

## EXECUTIVE SUMMARY

Brookhaven National Laboratory (BNL) is a multi-program national laboratory operated by Brookhaven Science Associates, LLC for the U.S. Department of Energy (DOE) and is located on a 5,265-acre site in Suffolk County, Long Island, New York. DOE Order 436.1 (2011), *Departmental Sustainability*, requires DOE sites to maintain an Environmental Management System (EMS). An EMS specifies requirements for conducting general surveillance monitoring to evaluate the effects, if any, of site operations. DOE Order 458.1 Admin Chg. 4 (2020), *Radiation Protection of the Public and Environment*, requires DOE sites to maintain surveillance monitoring for determining radiological impacts to the public and environment.

BNL has a comprehensive EMS in place, which meets the requirements of the International Organization for Standardization 14001 Standard. The Laboratory's extensive environmental monitoring program is one component of the EMS, and the BNL Environmental Monitoring Plan (EMP) describes this program in detail. The data derived from systematically monitoring the various environmental media enables the Laboratory to make informed decisions concerning the protection of human health and the environment and to be responsive to stakeholder concerns.

The Laboratory's Environmental Protection Program ensures that operations fully comply with applicable federal, state, and local environmental laws and regulations; executive orders; and DOE policies. The Laboratory monitors radiological and non-radiological aspects of ambient air quality, emissions from point sources, wastewater discharges, surface water quality, groundwater quality, precipitation, soil, flora, and fauna. Sampling is performed under one or more types of environmental monitoring: compliance, restoration, or surveillance monitoring. Compliance monitoring ensures adherence to regulatory and permit limits. Restoration monitoring measures the impact of past operations and assesses the effectiveness of remedial measures. Surveillance monitoring evaluates the impacts, if any, of current or historical operations on the various environmental media.

Air surveillance monitoring at the Laboratory involves the analysis of particulate matter collected on filters, as well as vapor chemically trapped in a collection medium. Monitoring is conducted for various airborne radionuclides (including particulates and tritiated water vapor) at both on- and off-site locations. Continuous radiological monitoring is conducted for operations that have the potential to result in a radiological dose at the closest offsite residence or occupied building in excess of 0.1 millirem per year. For facilities with emissions below that value, periodic confirmatory monitoring is conducted. Specific diffuse or nonpoint sources, arising as a result of environmental restoration activities, are monitored to protect worker and public health. BNL also measures environmental background radiation through a network of on- and off-site thermoluminescent dosimeter badges.

Samples of wastewater effluent from Laboratory operations are collected at the point of discharge. Monitoring is conducted in accordance with permit requirements and includes water quality parameters—such as pH, dissolved oxygen, and temperature—as well as radiological, organic, and inorganic parameters.

The Peconic River is sampled at several on-site locations from the point where the Peconic River enters the BNL site to the point where the river leaves the BNL site. The Carmans River, located to the west of the BNL site, is used as a control location to determine background or ambient conditions. Collected samples are analyzed for radiological and non-radiological parameters.

The Laboratory site is included on the Comprehensive Environmental Response, Compensation & Liability Act (CERCLA) National Priorities List. The U.S. Environmental Protection Agency

(EPA) and the New York State Department of Environmental Conservation (NYSDEC) have integrated DOE's response obligations into a comprehensive Federal Facilities Agreement. In compliance with this agreement, BNL's comprehensive groundwater protection program evaluates groundwater contamination from historical operations and determines whether measures taken to protect or restore groundwater quality are effective. To comply with NYS operating permits and DOE Orders, groundwater quality is also monitored at research and support facilities where there is a potential for environmental impact to determine whether operational and engineered controls designed to protect groundwater are working effectively.

The Laboratory maintains five operable groundwater production wells to supply potable water. The supply wells and distribution system are monitored for chemical and radiological parameters to ensure that concentrations of regulated contaminants present in the domestic water system are less than the maximum contaminant levels specified by regulation.

Data from the sampling and analysis of vegetation and fauna are used to estimate bioaccumulation and potential dose via the ingestion pathway. Precipitation, soil, and sediment are analyzed for contaminants released to the atmosphere and surface water.

All environmental monitoring data must meet appropriate quality assurance requirements. BNL maintains contracts with six contract analytical laboratories, all of which are certified by New York State for specific parameters and are subject to audits by the New York State Department of Health (NYSDOH), BNL, and/or DOE through their Laboratory Approval Program.

