
QUALITY ASSURANCE

Quality Assurance Program

The quality assurance (QA) program at the West Valley Demonstration Project (WVDP or Project) provides for and documents consistency, precision, and accuracy in collecting and analyzing environmental samples and in interpreting and reporting environmental monitoring data. West Valley Nuclear Services Co. (WVNSCO), by contract with the United States (U.S.) Department of Energy (DOE), implements the QA program at the WVDP. Subcontractor laboratories providing analytical services for the environmental monitoring program are contractually required to maintain a QA program consistent with WVNSCO requirements.

The quality requirements of Title 10 Code of Federal Regulations Part 830, Subpart A, "Quality Assurance Requirements," Section 830.122, "Quality Assurance Criteria," and DOE Order 414.1A, "Quality Assurance" (DOE, 1999), provide the QA program policies and requirements applicable to activities at the WVDP. The WVDP QA program serves as an implementation process for meeting the DOE Order 450.1 requirement to provide "a consistent system for collecting, assessing, and documenting environmental data of known and documented quality." The integrated QA program also incorporates the requirements from the con-

sensus standard "Quality Assurance Program Requirements for Nuclear Facilities" (American Society of Mechanical Engineers NQA-1, 1989). Controlled documents specific to the WVDP are used to implement the integrated QA program. General areas addressed by the QA program include the following:

Responsibility. Responsibilities for overseeing, managing, and conducting an activity must be clearly defined. Personnel who verify that an activity has been completed correctly must be independent of those who performed it. Managers of programs, projects, and tasks at the WVDP are responsible for ensuring that QA requirements applicable to activities under their cognizance are implemented.

Planning. Work activities must be planned beforehand, the plan followed, and activities documented. Purchases of quality-affecting equipment or items must be planned, specified precisely, and verified for correctness upon receipt.

Training. Anyone performing an activity in support of the WVDP environmental monitoring program must be trained in the appropriate procedures and qualified accordingly before carrying out the activity.

Control of Design, Procedures, Items, and Documents. Any activity, equipment, or construction must be clearly described or defined and tested. Changes in the design must be tested and documented. Procedures must clearly state how activities will be conducted. New procedures must be developed each time an activity is added to the monitoring program. Procedures are reviewed periodically, updated when necessary, and are controlled so that only approved and current procedures are used.

Equipment or particular items affecting the quality of environmental data must be identified, inspected, calibrated, and tested before use. Calibration status must be clearly indicated. Items that do not conform to requirements must be identified as nonconforming and segregated so as to prevent inadvertent use.

Corrective Action. Conditions adverse to quality must be promptly identified, a corrective action planned, responsibility assigned, and the problem remedied.

Documentation. Records of all activities must be kept to verify what was done and by whom. Records must be clearly traceable to an item or activity. Records such as field data sheets, chain-of-custody forms, requests for analysis, sample shipping documents, sample logs, data packages, training records, and weather measurements, in addition to other records in both paper and electronic form, are maintained as documentation for the environmental monitoring program.

Audits and Assessments. Audits and assessments must be conducted to verify compliance with all aspects of the QA program and to determine its effectiveness. The WVDP environmental monitoring program is subjected to audits by external agencies and to internal management and self-assessments.

Quality Control

More than 9,000 environmental samples were collected and analyzed in 2005 as part of the WVDP environmental monitoring program. Quality control (QC), an integral part of QA, is used to ensure that samples are collected and analyzed in a consistent and repeatable manner. QC methods are applied both in the field and in the laboratory.

Field QC. Procedures are defined for collecting each type of sample, such as surface water, groundwater, soil, and air. Trained Environmental Laboratory (ELAB) field personnel collect the samples. Field sampling locations are clearly marked to ensure that routine samples are collected in the same location each time. Collection equipment that remains in the field is routinely inspected, calibrated, and maintained, and automated sampling stations are kept locked to prevent tampering. Samples are collected into certified pre-cleaned containers of an appropriate material and capacity. Containers are labeled with information about the sample, such as date and time of collection, sample collection personnel, and special field conditions. Collection information is documented and kept as part of the sample record.

Chain-of-custody documentation is maintained so as to trace sample possession from time of collection through analysis. Samples brought in from the field are transferred under signature to the sample custodian in the laboratory, where the samples are stored in a lockup before analysis or shipping. Samples sent off site for analysis are accompanied by an additional chain-of-custody form. Subcontract laboratories are required by contract to maintain internal chain-of-custody records and to store the samples under secure conditions.

Special field QC samples are collected and analyzed to assess the sampling process. Duplicate field samples are used to assess sample homoge-

neity and sampling precision. Field and trip blanks (laboratory-deionized water in sample containers) are used to detect contamination potentially introduced during sampling or shipping. Environmental background samples (samples of air, water, vegetation, venison, and milk taken from locations remote from the WVDP) are collected and analyzed to provide baseline information for comparison with on-site or near-site samples so that site influences can be evaluated.

