12.0 Quality Assurance

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Quality assurance (QA) and quality control (QC) practices encompass all aspects of Hanford Site environmental monitoring and surveillance activities. Hanford Site contractors, subcontractors, and multiple U.S. Department of Energy (DOE) organizations are involved in and conduct environmental monitoring and surveillance activities independently, each driven by different missions and regulatory requirements but with the same goal in mind. This section describes the Environmental Surveillance program, part of the Public Safety and Resource Protection Program (PSRP) managed by Mission Support Alliance. The Environmental Surveillance program includes environmental surveillance and monitoring across multiple media types both on and off the Hanford Site. The program conducts multimedia environmental monitoring to assess Hanford Site and offsite human health exposures to radionuclides and chemicals and evaluate the potential impact of site operations on the environment. This section provides information on specific measures taken in 2016 to ensure quality and defensibility in project management, sample collection, and analytical results.

NOTE: Because of the complexity of the groundwater program, QA/QC specifications for groundwater sampling and program management are reported independently by CH2M Hill Plateau Remediation Company in the *Hanford Site Groundwater Monitoring Report for 2016* (DOE/RL-2016-67) and are not discussed in this section. However, details of the groundwater monitoring program can be found in Section 8.

Quality assurances and QCs of the Hanford Site and offsite surveillance programs are documented through QA program plans and describe applicable QA elements (e.g., MSC-23333, *Environmental Quality Assurance Program Plan*). Sample analyses across all media types are performed by contracted laboratories, which are also required to meet these plan specifications. To ensure the highest quality data are obtained, the accredited offsite laboratories used were audited for equipment and services before the contract awards were made.

12.1 Program Management

Per federal requirements, environmental surveillance activities are subject to an overall QA program that satisfies requirements for collecting and assessing environmental data in compliance with the following:

- 10 CFR 830, "Nuclear Safety Management," Subpart A, "Quality Assurance Requirements"
- DOE O 414.1D, *Quality Assurance*
- Analytical Services - Hanford Site, Hanford Analytical Services Quality Assurance Requirements Documents

DOE O 414.1D
QA Program Requirements

Management/QA Program
Personnel Training/Qualification
Quality Improvement
Documents and Records
Work Processes
Design
Procurement
Inspection and Acceptance Testing
Management Assessment
Independent Assessment

- EPA Requirements for Quality Assurance Project Plans (EPA 2001b)
- Richland Requirements Document 008, Quality Assurance Program Requirements
- Project-specific QA plans and documentation are found in MSC-23333 and describe the QA/QC elements associated with the Environmental Surveillance program.

12.1.1 Personnel Training and Qualifications

Hanford Site personnel are provided with the knowledge and skills necessary to perform specific jobs safely, effectively, and efficiently with minimal supervision. This capacity is accomplished by establishing and enforcing sitewide policies, procedures, and guidance through training programs that provide general and specialized training classes and housing hands-on training facilities dedicated to ensuring personnel are qualified and confident to perform their tasks safely. The following principles and practices are included in the training program and are documented in MSC-23333:

- Develop training standards and procedures that meet valid requirements and regulations and are consistent with industry-proven best management practices
- Recognize management's responsibility to lead and coach their employees to ensure employees are trained and remain proficient to perform assigned tasks
- Conduct evaluations of employee training to ensure regulatory compliance, compliance with standards and instructions, and improve the training process
- Employ instructional staff and subject matter experts who are qualified and maintain their instructional and subject area skills and knowledge
- Use a graded approach to develop training programs to ensure value and effectiveness
- Ensure that employee training records are current and complete.

12.2 Quality Control Samples

Several types of QC samples are collected during Environmental Surveillance sampling events. The QC procedures and associated QC samples ensure the highest quality data possible. These procedures are followed in the field and laboratories.

Several types of field QC samples are collected to ensure the validity of the sampling procedures and the resulting sample data. The potential cross-contamination between samples during the sampling process is evaluated using trip blanks and equipment blanks. Additionally, field duplicates are collected to evaluate sample matrix heterogeneity and sample collection reproducibility.

