, and data management performance with checks for accuracy and precision, SRS ensures that all monitoring and surveillance data accurately represent conditions at the SRS. The glossary contains definitions for each term presented in Figure 8-1.

Chapter 8 - Key Terms

Quality assurance is an integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure quality in the processes by which products are developed. The goal of QA is to improve processes so that defects do not arise when the product is produced. It is proactive.

Quality control is a set of activities for ensuring quality in products by identifying defects in the actual products. The goal of QC is to identify and correct defects in the finished product before it is made available to the customer. QC is a reactive process.

Stated another way, Quality Assurance makes sure you are doing the right things, the right way. Quality Control makes sure the results of what you have done are what you expected.

Some elements of the QA/QC program are inherent within environmental monitoring standard procedures and practices. SRS personnel assess these elements as part of the continuous assessment process. The DOECAP focuses on the assessment of specific QA/QC program elements. Those elements of Figure 9-1 discussed in this chapter are highlighted in bold text.

8.2 BACKGROUND

DOE Order 414.1D, "Quality Assurance," requires an integrated system of management activities to ensure that the results of the environmental monitoring program meet the requirements of federal and state regulations and DOE Order 458.1, "Radiation Protection of the Public and the Environment." SRS uses field and laboratory procedures to guide activities such as sample collection, laboratory analysis, data evaluation, and reporting. SRS uses an integrated testing system to ensure the integrity of analyses performed by SRS and offsite laboratories. In addition, SRS uses QA and QC procedures to verify and control environmental monitoring activities to ensure the resulting data provides a representative evaluation of SRS operational impacts on the health and safety of the public, workers, and the environment.

8.3 QUALITY ASSURANCE PROGRAM SUMMARY

The environmental monitoring QA/QC program focuses on minimizing errors through ongoing assessment and control of the program components. The QA and QC activities are interdependent.

