9 Quality Assurance

Quality assurance (QA) is an integral part of every activity at BNL. A comprehensive program is in place to ensure that all environmental monitoring data meet QA and quality control requirements. Samples are collected and analyzed in accordance with standard operating procedures that are designed to ensure that samples are representative and data are reliable and defensible. Quality control in the analytical laboratories is maintained through daily instrument calibration, efficiency and background checks, and testing for precision and accuracy. Data are verified and validated as required by project-specific quality objectives before they are used to support decision making. The multilayered components of QA monitored at BNL ensure that all analytical data reported for the 2003 Site Environmental Report are reliable and of high quality.

In 2003, BNL used the on-site Analytical Services Laboratory (ASL) and four off-site contractor laboratories to analyze environmental samples. All analytical laboratories were certified by New York State for the tests they performed for BNL and were subject to oversight that included state and national performance evaluation testing, review of QA programs, and audits. The ASL ceased performing nonradiological analyses on October 31, 2003. After that time, nonradiological samples were sent to off-site analytical laboratories for the remainder of the year.

The laboratories performing radiological analyses (BNL's ASL and two contract laboratories) each scored 95 percent or better in state and federal laboratory testing programs. BNL's "overall satisfactory" score in radiological testing was 95.9 percent. In nonradiological performance evaluation testing, BNL received an Acceptable rating of 96.1 percent and the off-site contractor laboratories scored between 95 percent and 98 percent Acceptable. For the 458 radiological and nonradiological performance evaluation tests carried out in 2003, BNL's combined "overall satisfactory" score was 95.9 percent.

9.1 QUALITY PROGRAM ELEMENTS

As required by DOE Order 450.1, Environmental Protection Program, BNL has established a Quality Assurance/Quality Control (QA/QC) Program to ensure that the accuracy, precision, and reliability of environmental monitoring data are consistent with the requirements of Volume 10 of the Code of Federal Regulations, Section 830 (10 CFR 830), Subpart A, Quality Assurance Requirements, and DOE Order 414.1A, Quality Assurance. The responsibility for quality at BNL starts with the Laboratory Director and extends throughout the entire organization. The purpose of the BNL Quality Management (QM) System is to implement QM methodology throughout the various BNL management systems and associated processes to:

- Plan and perform BNL operations in a reliable and effective manner to minimize any

impact on the health and safety of the public, Laboratory employees, and the environment
- Standardize processes and support continual improvement in all aspects of BNL operations
- Enable the delivery of products and services that meet or exceed our customers' requirements and expectations

For environmental monitoring, QA is deployed as an integrated system of management activities. These activities involve planning, implementation, control, reporting, assessment, and continual improvements. QC activities measure each process or service against the QA standards. QA/QC practices and procedures are documented in detail in manuals, plans, and a comprehensive set of standard operating procedures (SOPs) for environmental monitoring (EM-SOPs). Staff who must follow these procedures are required to document that they have reviewed and understand them.

The ultimate goal of the environmental monitoring and analysis QA/QC program is to ensure that results are representative and defensible, and that data are of the type and quality needed to verify protection of the public, Laboratory employees, and the environment. Figure 9-1 depicts the flow of the QA/QC elements of BNL's Environmental Monitoring Program and indicates the sections of this chapter that discuss each element in more detail.

BNL environmental personnel determine sampling requirements using the EPA Data Quality Objective (DQO) process or its equivalent. During this process, the project manager for each environmental program determines the type, amount, and quality of data needed to support decision making, legal requirements, and stakeholder concerns. An environmental monitoring plan or project-specific sampling plan is then prepared, specifying the location, frequency, type of sample, analytical methods to be used, and a sampling schedule. These plans or the SOPs also specify data acceptance criteria. Contracts with off-site analytical laboratories are established as necessary. Detailed SOPs direct sampling technicians on proper sample collection, preservation, and handling requirements. Field QC samples are prepared as necessary. Samples are analyzed in the field or at certified laboratories in accordance with SOPs. The results are then validated or verified in accordance with published procedures. Finally, data are reviewed and evaluated by environmental professionals and management in the context of expected results, related monitoring results, historical data, and applicable regulatory requirements (e.g., drinking water standards, permit limits, etc.). Data are then used to support decision making. Data are also reported as required and summarized in this annual report.

9.2 SAMPLE COLLECTION AND HANDLING

In 2003, environmental monitoring samples were collected as specified by SOPs, the BNL Environmental Monitoring Plan (2003a), and project-specific work plans, as applicable. For example, the BNL Groundwater Monitoring Program Quality Assurance Project Plan (BNL 1999a) describes the QA program and QC requirements followed for groundwater monitoring. This plan documents organizational structure, documentation requirements, sampling requirements, field QA/QC sample collection, acceptance criteria, sample custody requirements, data validation procedures, and general data handling/database procedures. Because almost half of all environmental monitoring samples collected for BNL are of groundwater, this chapter uses groundwater procedures for many of the examples.

