

Executive Summary

Brookhaven National Laboratory (BNL) is managed on behalf of the Department of Energy (DOE) by Brookhaven Science Associates (BSA), a partnership between the Research Foundation for the State University of New York on behalf of Stony Brook University and Battelle. For over 70 years, the Laboratory has played a lead role in the DOE Science and Technology mission and continues to contribute to the DOE's missions in energy resources, environmental quality, and national security. BNL manages its world-class scientific research with particular sensitivity to environmental issues and community concerns. The Laboratory's Environmental, Safety, Security, and Health (ESSH) Policy reflects the commitment of BNL's management to fully integrate environmental stewardship into all facets of its mission and operations.

BNL prepares an annual Site Environmental Report (SER) in accordance with DOE Order 231.1B, Environment, Safety, and Health Reporting. The report is written to inform the public, regulators, employees, and other stakeholders of the Laboratory's environmental performance during the calendar year in review. Volume I of the SER summarizes environmental data; environmental management performance; compliance with applicable DOE, federal, state, and local regulations; and performance in restoration and surveillance monitoring programs. BNL has prepared annual SERs since 1971 and has documented nearly all its environmental history since the Laboratory's inception in 1947.

Volume II of the SER, the Groundwater Status Report, is also prepared annually to report on the status of groundwater protection and restoration efforts. Volume II includes detailed technical summaries of groundwater data and treatment system operations and is intended for regulators and other technically oriented stakeholders. A summary of the information contained in Volume II is included in Chapter 7, Groundwater Protection, of this volume.

Both reports are available in print and as downloadable files on the BNL web page at <https://www.bnl.gov/esh/env/ser/>.

ENVIRONMENTAL MANAGEMENT SYSTEM

The Laboratory's Integrated Safety Management System (ISMS) incorporates management of environment (i.e., environmental protection and pollution prevention), safety, and health (ES&H) issues into all work planning. BNL's ISMS ensures that the Laboratory integrates DOE's five Core Functions and seven Guiding Principles into all work processes. These processes contributed to BNL's achievement of registration under the International Organization for Standardization (ISO) 14001 Standard for Environmental Management Systems (EMS). The standard requires an organization to develop a policy, create plans to implement the policy, implement the plans, check progress and take correction actions, and review the system periodically to ensure its

continuing suitability, adequacy, and effectiveness.

An EMS was fully established at BNL in 2001 to ensure that environmental issues are systematically identified, controlled, and monitored. The EMS also provides mechanisms for responding to changing environmental conditions and requirements, reporting on environmental performance, and reinforcing continual environmental improvement. The cornerstone of the Laboratory's EMS is the ESSH Policy. The policy makes clear the Laboratory's commitment to environmental stewardship, the safety and health of its employees, and the security of the site. Specific environmental commitments in the policy include compliance, pollution prevention, conservation, community outreach, and continual improvement. The policy is posted throughout the Laboratory and on the BNL website. It is also

included in all training programs for new employees, guests, and contractors.

The Laboratory's EMS was designed to meet the rigorous requirements of the globally recognized ISO 14001 Standard for Environmental Management Systems. BNL was the first DOE Office of Science Laboratory to become officially registered to this standard. The Laboratory achieves certification to the standard by undergoing annual audits by an accredited third-party registrar who assures that the Lab's EMS is maintained and continually improved. In 2021, BNL's registrar recertified the Lab to the ISO 14001 Standard.

Executive Order (EO) 13834, Efficient Federal Operations, was partially revoked by EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, on January 20, 2021, eliminating federal sustainability requirements for Federal agencies. Then, it was fully revoked by EO 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, on December 8, 2021. Therefore, BNL follows DOE sustainability goals put forth in the DOE 2020 Sustainability Report and Implementation Plan during this transitional time.

DOE's plan establishes sustainability goals for federal agencies with a focus on sustainability initiatives that save money and increase efficiency across the government with guidance, recommendations, plans, and numerical targets. DOE Order 436.1, Departmental Sustainability, provides requirements and responsibilities for managing sustainability within DOE to ensure facilities are working towards sustainability goals established in its Strategic Sustainability Performance Plan (SSPP). Each DOE facility is required to have a Site Sustainability Plan (SSP) in place detailing the strategy for achieving these long-term goals and due dates and to provide an annual status. The requirements influence the future of the Laboratory's EMS program and have been incorporated into BNL's SSP. For a status summary of BNL's 2021 SSP, see Appendix E.