Laboratory QC. In 2005, environmental monitoring samples were analyzed at several on-site and off-site laboratories. On-site analyses were conducted by the ELAB (radiological indicator parameters, gamma spectroscopy, strontium-90 in water, and field pH and conductivity), the Wastewater Treatment Facility Laboratory (total residual chlorine, pH, and settleable solids), and the Analytical and Process Chemistry Laboratory (A&PC, total dissolved solids).

During an internal review of the WVDP environmental monitoring program, it was determined that some key radiological water sample analyses, which are reported to the public, did not have updated and complete New York State Department of Health certifications.

Subsequently, in 2005, the ELAB initiated the process to become certified by the New York State Department of Health (NYSDOH) for gross alpha, gross beta, tritium, and gamma spectroscopy analyses in potable and nonpotable water. The ELAB also analyzes water samples for strontium-90 by the 3M Empore[®] Strontium Rad Disk method, for which no NYSDOH certification is available. Advantages of this method over the classical fuming nitric acid method are enhanced worker safety, waste minimization, simplicity of analysis, and rapid turnaround time. The Empore[®] Strontium Rad Disk method compared favorably in an evaluation of four strontium-90 analytical

methods performed by the Brookhaven National Laboratory (S. Scarpitta, J. Odin-McCabe, R. Gaschott, A. Meier, and E. Klug, 1999), and has been used by the ELAB since 1996. Analyses of DOE environmental crosscheck samples over this period have demonstrated acceptable results.

Off-site analyses were performed by General Engineering Laboratories (GEL, in Charleston, South Carolina) for multimedia radiochemical parameters and low-level mercury; Severn Trent Laboratories (STL, in Buffalo, New York) for chemical analyses; Lionville Laboratory, Inc. (LVLI, in Lionville, Pennsylvania) for chemical analysis of radiologically contaminated samples; Fruit Grower Laboratories (in Santa Paula, California) for analysis of biological contaminants in potable water; and Bechtel BWXT Idaho, LLC (at the Idaho National Laboratory) for environmental thermoluminescent dosimeters. Subcontract laboratories are required to maintain all relevant certifications, participate in applicable crosscheck programs, and maintain a level of QC as defined in their contracts with WVNSCO.

Laboratory QC practices specific to each analytical method are described in approved references or procedures. QC practices include proper training of analysts, maintaining and calibrating measuring equipment and instrumentation, and routinely processing laboratory QC samples such as standards and spikes (to assess method accuracy), duplicates and replicates (to assess precision), and blanks (to assess the possibility of contamination). Standard reference materials (materials with known quantities or concentrations of constituents of interest) traceable to the National Institute of Standards and Technology are used to calibrate counting and test instruments and to monitor their performance.

Independent Comparisons and Crosschecks. To allow for independent confirmation of environmental monitoring data, samples of air filters, wa-

ter, milk, fish, vegetation, and sediments are split or separately collected and sent to NYSDOH for measurement and independent reporting to the public. Locations at which co-located samples are taken are listed in Appendix B⁶⁰ of this report.

Crosscheck samples (performance evaluation samples) contain a quantity or concentration of a constituent of interest known to the agency conducting the crosscheck, but unknown to the participating laboratory. Crosscheck programs provide an additional means of testing accuracy of environmental measurements. Subcontract laboratories are required to perform satisfactorily on crosschecks, with satisfactory performance defined as having at least 80% of reported results falling within control limits. Crosscheck results that fall outside of control limits are addressed by formal corrective actions to determine any conditions that could adversely affect sample data and to ensure that actual sample results are reliable.

The WVDP participates in formal crosscheck programs for both radiological and nonradiological analyses.

Radiological Crosschecks. Organizations performing radiological analyses as part of effluent or environmental monitoring are encouraged by the DOE to participate in formal crosscheck programs to test the quality of environmental measurements being reported to the DOE by its contractors. Crosscheck samples for radiological constituents are analyzed on site by the ELAB and off site by GEL.

In 2005, the WVDP participated in the DOE Radiological Environmental Sciences Laboratory Mixed Analyte Performance Evaluation Program (MAPEP). Results are listed in Appendix J⁶⁰. A total of 73 radiological crosscheck analyses were performed by or for the WVDP. Of these results, 72 (98.6%) were within acceptance limits.

Nonradiological Crosschecks. As a New York State Pollutant Discharge Elimination System (SPDES) Permittee, the WVDP is required to participate in the U.S. Environmental Protection Agency Discharge Monitoring Report - Quality Assurance performance evaluation studies for the National Pollutant Discharge Elimination System. Samples from this program are analyzed both on site and by subcontract laboratories. To achieve and maintain certification to analyze environmental samples from the state of New York, subcontract analytical laboratories are contractually required to demonstrate evidence of satisfactory performance on samples provided by the NYSDOH Environmental Laboratory Approval Program (ELAP). In addition, subcontract laboratories performing nonradiological analyses of samples that contain radiological contamination participate in the DOE MAPEP program. This mixed analyte program provides performance evaluation samples for both radiological and nonradiological constituents.