BNL has sampling SOPs for all environmental media, including groundwater, surface water, soil, sediment, air, flora, and fauna. These procedures contain detailed information on how to prepare for sample collection; what type of field equipment to use and how to calibrate it; how to properly collect, handle, and preserve samples; and how to manage any wastes generated during sampling. The procedures ensure consistency between samples collected by BNL sampling personnel and samples collected by outside contractors in the environmental restoration, compliance, and surveillance programs.

QC checks of sampling processes include the collection of field duplicates, matrix spike samples, field blanks, trip blanks, and equip-

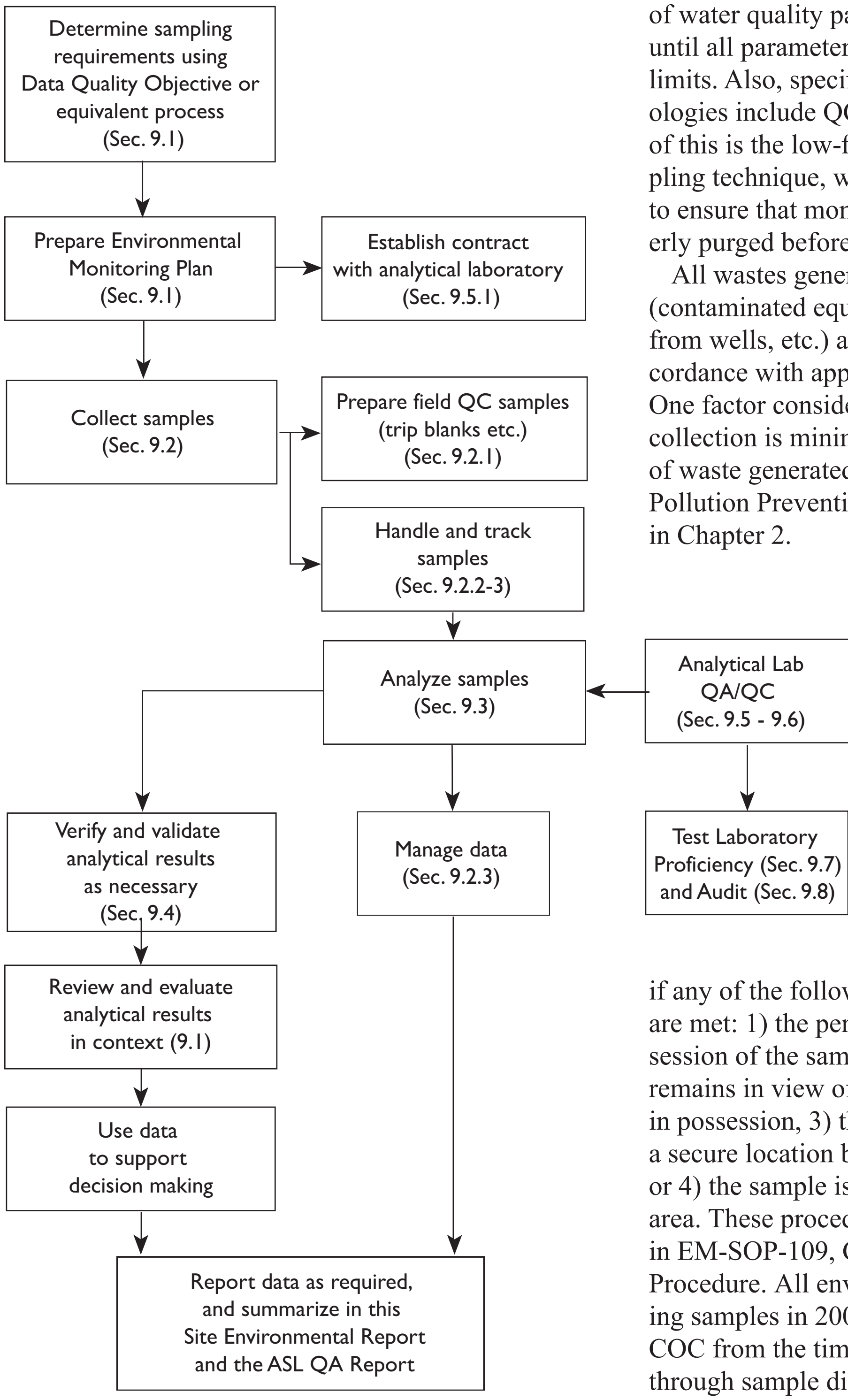

Figure 9-1. Flow of Environmental Monitoring QA/QC Program Elements.

ment blanks. For example, field readings of water quality parameters are taken until all parameters are within acceptable limits. Also, specific sampling methodologies include QC checks. An example of this is the low-flow groundwater sampling technique, which includes checks to ensure that monitoring wells are properly purged before readings are taken.

All wastes generated during sampling (contaminated equipment, purge water from wells, etc.) are managed in accordance with applicable requirements. One factor considered during sample collection is minimizing the amount of waste generated, consistent with the Pollution Prevention Program described in Chapter 2.