The Laboratory's Pollution Prevention (P2) Program is an essential element for the successful implementation of BNL's EMS. The P2 Program reflects the national and DOE pollution prevention goals and policies and represents an ongoing effort to make pollution prevention and waste minimization an integral part of the Laboratory's operating

philosophy. Pollution prevention and waste reduction goals have been incorporated as performance measures into the DOE contract with BSA and BNL's ESSH Policy. The overall goal of the P2 Program is to create a systems approach that integrates pollution prevention and waste minimization, resource conservation, recycling, and affirmative procurement into all planning and decision making. The implementation of pollution prevention opportunities, recycling programs, and conservation initiatives continues to reduce both waste volumes and management costs. In 2021, these efforts resulted in nearly \$1.5 million in cost avoidance or savings and approximately 2.8 million pounds of materials being reduced, recycled, or reused annually.

BNL continues to decrease its energy consumption and increase savings. In the past ten years, water consumption total was approximately half the 1999 total—a reduction of nearly a half billion gallons per year. In 2021, natural gas was used to meet over 99 percent of the heating and cooling needs of the Laboratory's major facilities, further reducing greenhouse (GHG) emissions. The Laboratory also scheduled operations at the Relativistic Heavy Ion Collider to avoid peak demand periods. This reduced the electric demand by approximately 25 megawatts (MW), saving approximately \$1.4 million in electric demand costs. BNL also maintains a contract with the New York Power Authority that resulted in an overall cost avoidance of \$26.5 million for 2021. In 2021, BNL's energy supply included 120 million kWh of clean, renewable hydropower energy, 1.0 million kWh of on-site generated solar photovoltaic (PV), and 24 million kWh of purchased renewable energy certificates (REC). In addition, the 2021 output from the Lab's Long Island Solar Farm (LISF) was 48.9 million kWh and resulted in an avoidance of approximately 27,055 tons of carbon. Chapter 2 of this report further describes these and other sustainability efforts, as well as implementation of BNL's EMS and P2 Program, in more detail.

BNL'S ENVIRONMENTAL MANAGEMENT PROGRAM

BNL's Environmental Management Program consists of several Laboratory-wide and facility-specific environmental monitoring and surveillance programs. These programs identify potential pathways of public and environmental exposure and

evaluate the impacts BNL activities may have on the environment. An overview of the Laboratory's environmental programs and a summary of performance for 2021 are provided below.

COMPLIANCE MONITORING PROGRAM

BNL has an extensive program in place to ensure compliance with all applicable regulatory and permit requirements. The Laboratory must comply with more than 100 sets of federal, state, and local environmental regulations; numerous sitespecific permits; nine equivalency permits for the operation of groundwater remediation systems; and several other binding agreements.

In 2021, the Laboratory operated in compliance with most of the requirements, and any instance of noncompliance was reported to regulatory agencies and corrected expeditiously or a plan was put in place to come into compliance. Emissions of nitrogen oxides, carbon monoxide, volatile organic compounds, total suspended particulates, and sulfur dioxide from the Central Steam Facility (CSF) were well within permit limits in 2021. Recorded excess opacity measurements from CSF boilers were investigated and documented in quarterly Site-Wide Air Emissions and Monitoring Systems Performance Reports submitted to the New York State Department of Environmental Conservation (NYSDEC).

There were no discharges of Halon 1211 from portable fire extinguishers or Halon 1301 from accidental or fire-induced activation of fixed fire suppression systems in 2021. Halon-portable fire extinguishers continue to be removed and replaced by dry-chemical or clean agent units as part of an ongoing program to phase out the use of chlorofluorocarbons as extinguishing agents to eliminate possible ozone-depleting substance emissions.

BNL's drinking water and the supply and distribution system were in compliance with all applicable county, state, and federal regulations regarding drinking water quality, monitoring, operations, and reporting in 2021. Most of the liquid effluents discharged to surface water and groundwater also met applicable New York State Pollutant Discharge Elimination System (SPDES) permit requirements.

BNL received a Notice of Violation for continuing violation of the permit limit for Tolytriazole (TTA). A formal noncompliance report which included a corrective action plan was submitted to

NYSDEC in September. This corrective action plan included background information on the issue, a description of all non-compliances, causes of TTA exceedances, immediate and preventative (long-term) corrective actions taken, and any proposed future actions.

Groundwater monitoring at the Laboratory's Major Petroleum Facility continued to demonstrate that current oil storage and transfer operations are not affecting groundwater quality. Efforts to implement release prevention measures and minimize impacts of spills of materials continued in 2021. There were ten spills in 2021 and three of those spills met regulatory agency reporting criteria.

