8.0 Quality Assurance

B. M. Gillespie

Quality assurance and quality control practices encompass all aspects of Hanford Site environmental monitoring and surveillance programs. Samples are collected and analyzed according to documented standard analytical procedures. Analytical data quality is verified by a continuing program of internal laboratory quality control, participation in interlaboratory crosschecks, replicate sampling and analysis, submittal of blind standard samples and blanks, and splitting samples with other laboratories.

Quality assurance/quality control for the Hanford Site environmental monitoring program also includes procedures and protocols for 1) documenting instrument calibrations, 2) conducting program-specific activities in the field, 3) maintaining wells to ensure representative samples are collected, and 4) using dedicated well sampling pumps to avoid crosscontamination.

This section discusses specific measures taken to ensure quality in project management, sample collection, and analytical results.

8.0.1 Environmental Surveillance and Groundwater Monitoring

Comprehensive quality assurance programs, including various quality control practices, are maintained to ensure the quality of data collected through the Surface Environmental Surveillance Project and the Hanford Groundwater Monitoring Project. Quality assurance plans are maintained for all program activities and define the appropriate controls and documentation required by the U.S. Environmental Protection Agency (EPA) and/or the U.S. Department of Energy (DOE) for the project-specific requirements.

8.0.1.1 Project Management Quality Assurance

Site environmental surveillance, groundwater monitoring, and related programs such as processing of thermoluminescent dosimeters and performing dose calculations are subject to an overall quality assurance program. This program implements the requirements of DOE Order 5700.6C.

The site surveillance and groundwater monitoring projects have quality assurance plans that describe the specific quality assurance elements that apply to each project. These plans are approved by a quality assurance organization that conducts surveillances and audits to verify compliance with the plans. Work performed through contracts such as sample analysis must meet the same quality assurance requirements. Potential equipment and services suppliers are audited before service contracts or material purchases that could have a significant impact on quality within the project are approved and awarded.

8.0.1.2 Sample Collection Quality Assurance / Quality Control

Surface Environmental Surveillance Project samples are collected by staff trained to conduct sampling according to approved and documented procedures (PNL-MA-580, Rev. 2). Continuity of all sampling location identities is maintained through careful

documentation. Field duplicates are collected for specific media and a summary of the results is provided in Table 8.0.1. The percentage of acceptable field duplicate results for 1998 was very high at 91%.

Samples for the Hanford Groundwater Monitoring Project are collected by trained staff according to approved and documented procedures (ES-SSPM-001). Chain-of-custody procedures are followed (SW-846) that provide for the use of evidence tape in sealing sample bottles to maintain the integrity of the samples during shipping. Full trip blanks and field duplicates are obtained during field operations. Summaries of the 1998 groundwater field quality control sample results are provided in Appendix D of PNNL-12086. The percentages of acceptable field blank and duplicate results in fiscal year 1998 were very high, 93% for blanks and 95% for field duplicates.

8.0.1.3 Analytical Results Quality Assurance / Quality Control

Routine hazardous and nonhazardous chemical analyses for environmental and groundwater surveillance and monitoring water samples are performed primarily by the Quanterra Laboratory, St. Louis, Missouri. Some routine analyses of hazardous and nonhazardous chemicals for the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) groundwater program were also performed by Recra Environmental, Inc., Lionsville, Pennsylvania. Each laboratory participates in the EPA Water Pollution and Water Supply Performance Evaluation Studies. Each laboratory maintains an internal quality control program that meets the requirements in SW-846, which is audited and reviewed internally and by Pacific Northwest

Table 8.0.1. Summary of Surface Environmental Surveillance Project Field Duplicate Results, 1998

Medium	Radionuclides	Number of Results Reported	Number Within Control Limits[a]
Air filters	Gross alpha	28	24
	Gross beta	28	27
	^{3}H	13	8
	^{7}Be, ^{40}K, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	36	36
Water	Gross alpha	1	0
	Gross beta	1	1
	^{3}H	2	2
	^{7}Be, ^{40}K, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	9	9
	^{90}Sr	3	3
	^{99}Tc	1	1
	^{234}U, ^{235}U, ^{238}U	3	3
Milk	^{40}K	2	0
	^{7}Be, ^{60}Co, ^{106}Ru, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{154}Eu, ^{155}Eu	16	16

(a) Control limit of ±30% for sample and duplicate results above the detection limit or minimum detectable concentration.