9.2.1 Field Sample Handling

To ensure the integrity of samples, chain-of-custody (COC) was maintained and documented for all samples collected. A sample is considered to be in the custody of a person if any of the following rules of custody are met: 1) the person has physical possession of the sample, 2) the sample remains in view of the person after being in possession, 3) the sample is placed in a secure location by the custody holder, or 4) the sample is in a designated secure area. These procedures are outlined in EM-SOP-109, Chain-of-Custody Procedure. All environmental monitoring samples in 2003 maintained a valid COC from the time of sample collection through sample disposal by the analytical laboratories.

9.2.1.1 Custody and Documentation

Field sampling technicians are responsible for the care and custody of samples until they are transferred to a receiving group or analytical laboratory. Samples requiring refrigeration are placed immediately into a refrigerator or a cooler with cooling media, and kept under custody rules. The technician who maintains custody of the samples signs the COC form when relinquishing custody of them. The laboratory or group receiving the samples signs the COC form when accepting custody.

The field sampling technician is also required to maintain a bound, weatherproof field logbook, which is filled out when samples are collected. The field technician records sample ID number, collection time, description, collection method, and COC number, as well as notes on daily weather conditions, field measurements, and other appropriate site-specific observations.

9.2.1.2 Preservation and Shipment

Samples shipped to off-site laboratories are managed as follows. Before sample collection, the field sampling technicians prepare all bottle labels and put them on the appropriate containers, as defined in the QA program plan or applicable EM-SOPs. Appropriate preservatives are added to the containers before or immediately after collection; in appropriate cases, samples are refrigerated.

Sample preservation is maintained as required throughout shipping. If samples are sent via commercial carrier, a bill-of-lading is used. COC seals are placed on the shipping containers; their intact status upon receipt indicates that custody was maintained during shipment.

9.2.2 Field Quality Control Samples

Field QC samples collected for the environmental monitoring program include equipment blanks, trip blanks, field blanks, field duplicate samples, and matrix spike/matrix spike duplicate samples. The rationale for selecting specific field QC samples and minimum requirements for their use in the environmental monitoring program are provided in EM-SOP-200, Collection and Frequency of Field Quality Control Samples. Equipment blanks and trip blanks (see below) were collected for all appropriate media in 2003.

An ***equipment blank*** is a volume of solution (in this case, laboratory-grade water) that is used to rinse a sampling tool before sample collection. The rinse water is collected and tested to verify that the sampling tool is not contaminated. Equipment blank samples are collected, as needed, to verify the effectiveness of the decontamination procedures on non-dedicated or reusable sampling equipment. For the groundwater monitoring program, equipment blanks are collected from the final rinse water that is generated during decontamination.

A ***trip blank*** is provided with each shipping container of samples to be analyzed for volatile organic compounds (VOCs). Analysis of trip blanks shows whether a sample bottle was contaminated during shipment from the manufacturer, while in bottle storage, in shipment to the laboratory, or during analysis at a lab. Trip blanks consist of an aliquot of distilled water sealed in a sample bottle, prepared either by the analytical laboratory prior to shipping the sample bottles to BNL, or by field sampling technicians before they collect the samples. Trip blanks were included with all shipments of aqueous samples for VOC analysis in 2003.

Field blanks are collected to check for cross-contamination that might occur during sample collection. For the groundwater monitoring program, one field blank is collected for every twenty samples, or one per sampling round, whichever was more frequent. On any given day, the field blanks are analyzed for the same parameters as the groundwater samples.

Contaminants in trip, field, and equipment blanks included methylene chloride, acetone, and toluene. These compounds are commonly detected in blanks and do not pose significant problems with the reliability of the analytical results. When these contaminants are detected, validation and/or verification procedures are used, where applicable, to qualify the associated data as nondetects, as described in procedures EM-SOPs 203 through 212 (see Section 9.4). The results from blank samples collected during 2003 did not indicate any significant impact to the quality of groundwater results.

Field duplicate samples are analyzed to check the reproducibility of sampling and analytical results, based on EPA Region II guidelines (EPA 1996). For example, in the groundwater monitoring program, duplicates are collected for 5 percent of the total number of samples collected for a project per sampling round. During 2003, 83 duplicate samples were collected for nonradiological analyses and 85 duplicate samples were collected for radiological analyses. All duplicate samples were acceptable for input into the Environmental Information Management System (EIMS) database. Duplicates were analyzed only for the parameters relevant to the program they monitored. In 2003, of the 5,310 nonradiological parameters analyzed, 98.8 percent of the analyses met QA criteria. Of the 353 radiological parameters monitored, 98 percent met QA criteria. These results indicate consistency between the laboratory and field sampling technicians.

Matrix spike* and *matrix spike duplicates are performed to determine whether the sample matrix (water, soil, air, etc.) adversely affected the sample analysis. A spike is a known amount of analyte added to a sample. Matrix spikes are performed at a rate specified by each environmental program. In the case of the groundwater monitoring program, that rate is approximately one per 20 samples collected per project. For groundwater samples, no significant matrix effects were observed in 2003. For media other than groundwater, several results were considered suspect after field QC sample results were evaluated. These specific instances are discussed in detail in Chapters 3 through 8.