Laboratory QC samples are also used to ensure the validity of the resulting data. The potential for cross-contamination of samples in the laboratory is evaluated using method blanks. In order to evaluate the precision and accuracy of laboratory data several types of QC samples are used including laboratory duplicates, matrix spikes, and matrix spike duplicates. Table 12-1 summarizes the different types,

characteristics, and frequency of QC samples. A QC sample frequency goal of 5% (1 in 20 samples) is used for environmental surveillance activities when feasible.

Table 12-1. Field and Laboratory Quality Control Sample Types, Characteristics, and Frequency.

Sample Type	Primary Characteristics Evaluated	Frequency
Field QC Samples		
Trip blank (TB)	Volatile organic compound (VOC) cross-contamination during transportation	1 per field trip, if VOCs are collected
Equipment blank (EB)	Cross-contamination from non-dedicated equipment	1 per sampling method type per year for selected analytes
Field Duplicate	Sample matrix heterogeneity and sample collection reproducibility	1 per 20 samples, where feasible
Laboratory QC Samples		
Method blank	Laboratory contamination	As defined in the laboratory contract or QA plan, and/or analysis procedures
Laboratory duplicates	Laboratory reproducibility	
Matrix spike	Matrix effect and laboratory accuracy	
Matrix spike duplicate	Laboratory reproducibility/accuracy	

Blanks. A sample of the carrying agent (gas, liquid, or solid) analyzed using the same analytical process and associated procedures as the samples they are associated with.

Field Duplicate Samples. Two samples collected at the same location at roughly the same time. The parent and duplicate samples are each uniquely labeled and used to evaluate the homogeneity of the sample matrix and the reproducibility of the collection procedures.

Laboratory Duplicate Sample. A single field sample aliquoted into two laboratory samples for individual extraction and analysis. Laboratory duplicates are a measure of variation within a field sample and the reproducibility of the laboratory procedures.

Matrix Spikes/Matrix Spike Duplicates. Prepared using field samples to which a calibrated amount of the analyte(s) of interest is added. Matrix spikes are used to evaluate the accuracy, reproducibility, and recovery efficiency of an analytical method.

12.3 Sample Collection Quality Assurance and Quality Control

Trained personnel collected environmental samples for air, surfacewater, biota (wildlife and food/farm products), soil, vegetation, and sediment in accordance with PSRP-approved schedules, desk instructions, and procedures. Established sampling locations were accurately identified with visible postings or plotted global positioning system readings and documented to ensure data continuity. In 2016, collected environmental samples were submitted to General Engineering Laboratories, LLC (GEL) and Test America Richland Laboratories (TARL; Table 12-2).

Table 12-2. Laboratories and Types of Environmental Surveillance Samples Analyzed.

Analytical Laboratory	Environmental Monitoring and Surveillance Samples			
	Air	Water	Biota	Other
TestAmerica Richland Laboratory	X	X		X
General Engineering Laboratories, LLC	X	X	X	X

Assessments of field sampling activities are routinely performed and documented by media task leads. In 2016, field duplicate samples were collected and analyzed for air, soil, Columbia River water, natural vegetation, milk, wine, wildlife, irrigation water, sediment, and seep samples. The accepted method of evaluating the precision or reproducibility of duplicate samples is the calculation of the relative percent difference (RPD). RPDs are calculated for individual analytes. The generalized formula for calculating RPDs is as follows:

$$RPD = \left(\frac{|S - D|}{\frac{(S + D)}{2}} \right) \times 100$$

Where a measure of precision of the measurement of a sample (S) and its duplicate (D).

For the 2016 Environmental Surveillance effort, field duplicate samples were collected at the locations indicated in Table 12-3.

Table 12-3. 2016 Field Duplicate Samples.

Media	Location	Number of Duplicate Sample Pairs
Air	Various	54
Soil	Various	5
Natural Vegetation	Various	3
Columbia River Water	Richland Pump house/Priest Rapids Dam	9
Columbia River Water Transects	Various	14
Columbia River Sediment	100-D-Spring	1
Seeps	100-F Springs	7
Wildlife – Bass/Carp	Various	4
Wildlife – Upland Game	100 Area	2
Leafy vegetables	East Wahluke Area	1
Potatoes	Riverview	1
Milk	Sagemoor Composite	1
Wine	Columbia Basin	2

To be considered acceptable (within the control limits), results for sample duplicate pairs must be non-detected. For detected results, the RPD of the duplicate sample pair must be less than 30%. Duplicate results for 2016 are shown in Table 12-4.