BNL uses the Data Quality Objective (DQO) process developed by EPA to describe the environmental monitoring matrices, sampling methods, locations, frequencies, and measured parameters, as well as the methods and procedures for data collection, analysis, maintenance, reporting, and archiving.

The EMP summarizes the drivers (i.e., compliance, support compliance, surveillance, and restoration), DQOs, potential sources and contaminants, extent and frequency of monitoring, analytical procedures, and quality assurance processes. The plan is reviewed and revised annually to reflect any changes made to the monitoring program from the previous year.

## **SUMMARY EMP CALENDAR YEAR 2022**

Highlights of proposed changes for the calendar year (CY) 2022 monitoring program are described below. Full descriptions of the changes are detailed in each DQO.

### **AIR EMISSIONS SOURCE (CH. 5):**

#### **▪ AMBIENT AIR QUALITY**

The proposed changes for calendar year (CY) 2022 are as follows:

- The title of all references to the New York State Department of Environmental Conservation (NYSDEC) guidance document DAR-1 was changed to Guidelines for the Evaluation and Control of Toxic Ambient Air Contaminants Under 6NYCRR Part 212 to reflect the proper name of this guidance.
- References to EPA AERSCREEN and AERMOD air dispersion models have been inserted into the DQO, as both have been identified as accepted air dispersion models to demonstrate that potential impacts of toxic emissions from new emission sources are less than corresponding annual and short-term guideline concentrations (Annual Guideline Concentrations and Short-term Guideline Concentrations) in the revised version of NYSDEC guidance document DAR-1, released on February 12, 2021.

- **AIR MONITORING AT THE BROOKHAVEN LINAC ISOTOPE PRODUCER**

Decision rules were added to trigger additional reviews and discussions with management for mitigation measures to be taken if trending of emissions data from continuously monitored facilities at BNL, compared to historic operational releases, indicates potential dose to the MEOSI may be greater than 15 percent of the NESHAPs standard of 10 mrem.

- **CENTRAL STEAM FACILITY EMISSIONS**

The five-year term of BNL's Title V Facility permit was changed from January 31, 2020 to January 30, 2025.

- **AIR MONITORING AT THE RADIONUCLIDE RESEARCH AND PRODUCTION LAB (RRPL)**

For CY 2022, the continuous active emissions monitoring system will be upgraded to monitor radioactive alpha particulate, gamma particulate, and gaseous gamma emissions from the main exhaust. The name of the facility was changed from TPL to Radionuclide Research and Production Lab (RRPL), of which TPL is one part, to reflect the inclusion of the All-inclusive Processing Hot Cells (AP Hot Cells). The Description and Technical Basis were updated to reflect changes due to the addition of the AP Hot Cells. In the same section, a new filter train for the AP Hot Cell's effluent was described. Step Three in the Data Quality Analysis section was changed to add alpha and gamma spectroscopy of particulate filters and charcoal cartridges as well as real-time active counting and the EPA methods that will be used for analysis. Step Four was changed to reflect the fact that the sampling point is in the main exhaust duct rather than the exhaust stacks. The decision rules in Step 5 were modified to reflect new analysis requirements as well as dose-level triggers for responses and notifications.

## **RADIOLOGICAL AIR MONITORING AT THE BNL SITE (CH. 6)**

For CY 2022, new active air monitoring instruments will be installed in each of the four perimeter air monitoring stations (P-stations), and additional units will be added for use in variable locations as necessary. No additional changes beyond in radiological air monitoring are expected. These new active monitors are intended to fill a gap in the types of radiation emitters that are currently monitored. Prior to these active monitors, BNL sampled for gross alpha, gross beta, and Tritium at the perimeter stations. The new active monitors will monitor in real-time for gamma emitters. In addition, there are plans to connect these monitors to an intranet network that can be accessed by logging into the website. Moreover, no measurable emissions are expected to be found, and these active air monitors will document zero emissions in their data log.

## **DIRECT RADIATION: THERMOLUMINESCENT DOSIMETERS (TLDs) (CH. 7)**

Three new TLDs were placed onsite in CY 2021. No other changes are planned for CY 2022.