9.2.3 Tracking and Data Management

9.2.3.1 Sample Tracking

Most environmental monitoring samples and analytical results were tracked in the EIMS. Tracking was initiated when a sample was recorded on a chain-of-custody form. Copies of the COC form and supplemental forms were provided to the project manager or the sample coordinator and forwarded to the data coordinator to be entered into the EIMS. Each analytical laboratory also maintains its own internal sample tracking system.

9.2.3.2 Data Management

Data management procedures are in place to govern tracking, validation, verification, and distribution of the analytical data. When samples were shipped to an analytical laboratory, COC information is entered into the EIMS. Following sample analysis, the contract laboratory provides the results to the project manager or designee and, when applicable, to the validation subcontractor in accordance with their contract.

9.2.3.3 Distribution of Analytical Data

Once data are entered into the EIMS, reports can be generated by project personnel and DOE-Brookhaven Area Office staff using a web-based data query tool that provides access to all analytical sample results and standard report formats. Also, the EIMS data management group is available to generate reports that may require special formatting.

9.3 SAMPLE ANALYSIS

In 2003, environmental samples were analyzed either by the on-site ASL or by one of four contractor laboratories, whose selection is discussed in Section 9.3.2. All samples were analyzed according to EPA-approved methods, where such methods exist. Where no EPA-approved methods exist, standard industry methods were used. In addition, field sampling technicians performed field monitoring of wastewater for parameters such as conductivity, dissolved oxygen, pH, temperature, and turbidity.

When demand exceeded ASL capacity, some samples were sent off site, including those to be tested for metals and polychlorinated biphenyls (PCBs). Most samples used to verify compliance with permitting requirements were sent off site, as were samples requiring semivolatile organic compound (SVOC) analysis or the toxicity characteristic leachate procedure (TCLP). Samples also were sent off site for radiological analyses that ASL did not perform, such as actinide analyses in soil, vegetation, animal tissue, and water.

9.3.1 ASL Qualifications

Typically, BNL's ASL performs approximately 5,000 radiological and nonradiological (chemical) analyses per year on environmental samples to support both environmental monitoring and facility operations. BNL's ASL is certified in the Environmental Laboratory Accreditation

Program (ELAP) conducted by the New York State Department of Health (NYSDOH), and in the EPA's National Environmental Laboratory Accreditation Program (NELAP). Analyses covered by these certifications include tritium, gross alpha/beta (GAB), and gamma in potable and nonpotable water analysis in several matrices.

ASL's nonradiological chemical group is certified by the NYSDOH ELAP to perform analyses using EPA Methods 524 and 624 for VOCs, in potable and wastewaters, respectively. In 2003, 37 groundwater and wastewater samples were provided for analysis with Method 624. This represented an additional 26 new analytes since 1998. EPA Method 524 (for potable water) included 63 organic analytes and was a new addition to ASL's capabilities in 2003. Metals were analyzed using both atomic absorption spectroscopy and inductively coupled plasma/mass spectroscopy (ICP/MS), using EPA methods. ASL is certified for analyses of 17 metals (the entire ELAP list) in potable water, as well as 21 metals in wastewater. Certification for three anions was established for potable and wastewaters using EPA Method 300.

9.3.2 Contractor Lab Qualifications

BNL procured and maintained contracts with the following off-site laboratories for analysis of environmental samples in 2003:

- General Engineering Lab (GEL) in Charleston, South Carolina, for radiological and nonradiological analytes
- H2M Lab in Melville, New York, for nonradiological analytes
- Severn-Trent Lab (STL) based in St. Louis, Missouri, for radiological and/or nonradiological analytes
- Chemtex Lab in Port Arthur, Texas, for select nonradiological analytes

The process of selecting contractor laboratories involves a number of factors: 1) their record on performance evaluation (PE) tests, 2) the laboratory's contract with the DOE Integrated Contract Procurement Team, 3) pre-selection bidding, and 4) their adherence to their own QA/QC programs. Routine QC procedures that laboratories must follow, as discussed in Section 9.5, include daily instrument calibrations, efficiency and background checks, and standard tests for precision and accuracy. All the analytical laboratories that BNL used in 2003 were certified by NYSDOH for the relevant analytes, where such certification existed. The laboratories also were subject to PE testing (see Section 9.7) and DOE-sponsored audits.

9.4 VERIFICATION AND VALIDATION OF ANALYTICAL RESULTS

Environmental monitoring data are subject either to data verification or data validation performed in accordance with established procedures, when the data quality objectives of the project require this step.