National Laboratory. Pacific Northwest National Laboratory submits additional quality control double-blind spiked samples for analysis.

Routine radiochemical analyses on samples for the Surface Environmental Surveillance Project and the Hanford Groundwater Monitoring Project are performed primarily by Quanterra's Richland, Washington laboratory. Data from Thermo NUtech, Richmond, California were also used in the fiscal year 1998 groundwater evaluations. Each laboratory participates in DOE's Quality Assessment Program, Environmental Measurements Laboratory, New York, and EPA's Laboratory Intercomparison Studies at the National Exposure Research Laboratory, Characterization Research Division, Las Vegas, Nevada. An additional quality control blind spiked sample program is conducted for each project. Each laboratory also maintains an internal quality control program, which is audited and reviewed internally and by Pacific Northwest National Laboratory. Additional information on these quality control efforts is provided in the following sections.

8.0.1.4 DOE and EPA Comparison Studies

Standard water samples are distributed blind to participating laboratories. These samples contain specific organic and inorganic analytes that have concentrations unknown to the analyzing laboratories. After analysis, the results are submitted to the EPA for comparison with known values and results from other participating laboratories. Summaries of the results for 1998 are provided in Table 8.0.2 for the primary laboratory, Quanterra, St. Louis, Missouri. The percentage of EPA-acceptable results is high for the laboratory, indicating acceptable performance.

The DOE Quality Assessment Program and EPA's Laboratory Intercomparison Studies provide standard samples of environmental media (e.g., water, air filters, soil, vegetation) that contain specific amounts of one or more radionuclides that were unknown by the participating laboratory. After analysis, the results are forwarded to DOE or EPA for

Table 8.0.2. Summary of Performance on EPA Water Pollution and Water Supply Studies, 1998

Laboratory	Water Supply Study March 1998 % Acceptable	Water Pollution Study May 1998 % Acceptable	Water Supply Study September 1998 % Acceptable	Water Pollution Study November 1998 % Acceptable
Quanterra Laboratory, St. Louis, Missouri	94[a]	95[b]	91[c]	83[d]

(a) Unacceptable results were for vinyl chloride, 1,1-dichloroethylene, dichloromethane, and pH.
(b) Unacceptable results were for total hardness, nitrate-nitrogen, orthophosphate, and oil and grease.
(c) Unacceptable results were for orthophosphate, bromoform, chlorodibromomethane, total trihalomethane, dichloromethane, and total cyanide.
(d) Unacceptable results were for alkalinity, nitrogen (Kjeldahl), polychlorinated biphenyl in oil 1016/1232, polychlorinated biphenyl in oil 1254, benzene, ethylbenzene, toluene, 1,2-dichlorobenzen, 1,4-dichlorobenzen, and total phenolics.

comparison with known values and results from other laboratories. Both DOE and EPA have established criteria for evaluating the accuracy of results (EPA-600/4-81-004, EML-596, EML-600). Summaries of the 1998 results are provided in Tables 8.0.3 and 8.0.4.

Table 8.0.3. Summary of Performance on DOE Quality Assessment Program Samples, 1998

Medium	Radionuclides	Number of Results Reported for Each Analyte	Number Within Acceptable Control Limits[a]
Quanterra Environmental Services, Richland, Washington			
Air filter particulate	^{54}Mn, ^{60}Co, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, gross alpha, gross beta, total uranium	2	2
	^{57}Co, ^{134}Cs, ^{144}Ce, total uranium	1	1
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}U, ^{239}Pu, ^{241}Am, total uranium	2	2
	^{208}Tl, ^{210}Pb, ^{212}Bi, ^{212}Pb, ^{214}Bi, ^{214}Pb, ^{226}Ra, ^{228}Ac, ^{228}Th, ^{234}Th, ^{238}Pu, total uranium	1	1
Vegetation	^{241}Am, ^{244}Cm	2	2
	^{90}Sr	1	1
Water	^{3}H, ^{54}Mn, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu, ^{241}Am, gross alpha, gross beta, total uranium	2	2
	Total uranium	1	1
Thermo NUtech, Richmond, California			
Water	^{55}Fe, ^{234}U, ^{238}U, ^{241}Am, gross alpha, gross beta, total uranium	2	2
	^{54}Mn, ^{60}Co, ^{137}Cs, ^{238}Pu, ^{239}Pu	2	1
	^{3}H, ^{63}Ni	1	1

(a) Control limits are from EML-596 and EML-600.

