7. QUALITY ASSURANCE

7.1 SUMMARY

Quality assurance and quality control are essential components of DOE environmental monitoring programs at PORTS. Quality is integrated into sample preservation, field data and sample collection, sample transportation, sample analysis, data management, and recordkeeping. Numerous program assessment activities in the field and within the facilities are conducted at regular intervals to demonstrate that quality is built into and maintained in all DOE programs. Analytical laboratories used by DOE contractors during 2019 participated in the DOE Consolidated Audit Program and Mixed-Analyte Performance Evaluation Program.

FBP implements and conducts its QA Program in compliance with the following standards or regulations:

- DOE Order 414.1D, *Quality Assurance*;
- American Society of Mechanical Engineers Nuclear Quality Assurance Standards NQA-1-2008 with the NQA-1a-2009 Addenda, *QA Requirements for Nuclear Facility Applications*;
- Title 10 CFR Part 830, Nuclear Safety Management.

7.2 QUALITY ASSURANCE INTRODUCTION

Quality assurance, an integral part of environmental monitoring, requires systematic control of the processes involved in sampling the environment and in analyzing the samples. To demonstrate accurate results, DOE uses the following planned and systematic controls:

- implementation of standard operating procedures for sample collection and analysis;
- training and qualification of surveyors and analysts;
- implementation of sample tracking and chain-of-custody procedures to demonstrate traceability and integrity of samples and data;
- participation in external quality control programs;
- frequent calibration and routine maintenance of measuring and test equipment;
- maintenance of internal quality control programs;
- implementation of good measurement techniques and good laboratory practices; and
- frequent assessments of field sampling, measurement activities, and laboratory processes.

Environmental sampling is conducted by DOE contractors at PORTS in accordance with state and federal regulations and DOE Orders. Sampling plans and procedures are prepared, and appropriate sampling instruments or devices are selected in accordance with practices recommended by U.S. EPA, the American Society for Testing and Materials, or other authorities. Chain-of-custody forms document sample custody from sample collection through receipt by the analytical laboratory. The samples remain in the custody of the sampling group until the samples are received at the laboratory. Samples shipped to an off-site laboratory are sealed within the shipping container to prevent tampering until they are received by the sample custodian at the off-site laboratory.

The analytical data are reviewed to determine compliance with applicable regulations and permits. The data are used to identify locations and concentrations of contaminants of concern, to evaluate the rate and extent of contamination at the site, and to help determine the need for remedial action. Adequate and complete documentation generated as a result of these efforts supports the quality standards established by DOE. Quality Assurance Project Plans were used by FBP and MCS during 2019 to ensure a consistent system for collecting, assessing, and documenting environmental data of known and documented quality.

7.3 SAMPLE COLLECTION AND HANDLING

The FBP Quality Assurance Project Plan consists of the *Sample Analysis Data Quality Assurance Project Plan* (DOE 2014b), project-specific sampling and analysis plans (SAPs), and their associated data quality objectives (DQOs). While the DQOs and SAPs are specific to discrete projects, the *Sample Analysis Data Quality Assurance Project Plan* (DOE 2014b) provides an overarching framework to ensure that standardized and consistent processes are utilized to obtain samples, perform data collection, and perform laboratory services.

Personnel involved in sampling and monitoring are properly trained through a combination of classroom, on-line, and/or on-the-job training as required by environmental, health, and safety regulations and DOE contract requirements. Procedures are developed from guidelines and regulations created by DOE or other regulatory agencies that have authority over PORTS activities.

Data generated from sampling can be greatly influenced by the methods used to collect and transport the samples. A quality assurance program provides the procedures for proper sample collection so that the samples represent the conditions that exist in the environment at the time of sampling. The DOE quality assurance program at PORTS mandates compliance with written sampling procedures, use of clean sampling devices and containers, use of approved sample preservation techniques, and collection of field quality control samples. Chain-of-custody procedures are strictly followed to maintain sample integrity. In order to maintain sample integrity, samples are delivered to the laboratory as soon as practicable after collection.

Field quality control samples that are collected and analyzed include trip blanks, field blanks, field duplicates, and equipment rinseates. Quality control samples for environmental monitoring are collected at a target rate of one per twenty environmental samples or one per analytical batch for environmental samples, as applicable to the samples being collected and the analyses required. Not all types of sampling require all of the field quality control samples. Table 7.1 summarizes the uses and definitions of the field quality control samples.

Analytical results for field quality control samples are evaluated to determine if the sampling activities have biased the environmental sample results. This evaluation typically occurs as part of data validation and/or assessment (see Section 7.5.2). An example of the successful use of quality control samples to identify bias in sampling is in the ambient air monitoring program (see Chapter 4, Section 4.6.1). Field blank samples collected for the ambient air program contain low levels of uranium and uranium isotopes. Upon further investigation, it was discovered that the filters used to collect air samples contain low levels of uranium due to the materials used to make the filters. Therefore, levels of uranium reported in ambient air may be slightly elevated.

7.4 ANALYTICAL QUALITY ASSURANCE

In 2019, samples collected for DOE environmental monitoring programs at PORTS such as NPDES monitoring, groundwater monitoring required by the *Integrated Groundwater Monitoring Plan* (DOE 2017c), and environmental monitoring required by the *Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* (DOE 2017b), were sent to analytical laboratories that participated in DOE programs to ensure data quality.