## **FLORA, FAUNA, PRECIPITATION, SOILS, AND PECONIC RIVER (CH. 8):**

- **PECONIC RIVER FISH SURVEILLANCE MONITORING**

Changes for CY 2022 include added language to allow for sampling of small fish to assess potential impacts to the food chain.

- **TERRESTRIAL VEGETATION AND SOIL MONITORING**

Minor changes to Decision 1 were made to reflect sampling beyond the first five years after cleanup

Environmental Monitoring Plan

of the former Hazardous Waste Management Facility (HWMF).

- **DEER SAMPLING**

Changes for this section include a minor edit to remove small mammals from Step 2 and added discussion of K-40 use for quality control.

## **POTABLE WATER MONITORING (CH. 11)**

Construction on Well 12 is expected to be completed in January. The well will be brought online after sampling is completed and approval obtained from the Suffolk County Department of Health. The Well 12 Granular Activated Carbon (GAC) system will be brought online at the same time and routine monitoring of the well and GAC system will occur.

## **GROUNDWATER MONITORING (CH. 12):**

- **OU I SOUTH BOUNDARY (RA V REMEDIAL ACTION)**

In CY 2022, two new wells, 98-103 and 98-104, will be installed to replace wells 98-101 and 98-102 for South Boundary (RA V Remedial Action). Based on the lack of significant rebound in volatile organic compound (VOC) concentrations since system shutdown in 2013, and very low remaining VOC concentrations in area monitoring wells, a petition for closure of the OU I South Boundary Treatment System was submitted and approved in 2019. The VOC groundwater monitoring program of annual sample collection will continue for plume core wells 107-70, 107-41, 115-13, 115-16, and 115-51. Quarterly sampling of well 098-99 will be maintained.

- **OU III BUILDING 96 AREA**

The proposed changes to the OU III Building 96 Area Groundwater Remediation System and monitoring program for CY 2022 are as follows: Reduce the monitoring frequency to quarterly for well 095-159 due to decreasing concentrations; reduce the sampling frequency of bypass wells 095-163, 095-165, 095-166, 095-0168, 095-169, and 095-170 to semi-annually due to concentrations near to below detectable levels; reduce sample frequency for well 085-293 to semi-annually as total volatile organic compounds (TVOCs) have been below 5 ug/L since 2014.

- **OU III SOUTH BOUNDARY PUMP AND TREAT SYSTEM**

Changes for the Operable Unit (OU) III South Boundary Treatment System and groundwater monitoring program for the CY 2022 include discontinuing sampling of wells 121-40, 121-44, and 122-41 (these wells have shown detections well below maximum contamination levels during the previous 20 years) and installing one or two vertical profile borings to confirm distribution of volatile organic compound (VOC) concentrations.

- **OU III SOUTH BOUNDARY RADIONUCLIDE**

Due to the lack of radionuclide detections above the Drinking Water Standard (DWS) for the last 20 years, a recommendation to discontinue further sampling for the Operable Unit (OU) III South Boundary and Western South Boundary Pump and Treat Systems was submitted to regulators and approved. The 48 monitoring wells that formerly comprised this program are listed in Table 12.15.2 and shown on Figure 12.15.1.

- **OU IV AREA OF CONCERN 6 - BUILDING 650 SUMP OUTFALL AREA**

Changes include removing wells 076-09, 076-263, and 076-417 from the Building 650 Sr-90 Monitoring Program due to the plume shifting away from these wells, adding wells 076-04, 076-06, and 076-20 to the Building 650 Sr-90 Monitoring Program, and sampling on an annual basis due to

plume migration.

- **GROUNDWATER MONITORING AT THE WASTE MANAGEMENT FACILITY**

With anticipated changes in groundwater flow directions in the Waste Management Facility (WMF) area due to increased use of nearby water supply Well 11 starting in 2020, and the planned routine use of supply Well 12 in early 2022, four monitoring wells (056-21, 056-22, 056-23, and 066-84) have been re-incorporated into the routine (semiannual) groundwater monitoring program.

- **GROUNDWATER MONITORING AT THE BROOKHAVEN MEDICAL RESEARCH REACTOR**

Groundwater Monitoring at the Brookhaven Medical Research Reactor The Brookhaven Medical Research Reactor (BMRR) groundwater monitoring wells are sampled every two years, with the next sampling for the wells scheduled for 2022. No changes to the monitoring program are proposed.