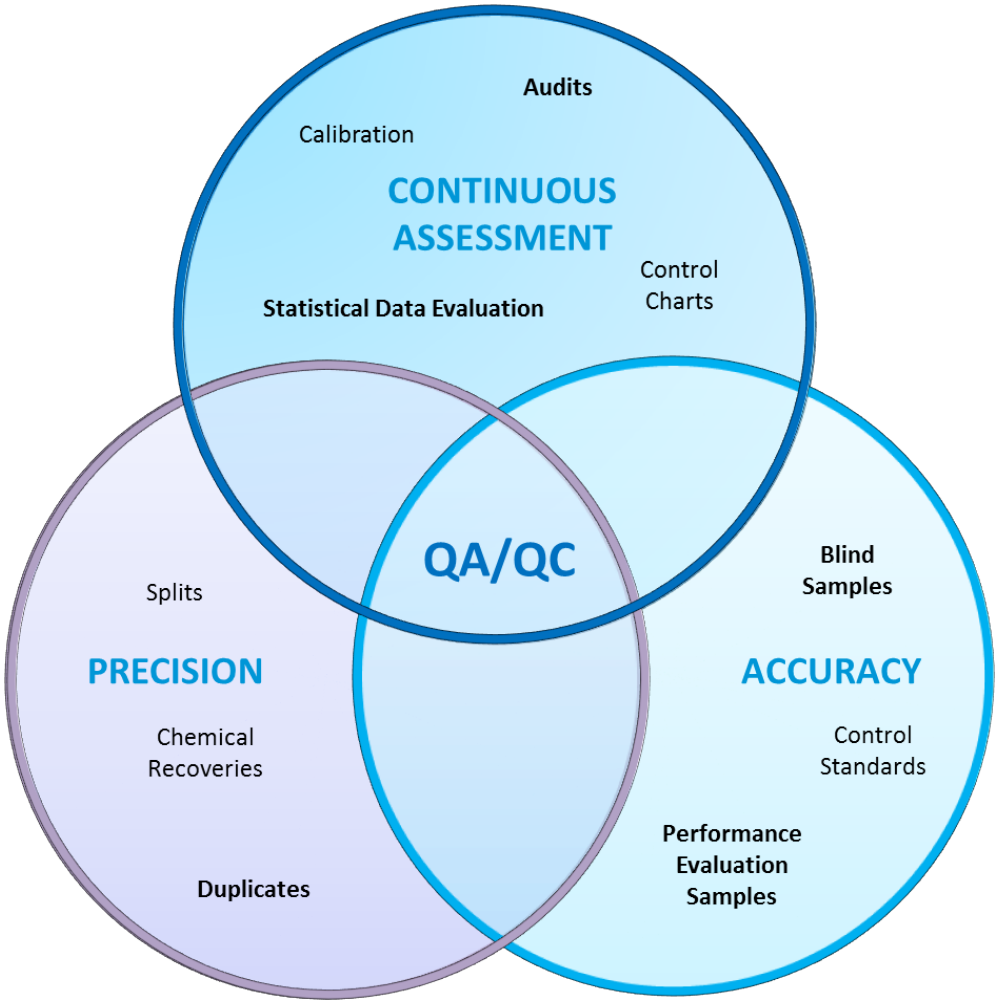

Figure 8-1 Interrelationship between QA/QC Activities

For example, QC detects an ongoing problem with the quality of the product and provides feedback to QA personnel that there is a problem in the process. QA determines the root cause and extent of the problem and changes the process to eliminate the problem, prevent reoccurrences, and improve product quality.

QA activities focus on the processes implemented to produce the data presented in this report. In 2015, QA efforts associated with the environmental monitoring program that resulted in program improvements were:

- Implementing monitoring changes,
- Recertification of three of the SRS onsite laboratories, and
- DOECAP audits of laboratories that support SRS environmental monitoring.

QC activities are those tests and checks that ensure compliance with defined standards. In 2015, these QC activities associated with the environmental monitoring program included:

- Participation in the Mixed Analyte Performance Evaluation Program (MAPEP) by laboratories that perform analytical measurements on SRS samples,
- Participation in proficiency testing for laboratories performing National Pollutant Discharge Elimination System (NPDES) analyses, and
- Collection and analysis of QC samples (duplicates and blind samples) associated with field sampling activities.

8.4 ENVIRONMENTAL MONITORING PROGRAM QA ACTIVITIES

In 2015, SRS continued to transition to the use of the SonTek RiverSurveyor® device for measuring flows in more SRS stream sampling locations. This device, as first discussed in the 2012 Annual Site Environmental Report, provides reliable average stream velocity measurements in either two or three dimensions, has built-in calibrations that are performed during each field use, and is simple to operate.

Other program quality improvements implemented in 2015 included the installation of wireless rain and flow real time modems at nine NPDES industrial stormwater locations, and installation of area velocity sensors at two surface water sampling locations. The modem devices provide immediate notifications of rain or flow events at stormwater outfalls and are programmed with automated samplers for immediate sampling during a flow event.

SRS uses SCDHEC certified laboratories for those environmental monitoring program parameters that are reportable to SCDHEC. SCDHEC certifies the SRS onsite laboratories and offsite subcontract laboratories for a large variety of environmental analyses.

In 2015, SCDHEC performed recertification evaluations of the Environmental Bioassay Laboratory, Environmental Analysis Laboratory, and the Domestic Water Plant Laboratory. These evaluations include a review of QA and QC practices and procedures. SCDHEC renewed the certification for these three onsite laboratories for another three years.

8.4.1 Department of Energy Consolidated Audit Program (DOECAP)

The DOECAP is a comprehensive audit program of contract and subcontract laboratories that provide analytical services to DOE Operations and Field Offices. The DOECAP conducts consolidated audits to reduce the number of audits conducted independently by DOE field sites and standardize audit methodologies, processes, and procedures.

DOECAP performs an annual audit of each subcontract laboratory used by SRS to ensure the laboratories demonstrate technical capability and proficiency and compliance with DOE QA program requirements. The audit evaluates laboratory performance including sample receipt, instrument calibration, analytical procedures, data verification, data reports, records management, nonconformance and corrective actions, preventive maintenance, and sample disposal. Within these topic areas, auditors evaluate the proper use of control charts, control standards, chemical recoveries, performance evaluation samples, and adherence to laboratory procedures.

In 2015, DOECAP conducted audits at three SRS subcontract laboratories used for analyzing environmental samples documented in this annual report, resulting in no findings of sufficient magnitude to render the audited facility unacceptable to provide service to DOE or SRS. There were 40 Priority II findings related to deficiencies in procedures, practices, or non-requirement-based issues. There were no Priority I findings affecting either SRS samples or analyses requested by SRS in 2015. Additionally, during the 2015 audit, the audit team was able to verify that the corrective actions that addressed most of the findings identified during the 2014 audit were satisfactory, thereby closing 24 of the 30 Priority II findings. Six Priority II findings from the 2014 audits remain open. These open findings are in the areas related to deficiencies in procedures, practices, or non-requirement-based issues. These remaining open Priority II findings did not affect the SRS samples or analyses requested by SRS in 2015. Auditors will address these open findings during the 2016 audit.

Priority Definitions

A Priority I finding documents a deficiency that is of sufficient magnitude to render the audited facility unacceptable to provide the affected service to DOE.