Table 7.1. Definitions and purpose of field quality control samples

Type of sample	Definition and purpose
Trip blank	Used to evaluate contamination from VOCs during the sampling process. The trip blank is an unopened container of laboratory-grade water that accompanies environmental samples analyzed for VOCs from sample collection through laboratory analysis.
Field blank	Used to evaluate contamination during the sampling process. The field blank is a container of laboratory-grade water that is carried into the field and opened to expose the field blank to field conditions when the environmental samples are collected. The field blank is analyzed for the same analytes as the environmental samples.
Field duplicate	Used to document the precision of the sampling process and provide information on analytical variability caused by collection methods, laboratory procedures, and sample heterogeneity (the variability within the sample media). A field duplicate, or duplicate sample, is a second environmental sample collected at the same time and from the same place as the first environmental sample. The duplicate sample is analyzed for the same analytes as the first sample.
Equipment rinseate	Used to assess contamination that could be present from reusable sampling equipment, such as a bailer used at a groundwater well to collect water. The sample is collected by rinsing the cleaned equipment with laboratory-grade water. An equipment rinseate is not required when dedicated or disposable sampling equipment is used for sample collection. The equipment rinseate sample is typically analyzed for the same analytes as the associated environmental samples.

DOE contractors at PORTS only use analytical laboratories that demonstrate compliance in the following areas through participation in independent audits and surveillance programs:

- compliance with federal waste disposal regulations,
- data quality,
- materials management,
- sample control,
- data management,
- electronic data management,
- implementation of a laboratory quality assurance plan, and
- review of external and internal performance evaluation program.

The following analytical laboratories were used by FBP, MCS, and/or Centrus in 2019 for analysis of environmental samples discussed in this report:

- GEL Laboratories, LLC
- Eurofins TestAmerica
- Southwest Research Institute
- ALS
- ETT Environmental, Inc.
- Portsmouth Analytical Laboratory
- Radiation Detection Company
- ARS Aleut Analytical, LLC

When available and appropriate for the sample matrix, U.S. EPA-approved methods are used for sample analysis. When U.S. EPA-approved methods are not available, other nationally recognized methods, such

as those developed by DOE and American Society for Testing and Materials, are used. Analytical methods are identified in a statement of work for laboratory services. Analytical laboratories follow chain-of-custody procedures and document the steps in sample handling, analysis, and reporting.

PORTS is required by DOE, Ohio EPA, and/or U.S. EPA to participate in independent QC programs. The DOE Consolidated Audit Program implements annual performance qualification audits of environmental laboratories. The DOE Mixed-Analyte Performance Evaluation Program provides semiannual performance testing and evaluation of analytical laboratories. The site also participates in voluntary independent programs to improve analytical QC. These programs generate data that readily are recognized as objective measures that provide participating laboratories and government agencies a periodic review of their performance. These programs are conducted by EPA, DOE, and commercial laboratories. Data that do not meet acceptable criteria are investigated and documented according to formal procedures. Although participation in certain programs is mandatory, the degree of participation is voluntary, so that each laboratory can select parameters of particular interest to that facility.

7.5 DATA MANAGEMENT

After analytical laboratory data are received by DOE contractors, they are verified for completeness, correctness, consistency, and compliance with written analytical specifications. Selected data are independently evaluated using a systematic process that compares the data to established quality assurance/quality control criteria. An independent data validator checks documentation produced by the analytical laboratory to verify that the laboratory has provided data that meet established criteria.

7.5.1 Data Management Systems

The data generated from sampling events are stored in the Project Environmental Measurements System (PEMS), a consolidated site data system for tracking and managing data. PEMS is used to manage field-generated data, import laboratory-generated data, input data qualifiers identified during data validation, and transfer data to the PORTS Oak Ridge Environmental Information System (OREIS) database. PORTS OREIS is used to consolidate data from PEMS for long term storage.

Environmental data from PORTS OREIS is periodically loaded into the PPPO Environmental Geographic Analytical Spatial Information System (PEGASIS). PEGASIS allows public access to environmental monitoring data and displays it on a local map that shows the locations the data were collected. Public access to PEGASIS is available at pegasis.ports.pppo.gov/pegasis

7.5.2 Data Verification, Validation, and Assessment

Data verification is the systematic process of checking data for completeness, correctness, consistency, and compliance with written analytical specifications. The verification process compares the laboratory data package to requirements associated with the project and documents requirements that were and were not met. All data collected for environmental monitoring programs are verified.

Data validation is the process performed by a qualified individual for a data set, independent from sampling, laboratory, project management, or other decision making personnel. Data validation evaluates laboratory adherence to analytical method requirements to determine the technical reliability of the reported results. Data are qualified as acceptable, estimated, or rejected. These validation qualifiers are stored in PEMS and transferred with the data to PORTS OREIS. Typically, at least 10% of analytical data associated with the environmental sampling programs are validated.

Data assessment is conducted by trained technical personnel in conjunction with other project team members. Data are reviewed for compliance with applicable standards or limits, as applicable. Current analytical results are also compared to previous results for the sampling location. Other data analyses

may be completed such as trend analyses or summary statistics (calculation of average, median, data range, etc.).