The data verification process involves checking for common errors associated with analytical data. The following criteria cause data to be rejected during the data verification process:

- *Holding time missed* – The analysis is not initiated or the sample is not extracted within the time frame required by EPA or by the contract.
- *Incorrect test method* – The analysis is not performed according to a method required by the contract.
- *Poor recovery* – The compounds or radioisotopes added to the sample before laboratory processing are not recovered at the recovery ratio required by the contract.
- *Insufficient QA/QC data* – Supporting data received from the analytical laboratory is insufficient to allow validation of results.
- *Incorrect minimum detection limit (MDL)* The laboratory reports extremely low levels of analytes as "less than minimum detectable," but the contractually required limit is not used.
- *Invalid chain-of-custody* – There is a failure to maintain proper custody of samples, as documented on COC forms.
- *Instrument failure* – The instrument does not perform correctly.
- *Preservation requirements not met* – The requirements identified by the specific analytical method are not met or properly documented.
- *Contamination of samples from outside sources* – These possible sources include

sampling equipment and personnel.

- *Matrix interference* – Analysis is affected by dissolved inorganic/organic materials in the matrix.
- *Incomplete data package or report* – Some information is missing.

Data validation is a more extensive process that includes all the verification checks as well as checks for less common errors, including calibration that was not conducted as required, internal standard errors, transcription errors, and calculation errors. The amount of data checked varies, depending on the environmental media and on the data quality objectives for each project. Data for some projects, such as long-term groundwater monitoring, may require only verification. Data from initial groundwater investigations receive the more rigorous validation testing, performed on 20 to 100 percent of the analytical results. The results of the verification or validation process are entered into the EIMS.

9.4.1 Verifying and Validating ASL Results

For samples analyzed by BNL's Analytical Services Laboratory in 2003, the QA officer or group leader verified that all analytical batches fulfilled internal QA/QC acceptance criteria. These criteria, which include precision, accuracy, recovery, instrument background checks, and stable instrument efficiency performance, are fully described in ASL's QA Program Plan (BNL 1999b). All QA/QC data were reviewed before ASL results were reported. As per the BNL Groundwater Monitoring Program Quality Assurance Project Plan (BNL 1999a), a significant portion of the groundwater samples analyzed by ASL for environmental restoration projects also underwent data verification, as described in Section 9.4.

9.4.2 Checking Off-Site Results

Nonradiological data analyzed off site in 2003 were verified and validated using EPA Contract Laboratory Program guidelines (EPA 1992, 1996). Radiological packages were verified and validated using BNL and DOE guidance documents (BNL 1997, DOE 1994).

9.5 ANALYTICAL LAB QA/QC

In 2003, sample results for environmental restoration, compliance, and surveillance were analyzed by ASL or by one of the off-site contract laboratories. For ASL analyses, procedures for calibrating instruments, analyzing samples, and assessing QC were consistent with EPA methodology (see Appendix D). QC checks that were performed included analyzing blanks and instrument background; using Amersham Radiopharmaceutical Company or National Institute for Standards and Technology (NIST) traceable standards; and analyzing reference standards, spiked samples, and duplicate samples. The ASL supervisor, QA officer, or group leaders reviewed all ASL analytical and QA results before data were reported. More details of the ASL QA program are in Section 9.6.

Off-site contractor laboratories that perform radiological and chemical analyses for BNL also are required to maintain stringent QA programs. Their contracts specify analytes, methods, required detection limits, and deliverables—which include standard batch QA/QC performance checks. As part of the contract laboratory selection process, contract laboratories are required to provide BNL with copies of their QA/QC manuals, as well as their QA program plans.

A nonconformance report was generated when discrepancies were found in field sampling designs, documented procedures, COC forms, data analyses, data processing systems, QA software, or when failures in PE testing occurred. Following an investigation into the root cause, corrective actions were taken and tracked to closure.

9.6 ASL INTERNAL QA PROGRAM

The QA procedures followed at ASL included daily instrument calibrations, efficiency and background checks, and routine tests for precision and accuracy. A detailed description of these activities can be found in the ASL QA Program Plan (BNL 1999b). A brief summary of 2003 ASL PE testing results follows. Additional details can be found in Appendix D.

9.6.1 Radiological Instrument Calibrations

ASL operated eight high-purity germanium gamma detectors in 2003. Each detector was calibrated daily for energy and instrument efficiency using a NIST-traceable cesium-137 standard. Annual geometry efficiency calibrations were performed. Efficiency is measured by noting which radiological decaying events are converted into observable counts (counts per minute). During 2003, all eight gamma detectors performed well within the EPA acceptance limit. One gamma detector was out of service for repair during the month of January, and two gamma detectors were taken out of service as a result of a regional blackout in August. After August, five of the eight gamma detectors were operational.

ASL operated two gross alpha/beta detectors and two liquid scintillation spectrometers for tritium. Instrument background and count-time were used to determine the minimum detection limit of a radiological analyte. In 2003, there was no unusual drift or variability in instrument background for alpha, beta, or tritium, based on the mean background count-rates (and one standard deviation value). Instrument efficiencies were determined daily, using a calibration standard, and averaged for the calendar year.