In 2021, due to the pandemic, inspections by federal, state, or local regulators were limited. BNL was inspected on nine occasions. These inspections included Clean Air Act compliance, Sewage Treatment Plant operations, hazardous waste management facilities, underground storage tank management, and the potable water system. Immediate corrective actions were taken to address all compliance issues raised during these inspections.

The DOE Brookhaven Site Office (BHSO) performs routine inspections, assessments, and surveillances of BNL operations to ensure continual improvement and success in meeting the Laboratory's mission. In 2021, BHSO performed an assessment of BNL's Wildland Fire Management Program and a surveillance of a Waste Management procedure titled, WM-SOP-581, Rev. 1 High Dose MIRP Transfer. Identified opportunities for improvement are being reviewed and analyzed and will be addressed, as appropriate, to improve programs.

Chapter 3 of this report describes BNL's Compliance Program and status in further detail.

AIR QUALITY PROGRAM

BNL monitors radioactive emissions at three facilities to ensure compliance with the requirements of the Clean Air Act. Environmental Protection Agency (EPA) regulations require continuous monitoring of all sources that have the potential to deliver an annual radiation dose greater than 0.1 mrem to a member of the public; all other facilities capable of delivering any radiation dose require periodic confirmatory sampling.

During 2021, BNL facilities released a total of 11,054 curies of short-lived radioactive gases. Oxygen-15 and Carbon-11 emitted from the Brookhaven Linac Isotope Producer (BLIP) constituted more than 99.9 percent of the site's radiological air emissions.

Because natural gas prices were comparatively lower than residual fuel oil prices throughout the year, BNL's Central Steam Facility (CSF) used natural gas to meet 98.9 percent of the heating and cooling needs of the Laboratory's major facilities in 2021. As a result, emissions of particulates, oxides of nitrogen, sulfur dioxide, and volatile organic compounds were well below the respective regulatory permit criteria pollutant limits.

In 2021, there were seven recorded excess opacity measurements. Two recorded readings for Boiler 6 on February 17 were due to a load shift and a single Boiler 6 excess opacity reading on March 28 was due to unusually heavy rainfall that obstructed the transmission of light in the Boiler 6 continuous opacity monitor. Two Boiler 7 excess opacity readings on March 15 were due to contractor maintenance of the opacity monitor, while two Boiler 7 excess opacity readings on June 22 occurred during start-up/shutdown of the boiler while firing #6 oil in preparation for National Grid utility maintenance of the natural gas supply system. While there are no regulatory requirements to continuously monitor opacity for Boilers 1A and 5, surveillance monitoring of visible stack emissions is a condition of BNL's Title V operating permit. Daily observations of stack gases recorded by CSF personnel throughout the year showed no visible emissions on days when the boilers were operated.

The Laboratory conducts ambient radiological air monitoring to verify local air quality and to assess possible environmental and health impacts from BNL operations. Samples collected from air monitoring stations around the perimeter of the site were analyzed for gross alpha and beta airborne activity. The annual average gross alpha and beta airborne activity levels for the four monitoring stations were 0.0012 and 0.0126 pCi/m³, respectively. The results for these locations are typical for the site and show seasonal variation in activity within a range that is representative of natural background levels.

BNL has two active facilities: the BLIP, whose emissions are continuously monitored with an inline detection system, and the Target Processing Laboratory (TPL), which has a particulate filter sampling system to continuously collect samples for gross alpha and gross beta activity, and one inactive facility, the High Flux Beam Reactor (HFBR), where periodic emissions monitoring is conducted. The average gross alpha and beta airborne activity concentration levels for samples collected from the BLIP exhaust stack were 0.0004 and 0.0067 pCi/m³, respectively. Annual average gross alpha and beta airborne activity concentration levels for samples collected from the TPL were 0.0009 and 0.0096 pCi/m³, respectively.

Airborne tritium in the form of tritiated water (HTO) is monitored throughout the BNL site. In 2021, samples were collected from Stations P2, P4, P7, and P9 to assess the potential impacts from the Laboratory's two tritium sources. The average tritium concentrations at all the sampling locations were less than the typical minimum detection limits, ranging from 4.4 to 14.5 pCi/m³.