Table 8.0.4. Summary of Performance on EPA Laboratory Intercomparison Studies Samples, 1998

Medium	Radionuclides	Number of Results Reported for Each Analyte	Number Within Control Limits for Each Analyte[a]
Quanterra Environmental Services, Richland, Washington			
Water	^{3}H, ^{65}Zn, ^{131}I, ^{133}Ba	2	2
	^{89}Sr, ^{90}Sr	3	3
	^{137}Cs	4	4
	^{134}Cs	4	3
	Gross alpha, gross beta, ^{226}Ra, ^{228}Ra, total uranium	5	5
Thermo NUtech, Richmond, California			
Water	^{3}H	1	1
	^{65}Zn, ^{131}I, ^{133}Ba	2	2
	^{60}Co, ^{89}Sr, ^{90}Sr, ^{134}Cs, ^{137}Cs, ^{226}Ra, ^{228}Ra, total uranium	4	4
	Gross alpha, gross beta	5	5

(a) Control limits are from EPA-600/4-81-004.

8.0.1.5 Pacific Northwest National Laboratory Evaluations

In addition to DOE and EPA interlaboratory quality control programs, Pacific Northwest National Laboratory maintains a quality control program to evaluate analytical contractor precision and accuracy and to conduct special intercomparisons. This program includes the use of blind spiked samples. Blind spiked quality control samples and blanks were prepared and submitted to check the accuracy and precision of analyses at Quanterra. In 1998, blind spiked samples were submitted for groundwater (Table 8.0.5) and for air filters, vegetation, soil, and surface water (Table 8.0.6). For all water samples, 72% of nonradiochemistry blind spiked determinations were within control limits (see discussion of results in Appendix D of PNNL-12086). For all media, 92% of Quanterra's radiochemistry blind spiked determinations were within control limits, which indicates acceptable results.

Pacific Northwest National Laboratory also participates in a Quality Assurance Task Force, a program conducted by the Washington State Department of Health. Public and private organizations from Idaho, Oregon, and Washington participate in analyzing the intercomparison samples. Samples from a Hanford Site well were collected for the 1998 intercomparison sample exchange. Ten of the Quality Assurance Task Force participants analyzed the sample.

The intercomparison sample was chosen to be representative of the type of sample that may be

Table 8.0.5. Summary of Hanford Groundwater Monitoring Project Double-Blind Spike Determinations, 1998[a]

Constituent	Number of Results Reported[b]	Number Within Control Limits[c]	Control Limits, %
General Chemical Parameters			
Total organic carbon spiked with potassium phthalate	15	8	±25
Total organic halides spiked with 2,4,6-trichlorophenol	14	11	±25
Total organic halides spiked with carbon tetrachloride, chloroform, and trichloroethene	14	7	Determined each quarter
Ammonia and Anions			
Cyanide	12	3	±25
Fluoride	12	9	±25
Nitrate	12	12	±25
Volatile Organic Compounds			
Carbon tetrachloride	12	10	Determined each quarter
Chloroform	12	8	Determined each quarter
Trichloroethene	12	11	Determined each quarter
Metals			
Chromium	12	12	±20
Radiological Parameters			
Gross alpha (spiked with ^{239}Pu)	12	10	±25
Gross beta (spiked with ^{90}Sr)	13	9	±25
Cobalt-60	12	12	±30
Strontium-90	12	12	±30
Technetium-99	12	12	±30
Iodine-129	12	12	±30
Cesium-137	12	12	±30
Plutonium-239,240	12	10	±30
Tritium	12	12	±30
Uranium	12	12	±30

(a) The Hanford Groundwater Monitoring Project reporting requirements are by fiscal year (October 1 through September 30).
(b) Blind standards were submitted in triplicate or quadruplicate each quarter and compared to actual spike values.
(c) Quality control limits are given in the Hanford Groundwater Monitoring Project's quality assurance plan.