9.6.2 Accuracy and Precision

Accuracy is the percent difference between a measured value and its known (expected) value. Precision is the percent difference between two measured values. The measure of batch precision is the Relative Percent Difference (RPD) statistic. This is defined as the absolute difference between the two results, divided by the average of both results, multiplied by 100. In radiological analyses, a spike of radioactive tracer solution is added to either a routine sample or tap water sample as a means of determining both precision and accuracy. In nonradiological analyses, the spike is a known amount of a given analyte added to a sample. The accuracy is stated as "percent recovery," which is the ratio of the measured amount, divided by the known (spiked) amount, multiplied by 100.

9.6.2.1 Gross Alpha/Beta

For gross alpha/beta analyses, the RPD was determined for each batch of analyses performed. Tap water was spiked with known amounts of americium-241 (for alpha) and strontium/yttrium-90 (for beta) in order to determine batch precision. The acceptance criterion for batch precision is an RPD less than 20 percent, for activity concentrations that are five times greater than the method MDL. During 2003, GAB batch precision for all 540 batches tested was within the acceptable range; there were four rejected batches, for a 0.7 percent rejection rate.

9.6.2.2 Tritium

Tritium precision was determined for 294 batches processed in 2003. ASL utilizes three sampling protocols for differing sample volumes (i.e., 7 mL distilled, 7 mL undistilled, and 1 mL undistilled). There were two rejected batches for tritium in 2003, corresponding to a rejection rate of 0.7 percent.

9.6.2.3 Strontium-90

Since 2002, strontium-90 samples have been sent to off-site contractor laboratories for analysis.

9.6.3 Nonradiological Analyses

Method precision was determined for 14 VOCs, three anions, and 21 metals processed by ASL in 2003. All metal and anion analyses had RPDs within ASL's internal acceptance limit of ± 20 percent. The standard deviation uncertainties were also within the EPA acceptance criteria.

ASL has an internal QC program for the ion chromatography, ICP/MS, and atomic absorption methods used for inorganic analyses. Several QC checks were performed for each batch of metals and anions in 2003. For the 21 certified metals analyzed by ASL, no analytes exceeded the EPA acceptance criteria for recovery.

The ASL has an internal QC program for the gas chromatography/mass spectroscopy method used for 14 primary VOCs. Recoveries and 99-percent confidence intervals were determined for approximately 100 independent VOC batches in 2003. Average recoveries for all of the 14 analytes were within their EPA target ranges of ± 25 percent for EPA methods 524.0 and 624.0 (these methods are discussed in Appendix D).

The 99-percent confidence intervals for surrogate recoveries also were determined for four analytes in 2003. All surrogate recoveries were within EPA acceptance limits.

9.7 PERFORMANCE OR PROFICIENCY EVALUATIONS

As in prior years, ASL and three contractor laboratories (GEL, STL, and H2M) participated in several national and state PE testing programs in 2003. The fourth contractor, Chemtex Laboratory, did not participate in PE testing because there is no testing program for the specific analytes Chemtex analyzed: tolytriazole, polypropylene-glycol-monobutyl-ether, and 1,1-hydroxyethylidene-diphosphonic acid. Each of the participating laboratories took part in at least one testing program, and several laboratories participated in multiple programs. Results of the tests provide information on the quality of a laboratory's analytical capabilities.

The testing was conducted by Environmental Resource Associates (ERA), the National Voluntary Laboratory Accreditation Program, the DOE Environmental Measurements Laboratory (EML) Quality Assessment Program, the voluntary Mixed Analyte Performance Evaluation Program (MAPEP), NYSDOH Environmental Laboratory Accreditation Program (ELAP), and the Analytical Products Group (APG). The results from these tests are summarized in Section 9.7.1 and discussed in more detail in Sections 9.7.2 (radiological) and 9.7.3 (nonradiological).

9.7.1 Summary of Test Results

In Figures 9-2 and 9-3, results are plotted as percentage scores that were "Acceptable," "Warning (But Acceptable)," or "Not Acceptable." A Warning (But Acceptable) is considered by the testing organization to be "satisfactory." An "average overall satisfactory" score is the sum of results rated as Acceptable and those rated as Warning (But Acceptable), divided by the total number of results reported. A Not Acceptable rating reflects a result that is greater than three standard deviations of the target value. Note that the ASL scores are labeled on both graphs as "BNL."

Figure 9-2 summarizes radiological performance scores in the mandatory DOE EML program as well as the voluntary ERA and MAPEP programs. During 2003 (as in 2002), the NYS ELAP did not provide radiological samples for PE testing, so there were no ELAP scores as there have been in some past years. ASL's average overall satisfactory score on radiological PE tests was 95.9 percent. GEL and STL had average overall satisfactory scores of 96.3 and 92 percent, respectively.

Figure 9-3 summarizes the four participating laboratorys' nonradiological performance results in the NYS ELAP, ERA, MAPEP, and APG tests. On the chart, bars that represent combined scores from more than one type of test are labeled "IND." For nonradiological tests, the average overall satisfactory results ranged from 94 to 95 percent.

BNL's combined average overall satisfactory score of 95.9 percent on the 458 radiological and nonradiological PE tests performed in 2003 is considered excellent.