Table 12-4. 2016 Field Duplicate Sample Results. (6 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
Air	Alpha (gross)	43 of 54	79
	Beta (gross)	49 of 54	90
	Americium-241	4 of 4	100
	Antimony-125	4 of 4	100
	Colbalt-60	4 of 4	100
	Cesium-134	4 of 4	100
	Cesium-137	4 of 4	100
	Europium-152	4 of 4	100
	Europium-154	4 of 4	100
	Europium-155	4 of 4	100
	Hydrogen-3 (tritium)	14 of 14	100
	Plutonium-238	4 of 4	100
	Plutonium-239/-240	4 of 4	100
	Potassium-40	4 of 4	100
	Ruthenium-106	4 of 4	100
	Strontium-90	4 of 4	100
	Uranium-234	4 of 4	100
	Uranium-235	4 of 4	100
	Uranium-238	4 of 4	100
Soil	Antimony-125	5 of 5	100
	Cesium-134	5 of 5	100
	Cesium-137	5 of 5	100
	Cobalt-60	5 of 5	100
	Europium-152	5 of 5	100
	Europium-154	5 of 5	100
	Europium-155	5 of 5	100
	Plutonium-238	5 of 5	100
	Plutonium-239/-240	5 of 5	100
	Potassium-40	5 of 5	100
	Ruthenium-106	5 of 5	100
	Strontium-90	5 of 5	100
	Uranium-234	5 of 5	100
	Uranium-235	5 of 5	100
	Uranium-238	5 of 5	100
Natural Vegetation	Antimony-125	3 of 3	100
	Cesium-134	3 of 3	100
	Cesium-137	3 of 3	100
	Cobalt-60	3 of 3	100
	Europium-152	3 of 3	100
	Europium-154	3 of 3	100
	Europium-155	3 of 3	100
	Plutonium-238	3 of 3	100
	Plutonium-239/-240	2 of 3	67
	Potassium-40	3 of 3	100
	Ruthenium-106	3 of 3	100
	Strontium-90	3 of 3	100
	Uranium-234	3 of 3	100
	Uranium-235	3 of 3	100

Table 12-4. 2016 Field Duplicate Sample Results. (6 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Uranium-238	3 of 3	100
Columbia River Water	Strontium-90	4 of 4	100%
	Uranium-234	3 of 4	75%
	Uranium-235	4 of 4	100%
	Uranium-238	3 of 4	75%
	Tecnetium-99	4 of 4	100%
	Tritium	3 of 4	75%
	Cesium-137	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Potassium-40	1 of 1	100%
	Berillium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Cesium-134	1 of 1	100%
	Plutonium-238	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Plutonium-239/-240	1 of 1	100%
Columbia River Water Transects	Aluminum	3 of 4	75%
	Iron	4 of 4	100%
	Lead	4 of 4	100%
	copper	4 of 4	100%
	Magnesium	4 of 4	100%
	Manganese	4 of 4	100%
	Mercury	4 of 4	100%
	Molybdenum	4 of 4	100%
	Nickel	4 of 4	100%
	Potassium	4 of 4	100%
	Silver	4 of 4	100%
	Strontium	4 of 4	100%
	Thallium	4 of 4	100%
	Thorium	4 of 4	100%
	Tin	4 of 4	100%
	Titanium	4 of 4	100%
	Antimony	4 of 4	100%
	Arsenic	4 of 4	100%
	Barium	4 of 4	100%
	Beryllium	4 of 4	100%
	Boron	3 of 4	100%
	Cadmium	4 of 4	100%
	Cesium	4 of 4	100%
	Chromium	4 of 4	100%
	Cobalt	4 of 4	100%
	Uranium	4 of 4	100%
	Bismuth	4 of 4	100%
	Calcium	4 of 4	100%
	Phosphorus	4 of 4	100%