Table 8.0.6. Summary of Surface Environmental Surveillance Project Blind Spiked Determinations, 1998

Medium	Radionuclides	Number of Results Reported	Number Within Control Limits[a]
Air filters	^{54}Mn, ^{60}Co, ^{90}Sr, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce, ^{238}Pu, ^{239}Pu, ^{241}Am	16	11
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{234}U, ^{238}U, ^{238}Pu, ^{239}Pu	13	11[b]
Surface water	^{3}H, ^{54}Mn, ^{60}Co, ^{90}Sr, ^{134}Cs, ^{137}Cs, ^{234}U, ^{238}Pu, ^{238}U, ^{239}Pu	18	18
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{238}Pu, ^{239}Pu	9	9

(a) Control limit of ±30%.
(b) Uranium isotopic results were determined using a different preparation method than was used to determine the standard value.

encountered in this region. The sample was analyzed for gross alpha, gross beta, technetium-99, tritium, iodine-129, uranium alpha-emitting isotopes, and total uranium. Table 8.0.7 provides the Pacific Northwest National Laboratory results with respect to the grand mean of the study. The results fell within the ±2 standard error of the mean of the concentration of the other participating laboratories and were acceptable, except for the gross beta results. The sample for gross beta was reanalyzed by the laboratory, but the difference in the results between the grand mean and the laboratory remains unresolved.

8.0.1.6 Laboratory Internal Quality Assurance Programs

The analyzing laboratories are required to maintain an internal quality assurance and control program. Periodically, the laboratories are audited internally for compliance to the quality assurance and control programs. At Quanterra St. Louis, the quality control programs meet the quality assurance and control criteria in SW-846. The laboratories are also required to maintain a system for reviewing and analyzing the results of the quality control samples to detect problems that may arise from contamination, inadequate calibrations, calculation errors, or improper procedure performance. Method detection levels are determined at least annually for each analytical method.

The internal quality control program at Quanterra Richland involves routine calibrations of counting instruments, yield determinations of radiochemical procedures, frequent radiation check sources and background counts, replicate and spiked sample analyses, matrix and reagent blanks, and maintenance of control charts to indicate analytical deficiencies. Available calibration standards traceable to the National Institute of Standards and Technology are used for radiochemical calibrations. Calculation of minimum detectable activities involves the use of factors such as the average counting efficiencies and background for detection instruments, length of time for background and sample counts, sample volumes, radiochemical yields, and a predesignated uncertainty multiplier (EPA 520/1-80-012).

Periodically, inspections of services are performed, which document conformance with contractual requirements of the analytical facility and provide the framework for identifying and resolving

Table 8.0.7. Comparison[a] of the Quality Assurance Task Force Intercomparison Well Water Sample, 1998

Radionuclide	Number of Sample Results	Intercomparison Sample Concentration, pCi/L
Gross Alpha		
Grand mean	21	129 ± 41
PNNL (Quanterra)	2	122 ± 17
Gross Beta		
Grand mean	21	993 ± 311
PNNL (Quanterra)	2	390 ± 3
Tritium		
Grand mean	22	587 ± 86
PNNL (Quanterra)	1	433 ± 223[b]
Technetium-99		
Grand mean	18	1,831 ± 252
PNNL (Quanterra)	2	1,470 ± 113
Iodine-129		
Grand mean	7	1.8 ± 2.1
PNNL (Quanterra)	1	-0.06 ± 0.3[b]
Total Uranium		
Grand mean	13	183 ± 36
PNNL (Quanterra)	1	158 ± 51[b]
Uranium-234		
Grand mean	12	85 ± 10
PNNL (Quanterra)	1	78 ± 12[b]
Uranium-235		
Grand mean	14	5 ± 1
PNNL (Quanterra)	1	3 ± 1[b]
Uranium-238		
Grand mean	14	84 ± 11
PNNL (Quanterra)	1	79 ± 12[b]