9.7.2 Radiological Assessments

ASL, GEL, and STL participated in the DOE EML Quality Assessment Program and the ERA radiological program in 2003. Results are summarized in Figure 9.2.

9.7.2.1 EML Radiological Results

Overall, ASL's performance in the EML program was satisfactory in 94.9 percent of the analyses performed on air, vegetation, water, and soil. Twenty-five of 39 analyses (64.1percent) were Acceptable, 12 results (30.8 percent) were Warning (But Acceptable), and 2 analyses (5.1 percent) were Not Acceptable.

GEL's performance was satisfactory in 95.3 percent of the DOE EML analyses performed on air, vegetation, water, and soil. Sixty-three of 86 analyses (73.3 percent) were Acceptable, 19 of 86 analyses (22.1 percent) were Warning (But Acceptable), and 4 analyses were Not Acceptable.

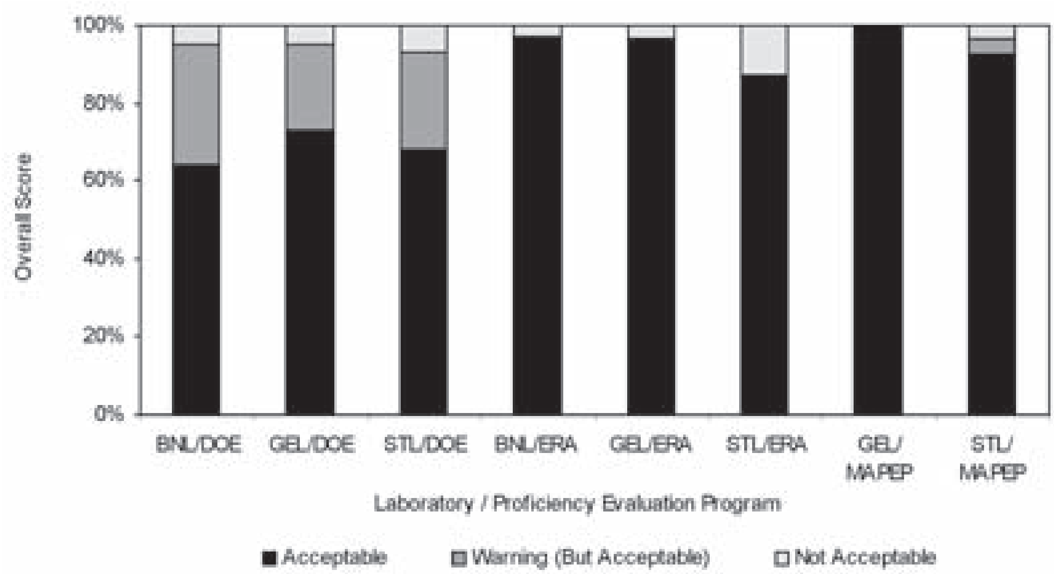

Figure 9-2. Summary of Scores in the Radiological Proficiency Evaluation Programs. Note that the Acceptable scores and the Warning (But Acceptable) scores combined constitute the "overall satisfactory" category referred to in the text of this chapter.

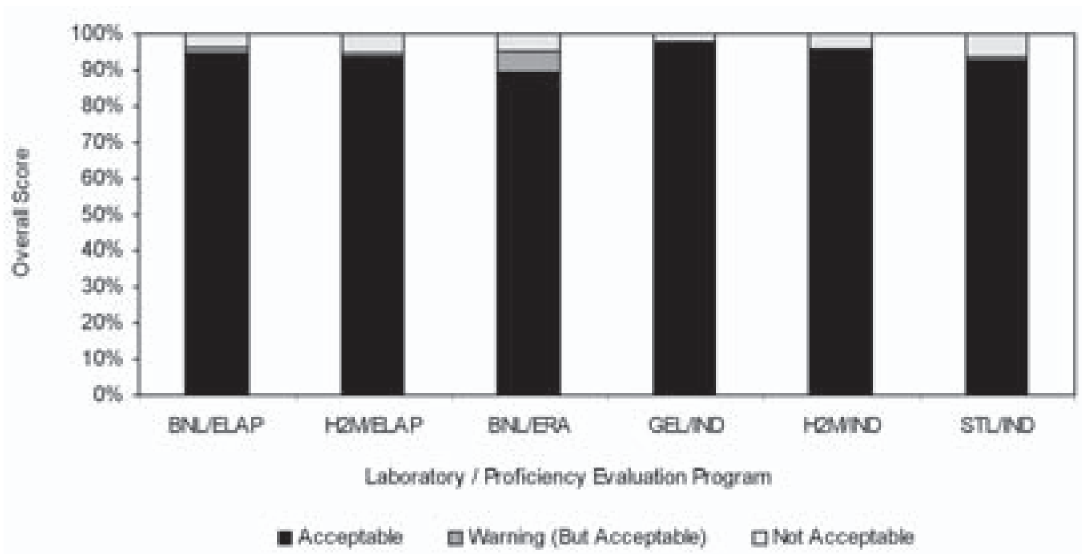

Figure 9-3. Summary of Scores in the Nonradiological Proficiency Evaluation Programs.