Table 12-4. 2016 Field Duplicate Sample Results. (6 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Selenium	4 of 4	100%
	Phosphate	2 of 2	100%
	Sulfate	2 of 2	100%
	Chloride	2 of 2	100%
	Fluoride	2 of 2	100%
	Bromide	2 of 2	100%
	Nitrogen in Nitrate	2 of 2	100%
	Nitrogen in Nitrite	2 of 2	100%
	Hexavalent chromium	4 of 4	100%
	tritium	2 of 2	100%
	Cesium-137	2 of 2	100%
	Cesium-134	2 of 2	100%
	Cobalt-60	2 of 2	100%
	Potassium-40	2 of 2	100%
	Berillium-7	2 of 2	100%
	Ruthenium-106	2 of 2	100%
	Antimony-125	2 of 2	100%
	Europium-152	2 of 2	100%
	Europium-154	2 of 2	100%
	Europium-155	2 of 2	100%
	Strontium-90	2 of 2	100%
	Uranium-234	2 of 2	100%
	Uranium-235	1 of 2	50%
	Uranium-238	2 of 2	100%
Seep	Aluminum	1 of 2	50
	Iron	2 of 2	100%
	Lead	2 of 2	100%
	copper	2 of 2	100%
	Magnesium	2 of 2	100%
	Manganese	2 of 2	100%
	Mercury	2 of 2	100%
	Molybdenum	2 of 2	100%
	Nickel	2 of 2	100%
	Potassium	1 of 2	50%
	Silver	2 of 2	100%
	Strontium	2 of 2	100%
	Thallium	2 of 2	100%
	Thorium	2 of 2	100%
	Tin	2 of 2	100%
	Titanium	2 of 2	100%
	Antimony	2 of 2	100%
	Arsenic	2 of 2	100%
	Barium	2 of 2	100%
	Beryllium	2 of 2	100%
	Boron	2 of 2	100%
	Cadmium	2 of 2	100%
	Cesium	2 of 2	100%
	Chromium	2 of 2	100%

Table 12-4. 2016 Field Duplicate Sample Results. (6 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Cobalt	2 of 2	100%
	Uranium	2 of 2	100%
	Vanadium	2 of 2	100%
	Zinc	2 of 2	100%
	Zirconium	2 of 2	100%
	Bismuth	2 of 2	100%
	Calcium	2 of 2	100%
	Phosphorus	2 of 2	100%
	Selenium	2 of 2	100%
	Hexavalent chromium	2 of 2	100%
	Tritium	0 of 1	0%
	Phosphate	1 of 1	100%
	Sulfate	1 of 1	100%
	Chloride	1 of 1	100%
	Fluoride	1 of 1	100%
	Bromide	1 of 1	100%
	Bicarbonate	1 of 1	100%
	Hydroxylion	1 of 1	100%
	Alkalinity	1 of 1	100%
	Carbonate Alakalinity	1 of 1	100%
	Nitrogen in Nitrate	1 of 1	100%
	Nitrogen in Nitrite	1 of 1	100%
Wildlife Bass/Carp	Aluminum	1 of 1	100%
	Iron	1 of 1	100%
	Lead	1 of 1	100%
	Copper	0 of 1	0%
	Magnesium	1 of 1	100%
	Manganese	1 of 1	100%
	Mercury	1 of 1	100%
	Molybdenum	1 of 1	100%
	Nickel	1 of 1	100%
	Potassium	1 of 1	100%
	Silver	1 of 1	100%
	Strontium	1 of 1	100%
	Thallium	1 of 1	100%
	Thorium	1 of 1	100%
	Tin	1 of 1	100%
	Titanium	1 of 1	100%
	Antimony	1 of 1	100%
	Arsenic	1 of 1	100%
	Barium	1 of 1	100%
	Beryllium	1 of 1	100%
	Boron	1 of 1	100%
	Cadmium	1 of 1	100%
	Cesium	1 of 1	100%
	Chromium	1 of 1	100%
	Cobalt	1 of 1	100%
	Uranium	0 of 1	0%