(a) Pacific Northwest National Laboratory (PNNL) analyses by Quanterra, Richland, Washington, are compared against grand mean (±2 standard error of the mean) of all participating laboratories.
(b) ±2 sigma total analytical uncertainty.

potential performance problems. Responses to assessment and inspection findings are documented by written communication, and corrective actions are verified by follow-up audits and inspections. Assessments of Quanterra St. Louis and Quanterra Richland were conducted in 1998 by the Hanford Site's Integrated Contractor Assessment Team, consisting of representatives from Bechtel Hanford, Inc., Pacific Northwest National Laboratory, and Waste Management Federal Services of Hanford, Inc. The purpose of the assessment of services was to evaluate the continued capability of the laboratories to analyze and process samples for the Hanford Site as specified in the statement of work between the DOE contractors and the laboratories.

Internal laboratory quality control program data are summarized by the laboratories in monthly or quarterly reports. The results of the quality control sample summary reports and the observations noted by each laboratory indicated an acceptably functioning internal quality control program.

8.0.1.7 Media Audits and Comparisons

Additional audits and comparisons are conducted on several specific types of samples. The Washington State Department of Health routinely cosampled various environmental media and measured external radiation levels at multiple locations during 1998. Media that were cosampled and analyzed for radionuclides included groundwater from 32 wells, water from 11 Columbia River locations along and across the river, water from 5 riverbank springs, water from 2 onsite drinking water locations, sediment from 9 Columbia River sites, surface soil samples from 4 locations, samples from 3 air monitoring stations, thermoluminescent dosimeters from 14 sites, pheasant, deer, and carp. Also cosampled and analyzed for radionuclides were upwind and downwind samples of leafy vegetables, fruit, perennial vegetation, potatoes, and wine. Results will be published in the Washington State Department of Health 1998 annual report.

The U.S. Food and Drug Administration also cosampled and analyzed sugar beets, cabbage, and potatoes for radionuclides from upwind and downwind sampling locations. The data are presented in Table 8.0.8.

Quality control for environmental thermoluminescent dosimeters includes the audit exposure of three environmental thermoluminescent dosimeters per quarter to known values of radiation (between 17 and 28 mR). A summary of 1998 results is shown in Table 8.0.9. On average, the thermoluminescent dosimeter measurements were biased 1.6% higher than the known values.

8.0.2 Effluent Monitoring and Near-Facility Environmental Monitoring

The Effluent Monitoring and Near-Facility Environmental Monitoring Programs are subject to the quality assurance requirements specified in the Hanford Analytical Services Quality Assurance Requirements Document (DOE/RL-96-68). These quality assurance programs comply with DOE Order 5700.6C, using standards from the American Society of Mechanical Engineers (ASME NQA-1-1997 Edition) as their basis. The programs also adhere to the guidelines and objectives in EPA/005/80 and EPA QA/R-5.

The monitoring programs each have a quality assurance project plan describing applicable quality assurance elements. These plans are approved by contractor quality assurance groups, who conduct surveillances and audits to verify compliance with

Table 8.0.8. Comparison of U.S. Food and Drug Administration Cosampling, 1998

Medium	Area[a]	Organization	Potassium-40, pCi/g[b]	Strontium-90, pCi/g[b,c]	Cesium-137, pCi/g[b,c]	Ruthenium-106, pCi/g[c]
Leafy vegetables	Riverview	FDA[d]	3.6 ± 1.1	0.0038 ± 0.0012	<0.01	<0.01
		PNNL[e]	œ4.4 ± 0.49	0.021 ± 0.0042	0.0055 ± 0.0043	<0.038
	Sunnyside	FDA	2.7 ± 0.8	0.0043 ± 0.0011	<0.01	<0.01
		PNNL	1.2 ± 0.31	<0.0045	<0.0081	<0.071
Potatoes	Sunnyside	FDA	6.0 ± 0.8	<0.002	<0.01	<0.01
		PNNL	3.8 ± 0.51	<0.0034	0.011 ± 0.0086	<0.079

(a) Locations are identified in Figure 4.4.1.
(b) ±2 sigma total propagated analytical uncertainty.
(c) < values are ±2 sigma total propagated analytical uncertainties.
(d) FDA = U.S. Food and Drug Administration.
(e) PNNL = Pacific Northwest National Laboratory.