BNL has taken several actions to meet DOE GHG reduction goals. In 2021, the LISF provided 48.9 million kilowatt-hours of solar energy to Long Island. This equates to 27,055 metric tons CO₂ equivalents (MT CO₂e) GHG offset or reduction. In 2021, BNL consumed 120,593 megawatts of hydropower, providing a net combined GHG reduction of 93,728 MT CO₂e from the LISF and hydropower. Furthermore, in 2016 BNL completed an expansion of the Northeast Solar Energy Research Center (NSERC). The NSERC is a solar photovoltaic facility that now has a total peak capacity of 907 kW. In 2021, it provided 659,336 kWh and offset 365 MT CO₂e.

Chapter 4 of this report describes BNL's Air Quality Program, monitoring data, and other GHG reduction efforts in further detail.

WATER QUALITY SURVEILLANCE PROGRAM

Wastewater generated from BNL operations is treated at the STP before it is discharged to nearby groundwater recharge basins. Some wastewaters may contain very low levels of radiological, organic, or inorganic contaminants. Monitoring, pollution prevention, and vigilant operation of treatment facilities

ensure that these discharges comply with all applicable regulatory requirements and that the public, employees, and the environment are protected.

Analytical data for 2021 shows that the average gross alpha and beta activity levels in the STP discharge (EA, Outfall 001) were within the typical range of historical levels and were well below New York State Drinking Water Standards (NYS DWS). Tritium was detected just above the method detection limit (MDL) in the STP discharge during December 2021; no cesium-137, strontium-90, or other gamma-emitting nuclides attributable to Laboratory operations were detected. Non-radiological monitoring of the STP effluent showed that all organic and inorganic parameters were within SPDES effluent limits or other applicable standards.

Stormwater and cooling water discharges to recharge basins are sampled throughout the year and analyzed for gross alpha and beta activity, gamma-emitting radionuclides, and tritium. Each recharge basin is a permitted point-source discharge under the Laboratory's SPDES permit. The average concentrations of gross alpha and beta activity in stormwater and cooling water discharged to recharge basins were within typical ranges and no gamma-emitting radionuclides were detected. Disinfection byproducts continue to be detected at low concentrations, above the method detection limit, in discharges to recharge basins due to the use of chlorine and bromine for the control of algae and bacteria in potable and cooling water systems. Inorganics (i.e., metals) were detected; however, their presence is due primarily to sediment runoff in stormwater discharges.

The Peconic River did not flow offsite in 2021. Radiological data from Peconic River surface water sampling show that the average concentrations of gross alpha and gross beta activity from on-site locations were indistinguishable from control locations, and all detected levels were below the applicable NYS DWS. No gamma-emitting radionuclides attributable to Laboratory operations were detected either upstream or downstream of the STP area, and tritium was not detected above method detection limits in any of the surface water samples.

Chapter 5 of this report describes BNL's Water Quality Surveillance Program and monitoring data in further detail.

NATURAL AND CULTURAL RESOURCE MANAGEMENT PROGRAM

The BNL Natural Resource Management Program was designed to promote stewardship of the natural resources found on site and to integrate natural resource management and protection with the Laboratory's scientific mission. The program includes protecting and monitoring the ecosystem on site, conducting research, and communicating the results with the public, stakeholders, and staff members. BNL conducts routine monitoring of flora and fauna to assess the impact, if any, of past and present activities on the Laboratory's natural resources.

To evaluate Cs-137 in deer, BNL has established a routine on and off-site deer sampling program. In 2021, 19 deer were obtained from both on and off the BNL site. The 2021 average is approximately seven times the 2020 value of 0.06 pCi/g, wet weight, but is lower than the ten-year average. The higher averages shown are reflective of a significant number of samples taken in the fall when Cs-137 levels are typically higher. However, these sample results continue to indicate the effectiveness of cleanup actions across the Laboratory, with levels trending downward from 2012 to 2021 and the ten-year average being 0.49 pCi/g. The New York State Department of Health (NYSDOH) has formally considered the potential public health risks associated with elevated Cs-137 levels in onsite deer and determined that neither hunting restrictions nor formal health advisories are warranted (NYSDOH 1999).

High deer populations are a regional problem, and the Laboratory is just one area on Long Island with such an issue. Normally, a population density of ten to 30 deer per square mile is considered an optimum sustainable level for a given area. This would equate to approximately 80 to 250 deer inhabiting the BNL property under optimal circumstances. At the end of 2020, the herd was estimated at 425 animals; a harvest was planned between February and April 2021 and 81 deer were removed from the population. With a reproduction rate of approximately 60 percent and mortalities from epizootic hemorrhagic disease, the population at the end of 2021 was estimated at 400 deer.