Table 12-4. 2016 Field Duplicate Sample Results. (6 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Vanadium	1 of 1	100%
	Zinc	1 of 1	100%
	Zirconium	1 of 1	100%
	Bismuth	1 of 1	100%
	Calcium	1 of 1	100%
	Phosphorus	1 of 1	100%
	Selenium	0 of 1	0%
	Cesium-137	2 of 2	100%
	Cesium-134	2 of 2	100%
	Cobalt-60	2 of 2	100%
	Potassium-40	2 of 2	100%
	Berillium-7	2 of 2	100%
	Plutonium-238	1 of 1	100%
	Ruthenium-106	2 of 2	100%
	Antimony-125	2 of 2	100%
	Europium-152	2 of 2	100%
	Europium-154	2 of 2	100%
	Europium-155	2 of 2	100%
	Strontium-90	2 of 2	100%
	Uranium-234	1 of 1	100%
	Uranium-238	1 of 1	100%
	Tritium	2 of 2	100%
Wildlife Upland Game	Cesium-137	1 of 1	100%
	Cesium-134	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Potassium-40	1 of 1	100%
	Berillium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Strontium-90	1 of 1	100%
	Uranium-234	1 of 1	100%
	Uranium-238	1 of 1	100%
Leafy Vegetables	Cesium-137	1 of 1	100%
	Cesium-134	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Potassium-40	1 of 1	100%
	Berillium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Strontium-90	1 of 1	100%
	Uranium-234	1 of 1	100%
	Uranium-235	1 of 1	100%

Table 12-4. 2016 Field Duplicate Sample Results. (6 Pages)

Media	Analytes	Number of Results Within Control Limits [a]	Percent of Results within Control Limits
	Uranium-238	1 of 1	100%
	Tritium	1 of 1	100%
Potatoes	Cesium-137	1 of 1	100%
	Cesium-134	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Potassium-40	1 of 1	100%
	Berillium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Strontium-90	1 of 1	100%
	Uranium-234	1 of 1	100%
	Uranium-235	1 of 1	100%
	Uranium-238	1 of 1	100%
	Tritium	1 of 1	100%
Milk	Cesium-137	1 of 1	100%
	Cesium-134	1 of 1	100%
	Cobalt-60	1 of 1	100%
	Potassium-40	1 of 1	100%
	Berillium-7	1 of 1	100%
	Ruthenium-106	1 of 1	100%
	Antimony-125	1 of 1	100%
	Europium-152	1 of 1	100%
	Europium-154	1 of 1	100%
	Europium-155	1 of 1	100%
	Strontium-90	1 of 1	100%
	Uranium-234	1 of 1	100%
	Uranium-235	1 of 1	100%
	Uranium-238	1 of 1	100%
	Tritium	0 of 1	0%
Wine	Cesium-137	2 of 2	100%
	Cesium-134	2 of 2	100%
	Cobalt-60	2 of 2	100%
	Potassium-40	2 of 2	100%
	Berillium-7	2 of 2	100%
	Ruthenium-106	2 of 2	100%
	Antimony-125	2 of 2	100%
	Europium-152	2 of 2	100%
	Europium-154	2 of 2	100%
	Europium-155	2 of 2	100%
	Strontium-90	2 of 2	100%
	Uranium-234	2 of 2	100%
	Uranium-238	2 of 2	100%
	Tritium	2 of 2	100%

[a] Number of reported results within control limits are those with the Relative Percent Difference value less than 30%, and the result is greater than the minimum detectable activity or method detection limit.

12.4 Media Audits and Comparisons

Selected sediment, surfacewater, food and farm products, wildlife, soil, and vegetation samples are provided to the Washington State Department of Health (WDOH) for comparative analysis as part of the PSRP QA program (DOE/RL-91-50). The Hanford Environmental Radiation Oversight Program of the WDOH independently verifies the quality of DOE monitoring programs at the Hanford Site. Since 1985, WDOH and DOE have collaboratively participated in the collection of environmental samples located on or in the surrounding areas of the Hanford Site (DOH 320-115, *Hanford Environmental Radiation Oversight Program: 2015 Data Summary Report*). This includes, but is not limited to, conducting split, collocated, and independent sampling at locations that have the potential to release radionuclides to the environment or that could be impacted by such releases. This program is not intended to characterize completely the environmental radiation on the Hanford Site but provides oversight to Hanford Site contractors in determining the impact of Hanford releases on the environment and the public. More information can be found on the WDOH Environmental Sciences website at http://www.doh.wa.gov/CommunityandEnvironment/Radiation/EnvironmentalSciences.aspx. Media types analyzed by the WDOH in 2016 included the following:

- Air Filters from 14 locations
- Columbia River continuous water from one location
- Columbia River transects from four locations
- Columbia River shoreline springs (seeps) from six locations.
- Offsite irrigation water from two locations
- Columbia River Sediment from eight locations
- Apricots from three locations
- Melons from three locations
- Leafy Vegetables from three locations
- Potatoes from two locations
- Corn from four locations
- Upland Game Birds from two locations
- Carp from two locations
- Deer/Elk from one background location
- Soil from six locations
- Vegetation from five locations.