Table 8.0.9. Comparison of Thermoluminescent Dosimeter Results with Known Exposure, 1998

Quarter/ Exposure		Known Exposure, mR[a]	Determined Exposure, mR[b]	Determined/ Known Exposure, %
1st	February 17, 1998	19 ± 0.70	19.88 ± 1.12	105
	February 17, 1998	24 ± 0.89	23.69 ± 0.25	99
	February 17, 1998	26 ± 0.96	26.66 ± 0.02	103
2nd	May 15, 1998	17 ± 0.63	16.60 ± 0.39	98
	May 15, 1998	20 ± 0.74	19.70 ± 0.15	99
	May 15, 1998	27 ± 1.00	26.89 ± 0.29	100
3rd	August 17, 1998	21 ± 0.78	20.69 ± 0.24	99
	August 17, 1998	25 ± 0.93	25.39 ± 0.80	102
	August 17, 1998	28 ± 1.04	28.99 ± 1.50	104
4th	November 13, 1998	17 ± 0.63	17.51 ± 0.71	103
	November 13, 1998	22 ± 0.81	22.63 ± 0.68	103
	November 13, 1998	26 ± 0.96	27.05 ± 0.73	104

(a) ±2 sigma total propagated analytical uncertainty.
(b) ±2 times the standard deviation.

the plans. Work such as sample analysis performed through contracts must meet the requirements of these plans. Suppliers are audited before the contract selection is made for equipment and services that may significantly impact the quality of a project.

8.0.2.1 Sample Collection Quality Assurance

Samples for the Effluent Monitoring and Near-Facility Environmental Monitoring Programs are collected by staff trained for the task in accordance with approved procedures. Established sampling locations are accurately identified and documented to ensure continuity of data for those sites and are described in DOE/RL-91-50, Rev. 2.

8.0.2.2 Analytical Results Quality Assurance

Samples for the Effluent Monitoring and Near-Facility Environmental Monitoring Programs are analyzed by two different analytical laboratories. The use of these laboratories depends on the Hanford contractor collecting the samples and contract(s) established between the contractor and the analytical laboratory(s). Table 8.0.10 provides a summary of the Hanford Site's analytical laboratories used for effluent monitoring and near-facility monitoring samples.

The quality of the analytical data is ensured by several means. Counting room instruments, for

Table 8.0.10. Hanford Site Laboratories Used by Contractor and Sample Type, 1998

	Effluent Monitoring Samples					Near-Facility Environmental Monitoring Samples		
	Fluor Daniel Hanford, Inc.		Pacific Northwest National Laboratory	Bechtel Hanford, Inc.		Fluor Daniel Hanford, Inc.		
Analytical Laboratory	Air	Water	Air	Air	Water	Air	Water	Other
Waste Sampling and Characterization Facility[a]	X	X		X	X	X	X	X
222-S Analytical Laboratory[a]								X
Quanterra Environmental Services, Richland	X	X	X	X	X			
Analytical Chemistry Laboratory[b]	X	X	X					

(a) Operated by Waste Management Federal Services of Hanford, Inc.
(b) Operated by Pacific Northwest National Laboratory.

instance, are kept within calibration limits through daily checks, the results of which are stored in computer databases. Radiochemical standards used in analyses are regularly measured and the results are reported and tracked. Formal, written, laboratory procedures are used in analyzing samples. Analytical procedural control is ensured through administrative procedures. Chemical technologists at the laboratory qualify to perform analyses through formal classroom and on-the-job training.

The participation of the Hanford Site analytical laboratories in DOE and EPA laboratory intercomparison programs also serves to ensure the quality of the data produced. Laboratory intercomparison program results for 1998 can be found in Tables 8.0.11 through 8.0.14 for the Waste Sampling and Characterization Facility and the 222-S Analytical Laboratory. Laboratory intercomparison results for Quanterra were previously provided in Tables 8.0.3 and 8.0.4.