During 2021, grassy vegetation samples were collected from ten locations around the Laboratory

and a control location in Ridge, New York. All samples were analyzed for Cs-137. All vegetation samples were non-detect for Cs-137. Soil samples had Cs-137 levels ranging from nondetect to 0.27 pCi/g, dry weight. All values were consistent with historic monitoring. Monitoring results for grassy vegetation and soils were utilized for the annual dose to biota analysis reported in Chapter 8.

Mercury concentrations in precipitation have been measured at BNL since 2007. Analysis of mercury in precipitation is conducted to document mercury deposition that is attributable to off-site sources. This information is compared to Peconic River monitoring data and aids in understanding the distribution of mercury within the Peconic River watershed. During 2021, precipitation samples were collected quarterly at two air monitoring stations. Mercury was detected in all the precipitation samples collected at both stations. Mercury ranged from 2.52 ng/L at station P4 in January 2021 to 15.3 ng/L at station S5 in July 2021. The 15.3 ng/L concentration is three times lower than the highest value of 45.1 ng/L, recorded in 2017.

The Laboratory sponsors a variety of educational and outreach activities involving natural resources. These programs are designed to help participants understand the ecosystem and to foster interest in science. Wildlife programs are conducted at BNL in collaboration with local agencies, colleges, and high schools. Ecological research is also conducted on site to update the current natural resource inventory, gain a better understanding of the ecosystem, and guide management planning.

In 2021, due to COVID-19 restrictions, BNL internships were required to be conducted virtually. Due to the nature of the natural resources program, the Environmental Protection Division hosted one intern during the summer of 2021 who worked on statistical analysis of data associated with the 4-Poster™ project for tick management.

Also in 2021, BNL continued its active support of ecological education programs by hosting the Day in the Life of a River program which ran from September 24 to November 5, 2021. The Day in the Life of a River Program is a place-based educational experience where students and teachers collaborate with environmental professionals to collect scientific information capturing a snapshot of the health of the Long Island rivers and creeks.

The Day in the Life of a River is a collaboration between the Central Pine Barrens Commission, the NYSDEC, and BNL.

The BNL Cultural Resource Management Program ensures that the Laboratory fully complies with numerous cultural resource regulations. In 2019, the Laboratory contracted with Hartgen Archeological Associates to conduct historical architectural reviews of buildings that had recently reached 50 years of age. The Lab submitted these reports to the New York State Historic Preservation Office in 2021 and received concurrence of its findings.

Also in 2021, the Cultural Resource Management Program worked with the Laboratory Graphic Arts team to establish a project to catalog and evaluate all of the video tapes held by Graphic Arts. The videos were evaluated, prioritized, and contract established with Puddle Drop Media to digitize those videos of highest historic value. The contract resulted in a total of 1,448 videos being digitized. The digitized videos are now more accessible for use in video production and historical study.

Chapter 6 of this report describes BNL's natural and cultural resources in further detail.

GROUNDWATER PROTECTION MANAGEMENT PROGRAM

BNL has made significant investments in environmental protection programs for more than 25 years and continues to make progress in achieving its goal of preventing new groundwater impacts and remediating previously contaminated groundwater. The Laboratory's extensive groundwater monitoring well network is used to evaluate progress in restoring groundwater quality, comply with regulatory permit requirements, and monitor active research and support facilities where there is a potential for environmental impact.

Due to the detection of Per and Polyfluoroalkyl Substances (PFAS) in water samples collected from three BNL water supply wells in 2017, BNL conducted a search of available records to determine a source of PFAS. In 2018, BNL identified eight areas where PFAS-containing firefighting foam had been used for firefighter training or fire suppression system maintenance from 1966 until 2008. During 2021, BNL identified a ninth PFAS source area near dormitory Building 170, which had been used for firefighter training. In all nine

foam release areas, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) concentrations were found to exceed the 10 ng/L drinking water standards that were adopted for these chemicals by New York State in August 2020. During 2021, BNL began the construction of two groundwater treatment systems that will be used to remediate high concentration PFAS plumes originating from the Laboratory's former firehouse (in operation from 1947-1985) and current firehouse facilities. It is anticipated that construction of the treatment systems will be completed by Fall 2022.