No comparison data for 2016 were available at the time this report was written; however, links to past data summary reports and other environmental science publications for the Hanford Environmental Radiation Oversight program are available at http://www.doh.wa.gov/communityandenvironment/radiation/publications/environmentalsciences.aspx.

12.5 Laboratory Quality Assurance Programs

Contracted analytical laboratories are required to participate in internal and independent QC programs to evaluate analytical precision and accuracy. These laboratories employ chemists and technologists

who are qualified to perform these analyses through formal classroom education and on-the-job training. Internal QC programs for contracted laboratories involve routine calibrations of counting instruments, yield determinations of radiochemical procedures, frequent radiation-check sources and background counts, replicate and spiked sample analyses, use of matrix and reagent blanks, and maintenance of control charts to indicate analytical deficiencies.

Examples of independent QC programs are the Mixed Analyte Performance Evaluation Program (MAPEP), which is conducted twice a year,and the DOE Consolidated Audit Program (DOECAP), which is conducted annually..

12.5.1 Analytical Quality Assurance and Quality Control

In 2016, Hanford Site Environmental Surveillance samples were sent to two laboratories (GEL and TARL). These laboratories participated in various independent QA and QC programs including MAPEP and DOECAP. These managed programs use standardized audit methods, processes, and procedures to ensure the validity, reliability, and defensibility of data annually from the contract laboratories. MAPEP results for GEL and TARL are presented in Tables 12-5 and 12-6, respectively.

Table 12-5. 2016 DOE Mixed Analyte Performance Evaluation Program Results for General Engineering Laboratories, LLC.

Environmental Sample Media and Analytes		MAPEP 34 Series June 2016 [a]	MAPEP 35 Series December 2016 [a]
Radionuclides			
Air Filters	Alpha (gross), beta (gross), americium-241, cesium-134, cesium-137, cobalt-60, plutonium-238, plutonium-239/-240, strontium-90, uranium-234/233, uranium-235, uranium-238	Strontium-90 [b]	Strontium-90 [b]
Water	Alpha (gross), beta (gross), americium-241, cesium-134, cesium-137, cobalt-60, iodine-129 plutonium-238, plutonium-239/-240, potassium-40, strontium-90, technetium-99, tritium, uranium-234/233, uranium-238	100% Acceptable	100% Acceptable
Vegetation	Americium-241, cesium-134, cesium-137, cobalt-60, plutonium-238, plutonium-239/-240, strontium-90, uranium-234/233, uranium-238	100% Acceptable	Strontium-90 [b]
Soil	Americium-241, cesium-134, cesium-137, colbalt-60, potassium-40, plutonium-238, plutonium-239/-240, strontium-90, technetium-99	100% Acceptable	100% Acceptable
Inorganic Compounds			
Water	Antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, zinc	100% Acceptable	Mercury [b]

[a] Performance results 100% acceptable for all analytes reported to Public Safety and Resource Protection Program unless otherwise noted.
[b] Result is acceptable but was issued a warning for having a bias between 20% and 30%.

MAPEP = Mixed Analyte Performance Evaluation Program

Table 12-6. DOE Mixed Analyte Performance Evaluation Program Results for TestAmerica Richland Laboratory.