Table 8.0.11. Waste Sampling and Characterization Facility[(a)] Performance on DOE Quality Assessment Program Samples, 1998

Medium	Radionuclide	Number of Results Reported	Number Within Control Limits
Air filters	^{54}Mn, ^{57}Co, ^{60}Co, ^{90}Sr, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce, ^{238}Pu, ^{239}Pu, ^{241}Am, total uranium	27	26
Soil	^{40}K, ^{90}Sr, ^{137}Cs, ^{234}U, ^{239}Pu, ^{241}Am	12	11
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	14	14
Water	^{3}H, ^{54}Mn, ^{60}Co, ^{90}Sr, ^{134}Cs, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{241}Am, total uranium	24	23

(a) Onsite laboratory operated by Waste Management Federal Services of Hanford, Inc.

Table 8.0.12. 222-S Analytical Laboratory[(a)] Performance on DOE Quality Assessment Program Samples, 1998

Medium	Radionuclide	Number of Results Reported	Number Within Control Limits
Air filters	^{54}Mn, ^{57}Co, ^{60}Co, ^{90}Sr, ^{125}Sb, ^{134}Cs, ^{137}Cs, ^{144}Ce, ^{238}Pu, ^{239}Pu, ^{241}Am, total uranium	23	21
Soil	^{40}K, ^{90}Sr, ^{137}Cs	6	4
Vegetation	^{40}K, ^{60}Co, ^{90}Sr, ^{137}Cs, ^{239}Pu, ^{241}Am, ^{244}Cm	14	12
Water	^{3}H, ^{54}Mn, ^{60}Co, ^{90}Sr, ^{134}Cs, ^{137}Cs, ^{238}Pu, ^{239}Pu, ^{241}Am, total uranium	18	15

(a) Onsite "high-level" radiological laboratory operated by Waste Management Federal Services of Hanford, Inc. (Note: these samples are "low-level" environmental activity samples.)

Table 8.0.13. Waste Sampling and Characterization Facility[(a)] Performance on EPA Laboratory Intercomparison Studies Samples, 1998

Category	Radionuclide	Number of Results Reported	Number Within Control Limits
Gross alpha-beta in water	Gross alpha	4	4
Gamma in water	^{60}Co, ^{65}Zn, ^{133}Ba, ^{134}Cs, ^{137}Cs	10	9
Uranium-radium in water	Uranium (natural)	9	8
Tritium in water	^{3}H	2	1
Blind A[(b)]	Gross alpha, uranium (natural)	8	7
Blind B[(c)]	Gross beta, ^{60}Co, ^{134}Cs, ^{137}Cs	8	7

(a) Onsite laboratory operated by Waste Management Federal Services of Hanford, Inc.
(b) Blind A samples are liquid samples with unknown quantities of alpha emitters analyzed for gross alpha and each radionuclide component.
(c) Blind B samples are liquid samples with unknown quantities of beta emitters analyzed for gross beta and each radionuclide component.

Table 8.0.14. 222-S Analytical Laboratory[(a)] Performance on EPA Laboratory Intercomparison Studies Samples, 1998

Category	Radionuclide	Number of Results Reported	Number Within Control Limits
Gamma in water	^{60}Co, ^{65}Zn, ^{133}Ba, ^{134}Cs, ^{137}Cs	10	8
Gross alpha-beta in water	Gross alpha	1	1
Uranium-radium in water	Uranium (natural)	3	3
Tritium in water	^{3}H	2	2
Blind A[(b)]	Gross alpha, uranium (natural)	3	3
Blind B[(c)]	^{60}Co, ^{134}Cs, ^{137}Cs	3	3

(a) Onsite "high-level" radiological laboratory operated by Waste Management Federal Services of Hanford, Inc. (Note: these samples are "low-level" environmental activity samples.)
(b) Blind A samples are liquid samples with unknown quantities of alpha emitters analyzed for gross alpha and each radionuclide component.
(c) Blind B samples are liquid samples with unknown quantities of beta emitters analyzed for gross beta and each radionuclide component.

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