STL also participated in the DOE EML program. Of 88 analyses, 60 (68 percent) were Acceptable, 22 (25 percent) were Warning (But Acceptable), and 6 were Not Acceptable, corresponding to an average overall satisfactory score of 93.2 percent.

9.7.2.2 ELAP Radiological Results

The New York State Department of Health Environmental Laboratory Accreditation Program provided no samples for radiological testing in 2003.

9.7.2.3 ERA Radiological Results

ASL, GEL, and STL participated in the ERA radiological PE studies. ASL's average overall score for the 34 results in 2003 was 97.1 percent, with one Not Acceptable result. GEL's average overall satisfactory score in these studies was 96.65 percent; STL's average overall satisfactory score was 87 percent.

9.7.2.4 Voluntary PE Studies

Both GEL and STL participated in the MAPEP. GEL's average overall score for 15 analytes was 100 percent. STL's average overall score for 27 analytes was 96.4 percent.

9.7.3 Nonradiological Assessments

During 2003, ASL and H2M participated in the NYSDOH ELAP tests for nonpotable water, potable water, and solid wastes. GEL and STL did not participate in the ELAP tests because those laboratories are certified through the National Environmental Laboratory Accreditation Conference (NELAC). ASL and GEL also participated in the ERA water supply and water pollution studies, although participation in these tests is not required for New York State certification. Note that in Figure 9.3, GEL's score is labeled "IND" rather than "ERA" because that bar represents a composite of GEL's APG and ERA scores. Finally, H2M and STL voluntarily participated in APG and ERA testing, also reported as composite scores labeled "IND." The results of all these tests are shown in Figure 9-3.

9.7.3.1 ELAP Nonpotable Water Results

Of the 120 results reported for ASL, there were seven Not Acceptable, earning ASL an average overall satisfactory score of 94.2 percent. H2M reported 788 results, with 43 Not Acceptable, scoring 94.5 percent.

9.7.3.2 ELAP Solid and Hazardous Waste Chemistry

In the Solid and Hazardous Waste Chemistry portion of the NYSDOH ELAP, ASL scored 100 percent for their 14 results.

9.7.3.3 ELAP Potable Water Results

In the potable water category of the NYSDOH ELAP, ASL reported 72 results, with one Not Acceptable, earning an average overall satisfactory score of 98.6 percent. H2M reported 343 results, with 18 Not Acceptable, for an average overall satisfactory score of 94.8 percent.

9.7.3.4 Voluntary PE Studies

ASL and GEL participated in the voluntary ERA water pollution and water supply PE studies. For these studies combined, ASL reported 179 results: 160 Acceptable, 11 Warning (But Acceptable), and 8 Not Acceptable. The average overall satisfactory score for ASL in these studies was 95.5 percent. GEL reported 1,693 results, with 1,645 Acceptable, 9 Warning (But Acceptable), and 39 Not Acceptable. GEL's average overall satisfactory score in these studies was 97.7 percent.

STL and H2M participated in the Analytical Products Group (APG) and ERA PE testing programs. Results in these two independent programs are labeled as IND on the bar graph in Figure 9-3. STL's average overall satisfactory score was 94.8 percent; H2M's average overall satisfactory score was 95.6 percent.

9.8 AUDITS

NYSDOH ELAP/NELAC audited the ASL radiological group in October 2003. There were four minor findings, which were corrected within one month of the audit. The minor findings included the updating of certification forms, a list of SOPs in the quality manual, a SOP regarding oven temperature related to radiological analyses, and the calibration of pipettes.

As part of the DOE's Integrated Contract Procurement Team Program, STL and GEL were audited during 2003 (DOE 2003a,b). The results of the STL audit included eight Priority II findings: two radiological findings, one inorganic finding, three organic findings, and two general findings. The results of the GEL audit included ten Priority II findings: two radiological findings, three inorganic findings, two organic findings, and three general findings. Corrective action plans were submitted to DOE by both laboratories to document that procedures were put in place to correct these findings. Results of the audits indicated that the analytical data from these laboratories is of acceptable quality.

9.9 CONCLUSIONS

Detailed data on laboratory performance evaluation testing for ASL and the BNL contractor laboratories are maintained in ASL QA records. For radiological performance tests, the three laboratories reporting analytical data in the 2003 Site Environmental Report (ASL, GEL, and STL) each had combined satisfactory results of 95 percent or better in both state and federal performance evaluation programs. For nonradiological performance evaluation testing, ASL and the three participating contractor laboratories (H2M, GEL, and STL) all had an overall satisfactory score of approximately 95 percent. BNL's combined average overall satisfactory score was 95.9 percent on the 458 radiological and nonradiological laboratory evaluation tests performed in 2003. Based on implementation and evaluation of the QA/QC program, it can be concluded that the analytical data reported in this report are reliable and of high quality.

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