Environmental Sample Media and Analytes		MAPEP 34 Series June 2016 [a]	MAPEP 35 Series December 2016 [a]
Radionuclides			
Air Filters	Alpha (gross), beta (gross), americium-241, cesium-134, cesium-137, cobalt-60, plutonium-238, plutonium-239/-240, strontium-90, uranium-234/233, uranium-238	Plutonium-238 [b]	Cesium-134 [c] Cesium-137 [c] Cobalt-60 [c] Plutonium-238 [c] Plutonium-239/-240 [c] Strontium-90 [c] Uranium-234/233 [c] Uranium-238 [c]
Water	Alpha (gross), beta (gross), americium-241, cesium-134, cesium-137, cobalt-60, iodine-129 plutonium-238, plutonium-239/-240, potassium-40, strontium-90, technetium-99, tritium, uranium-234/-233, uranium-238	Americium-241 [d] Technetium-99 [d]	Technetium-99 [b] Uranium-238 [c] Strontium-90 [d]
Vegetation	Americium-241, cesium-134, cesium-137, cobalt-60, plutonium-238, plutonium-239/-240, strontium-90, uranium-234/-233, uranium-238	100% Acceptable	NA
Soil	Americium-241, cesium-134, cesium-137, colbalt-60, potassium-40, plutonium-238, plutonium-239/-240, strontium-90, technetium-99	Plutonium-239/240 [c] Technetium-99 [d]	Cesium-137 [b]

[a] Performance results 100% acceptable for all analytes reported to Public Safety and Resource Protection Program unless otherwise noted.
[b] Result is acceptable but was issued a warning for having a bias between 20% and 30%.
[c] Result not acceptable; bias >30%.
[d] Result not acceptable; false positive.

MAPEP = Mixed Analyte Performance Evaluation Program

12.5.2 Laboratory Performance Evaluation and Proficiency Testing

Participation of Hanford Site analytical laboratories in DOE and U.S. Environmental Protection Agency (EPA) laboratory performance evaluation programs serves to ensure data quality. Hanford Site environmental monitoring contract laboratories participate in MAPEP-sanctioned proficiency testing provided by an independent laboratory (e.g., Environmental Resource Associates).

DOE's MAPEP provides critical QA testing for environmental analytical services. Radiological and non-radiological (organic and inorganic) constituents are evaluated by performing semiannual proficiency testing of the Hanford Site DOE laboratories and other federal, state, commercial, and international laboratories. MAPEP proficiency tests help to ensure the accuracy of analytical results reported to DOE and other stakeholders, while also providing an efficient means for laboratories to demonstrate analytical proficiency. Results to past MAPEP studies can be found on the DOE's Mixed Analyte Performance Evaluation Program webpage at http://www.id.energy.gov/resl/mapep/mapepreports.html.

GEL's MAPEP program radiological results were issued warnings for biased strontium-90 results in the 20 to 30% range. However, these results are considered acceptable. Therefore, GEL's radiological MAPEP results are 100% acceptable for studies 34 and 35 in 2016 for air, water, soil, and vegetation.

GEL's MAPEP results for inorganic compounds in water were issued a warning for mercury in MAPEP study 35. However, this is considered an acceptable result. Therefore, GEL's inorganic MAPEP results are 100% acceptable. Results of MAPEP studies 34 and 35 for GEL are provided in Table 12-5 or at http://www.id.energy.gov/resl/mapep/mapepreports.html.

TARL's MAPEP program radiological results for studies 34 and 35 in 2016 received warnings for plutonium-238 in air and technetium-99 in water. However, these results are considered acceptable. TARL had unacceptable results for technetium-99, strontium-90, and americium-241 due to false positive results. Additionally, TARL had numerous unacceptable results due to bias greater than 30%. Most of these high bias results were from the air filter sample in study 35 and could be due to an anomaly associated with that specific sample. For additional details of the TARL MAPEP results for studies 34 and 35 please see Table 12-6 or the full reports at http://www.id.energy.gov/resl/mapep/mapepreports.html.

12.6 Data Recording and Data Management

Record keeping is a vital part of all environmental programs on the Hanford Site. Maintenance of environmental data is essential for QA, regulatory compliance, trend analysis, and optimization purposes. The Environmental Surveillance program is responsible for ensuring that analytical data are appropriately reviewed, managed, and stored in accordance with applicable programmatic requirements governing data management procedures. Project documentation includes environmental sample logbooks and processing forms, and, as applicable, monthly, quarterly, and annual occurrence reports. Several electronic data repositories are used to house the environmental data, all of which have their own internal QA and QC policies and procedures.