In 2005, nonradiological crosschecks were analyzed by the WVDP Wastewater Treatment Facility Laboratory, the ELAB, LVLI, and STL. Results are summarized in Appendix J⁶⁰. A total of 115 nonradiological crosscheck analyses were performed by or for the WVDP. Of these results, a total of 111 (96.5%) were within acceptance limits.

Data Management

The Environmental Laboratory Information Management System (LIMS) is a database system used at the WVDP for establishing sample identification number, maintaining the sample data log, tracking samples, managing field and analytical data, and recording status and results of data validation. The LIMS is used as a controlled-source database for generating reports and statistical evaluations of data sets to support environmental

surveillance activities. Subcontract laboratories are requested to provide data in electronic format for direct entry into the LIMS by WVDP personnel.

All software packages used to generate data are verified and validated before use. All analytical data produced in the ELAB at the bench level are reviewed and signed off by a qualified person other than the one who performed the analysis. A similar in-house review is contractually required from subcontractor laboratories.

Data Verification and Validation

Data validation is the process by which analytical data from both on-site and off-site laboratories are reviewed to verify proper documentation of sample processing and data reporting, and to determine the quality and usability of the data. A graded approach is applied that, based upon data quality objectives, dictates the rigor of review of the documentation associated with sample collection and/or sample analysis. In the WVDP environmental program, each data point is validated per approved standard procedures before it is assigned approval status and made ready for data assessment.

Data Assessment and Reporting

Validated analytical data, field information, and historical project data are integrated and evaluated to determine whether the constituents of interest are actually present and, if so, at what concentrations. Data problems identified at this level are investigated and appropriately resolved.

Data from the environmental monitoring program are then evaluated to assess the effect, if any, of the site operations and activities on the environment and the public. Data from each sampling location are compared with historical results from

the same location, with comparable background measurements, and (if applicable) with regulatory limits or guidance standards. Standard statistical methods are used to evaluate the data.

Before each technical report is issued, the final document is comprehensively reviewed by one or more persons who are knowledgeable in the technical aspects of the work.

Audits, Appraisals, and Self-Assessments

No audits or assessments of the environmental monitoring program were completed by the U.S. Nuclear Regulatory Commission, the U.S. Environmental Protection Agency, or the DOE in 2005.

In 2005, the New York State Department of Environmental Conservation (NYSDEC) performed the annual Resource Conservation and Recovery Act hazardous waste inspection of the WVDP. No findings or concerns were identified.

NYSDEC visited the site two more times in 2005 to perform a SPDES inspection and to review Discharge Monitoring Report records. Commitments to study the lagoon 3 embankment integrity in response to inquiries during the first NYSDEC Division of Water visit were initiated and discussed during the second NYSDEC Division of Water visit. No deficiencies, issues, or additional actions were identified.

In 2005, as part of the DOE Consolidated Audit Program (DOECAP), a representative from the WVNSCO QA Department participated in DOECAP audits of two laboratories that analyze environmental samples for the WVDP. WVNSCO utilized results from two additional DOECAP audits for other laboratories that had analyzed samples for WVNSCO. In 2005, the WVNSCO QA Department conducted an audit of the WVDP

A&PC Laboratory concurrent with a NYSDOH ELAP inspection.

In 2005, WVNSCO QA also conducted several surveillances of activities and inspections of equipment pertaining to environmental management, safety, or monitoring. Topics addressed included waste shipping and disposal practices, procurement processes, spill control practices, fire protection, compliance with process safety requirements, testing of filter banks, and inspection of stack sampling systems. Results of all were satisfactory.

One routine self-assessment of the environmental monitoring program was conducted in 2005. Topics examined were the environmental monitoring program's conformance with federal, state, and sitewide policies and procedures and compliance with the NYSDOH ELAP protocols concerning collection and documentation of field samples. Although actions were recommended to improve some program aspects, nothing was found that would compromise the quality of the data in this report or the environmental monitoring program in general.

able data are reported. The effectiveness of the environmental monitoring program is evidenced by continuing favorable QA assessments.

Lessons Learned

Lessons learned data from audits, appraisals, and self-assessments are shared internally and externally through the WVDP lessons learned program. The WVDP maintains this system to promote the recurrence of desirable events and to minimize the recurrence of undesirable events.

Conclusion

The QA elements described in this chapter ensure that environmental monitoring data are consistent, precise, accurate, and complete. The multiple levels of scrutiny built into generating, verifying, validating, evaluating, and reporting data from the environmental monitoring program ensure that reli-