A Priority II finding documents a deficiency that is not of sufficient magnitude to render the audited facility unacceptable to provide services to DOE. Each affected laboratory submits corrective action responses to DOECAP that auditors review and approve prior to the next year's audit.

8.5 ENVIRONMENTAL MONITORING PROGRAM QC ACTIVITIES

8.5.1 QC Sampling

SRS personnel collect several types of QC samples, including blinds, field duplicates, trip blanks, and field blanks throughout the year to determine the source of any measurement error. SRS personnel routinely conduct blind sample analyses for field measurements of pH to assess the quality and reliability of field data measurements. For 2015, all 24 blind sample analyses (a blind sample is a sample with a composition known to the submitter, but not to the analyst) were within the acceptable limit of less than a 0.4 pH unit difference between the original and blind samples. Analysis of blind samples tests the analyst's proficiency in performing the specified analysis.

Table 8-1 summarizes the results of blind and duplicate sample analyses associated with the NPDES program. This table addresses analyses conducted at both onsite SRS and offsite subcontract laboratories. The duplicate samples test the samplers' proficiency in collecting the samples. The eight blind and nine duplicate samples with a difference greater than 20% represent six and eight different parameters, respectively. This indicates that in 2015 there were no consistent problems with the laboratory sample analyses.

SRS's water quality (nonradiological) program requires collection of duplicates for 10% of the samples to verify analytical results. SRS onsite and subcontract laboratories continued to analyze duplicate samples from SRS streams and the Savannah River in 2015, as summarized in Table 8-1.

Table 8-1 Summary of Laboratory Blind and Duplicate Sample Analyses

Program and Sample Type	Number of Samples Analyzed	Number of Samples within Acceptable Limits (Percent difference between results < 20%)	Number of Samples Outside Acceptable Limits (Percent difference between results > 20%)
NPDES Blind	94	86	8
NPDES Duplicate	116	107	9
Water Quality River/Stream Duplicate	699	679	20

Though results for the water quality field duplicate sampling program indicate there were some differences between duplicates, there was no impact on conclusions made with the data. Reasons for duplicate results to differ include analytical uncertainties associated with the measurements such as the precision of the analytical instruments and detection limits of the analytical instruments.

The results of field and trip blank analyses associated with the NPDES program are summarized in Table 8-2. Field blanks determine whether the field sampling and sample processing procedures and environments have contaminated the sample. A trip blank is used to document contamination associated with shipping and field handling procedures. The analytical results indicate neither sampling processes nor shipping activities are contributing factors to contaminants found in the actual samples as discussed in Chapter 4, "Nonradiological Environmental Monitoring Program."

Table 8-2 Summary of Trip and Field Blank Sample Analyses

Program and Sample Type	Number of Samples Analyzed	Number of Samples with Results Below Detection Limits
NPDES Trip Blank	29	29
NPDES Field Blank	12	12

8.5.2 Laboratory Proficiency Testing

SRS laboratories performing NPDES analyses maintained state certification for all analyses after achieving acceptable results in SCDHEC-required proficiency testing.

Proficiency testing is also known as comparative testing and is an evaluation of a laboratory's performance against pre-established criteria by means of inter-laboratory comparisons.

The proficiency testing is required per state regulation 61-81 "State Environmental Laboratory Certification Program." All laboratories used proficiency-tested providers approved by SCDHEC. During 2015, the onsite

and subcontract laboratories participated in various water pollution performance evaluation studies, and each reported proficiency in 100% of the parameters tested. Therefore, both onsite and subcontract laboratories maintained SCDHEC certification for all analyses performed for SRS.

All laboratories with licenses to handle radioactive materials that perform environmental analytical measurements in support of the DOE Environmental Management activities are required to participate in MAPEP, a laboratory comparison program that tracks performance accuracy and tests the quality of environmental data reported to DOE. One SRS laboratory continues to participate in MAPEP, analyzing MAPEP performance evaluation samples including water, soil, air filter, and vegetation matrices all with environmentally important stable inorganic, organic, and radioactive constituents. MAPEP offered two separate studies in 2015. In the second study, MAPEP provided an "unknown" sample. The SRS Environmental Laboratory participated in the two studies receiving 98.6% acceptable results in each. For the unknown sample in the second study, which was concrete, all 13 analytical results provided were acceptable. MAPEP results for SRS subcontract laboratories were also satisfactory, with an average percent of passing parameters of 94% for water matrix and 98% for soil matrix. For the failed analyses the laboratories develop corrective actions. The objective of the corrective actions is to prevent a recurrence of failed analyses. These corrective actions may include modification to sample preparation or analytical procedures.

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