BNL implements aggressive pollution prevention measures to protect groundwater resources and uses an extensive groundwater monitoring well network to verify that prevention and restoration activities are effective. During 2021, BNL collected groundwater samples from 580 permanent monitoring wells and 70 temporary wells. Seven groundwater remediation systems removed 58 pounds of volatile organic compounds (VOCs) and returned approximately one billion gallons of treated water to the Upper Glacial aquifer. Since the beginning of active groundwater remediation in December 1996, the treatment systems have removed 7,758 pounds of VOCs by treating almost 30 billion gallons of groundwater. Also, one groundwater treatment system removed approximately 0.3 millicurie of strontium-90 (Sr-90) while remediating approximately 14 million gallons of groundwater. Since 2003, BNL has removed approximately 34 millicuries of Sr-90 from the groundwater while remediating approximately 274 million gallons of groundwater. As a result of the successful operation of these treatment systems, significant reductions in contaminant concentrations have occurred in on-and off-site areas.

Chapter 7 of this report provides an overview of this program, and the SER Volume II, Groundwater Status Report, provides detailed descriptions, data, and maps relating to all groundwater monitoring and remediation performed in 2021.

RADIOLOGICAL DOSE ASSESSMENT PROGRAM

The Laboratory routinely reviews its operations to ensure that any potential radiological dose to members of the public, workers, and the

environment is "As Low As Reasonably Achievable" (ALARA). The potential radiological dose to members of the public is calculated at an off-site location closest to an emission source as the maximum dose that could be received by an offsite individual, defined as the "maximally exposed off-site individual" (MEOSI). The dose to the MEOSI is the sum total from direct and indirect dose pathways via air immersion, inhalation of particulates and gases, and ingestion of local fish and deer meat.

In 2021, the total effective dose (TED) to the MEOSI of 3.61 mrem (36.1 μ Sv) from Laboratory operations was well below the dose limit of 100 mrem required by DOE Order 458.1, as well as all other EPA and DOE regulatory dose limits for the public, workers, and the environment.

In general, the radiological footprint at BNL continues to slowly grow, with a recent dose peak in 2018, as testing for Ac-225 production occurred. The ambient dose increased slightly in 2021 as testing for that production process resumed.

Dose to the maximally exposed individual (MEI) on site and outside of controlled areas, calculated from thermo-luminescent dosimeter (TLD) monitoring records, was 7 mrem above natural background radiation levels, also well below the 100-mrem DOE limit on dose. The average annual external dose from ambient sources on site was 68 ± 11 mrem (680 ± 110 μ Sv), while the dose from off-site ambient sources was 68 ± 11 mrem (680 ± 110 μ Sv). Both on- and off-site external dose measurements include the contribution from natural terrestrial and cosmic background radiation. A statistical comparison of the average doses measured using 50 on-site TLDs and 17 off-site TLDs showed that there was no external dose contribution from BNL operations distinguishable from the natural background radiation level. Additional TLDs were used to measure on-site areas known to receive radiation dose slightly above the natural background radiation.

Dose to aquatic and terrestrial biota were also evaluated and found to be well below DOE regulatory limits. In summary, the overall dose impact from all Laboratory activities in 2021 was comparable to that of natural background radiation levels.

Chapter 8 of this report describes the BNL Radiological Dose Assessment Program and monitoring data in further detail.

QUALITY ASSURANCE PROGRAM

The multi-layered components of the BNL Quality Assurance (QA) Program ensure that all analytical data reported in this report are reliable and of high quality and meet quality assurance and quality control objectives. Samples are collected and analyzed in accordance with EPA methods and BNL standard operating procedures that are designed to ensure samples are representative and the resulting data are reliable and defensible. Quality control in the analytical laboratories is maintained through daily instrument calibrations, efficiency and background checks, and testing for precision and accuracy. Data are verified and validated as required by project-specific quality objectives before being used to support decision making.

In 2021, environmental samples were analyzed by six contract analytical laboratories. All samples were analyzed according to EPA-approved methods or by standard industry methods where no EPA methods are available (e.g., for tolyltriazole). In addition, field sampling technicians performed field monitoring for parameters such as conductivity, dissolved oxygen, pH, temperature, and turbidity. In 2021, procedures for calibrating instruments, analyzing samples, and assessing QC were consistent with EPA methodology.

The data validations, data verifications, and Data Quality Objectives (DQO) checks conducted on analytical results at BNL are designed to eliminate any data that fails to meet the DQOs of each project. The results of the independent Performance Evaluation assessments and assessments of contractor laboratories summarized in this chapter are also used to assess the quality of the results. Therefore, the data used in this Site Environmental Report are of acceptable quality.

Chapter 9 of this report describes the BNL Quality Assurance/Quality Control Program in further detail.