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 3 (2013), *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 nonradiological 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 site boundary 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 units.

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- and off-site locations from the point where the Peconic River enters the BNL site to an area several miles downstream of 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 nonradiological 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 seven 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. A complete update is published triennially. Highlights of proposed changes for the calendar year (CY) 2016 monitoring program are described below. Full descriptions of the changes are detailed in each DQO.

THERMOLUMINESCENT DOSIMTERS (TLDS)

Proposed changes include the relocation or elimination of up to two neutron monitoring and six on-site monitoring TLDs. The neutron TLD sites are being changed because there has been no dose recorded at either location for several years. The on-site TLD locations are being changed because the dose recorded at those locations has consistently been at background levels, with little deviation, for approximately 10 years. There are no proposed changes to the off-site TLD locations established in 2015.

PECONIC RIVER FISH SURVEILLANCE MONITORING

Proposed changes include adding a question concerning the presence of sufficient water to support fish and appropriate decision rules to determine monitoring. In addition, aquatic vegetation and sediment monitoring is being removed from the surveillance monitoring program.

PECONIC RIVER POST-CLEANUP MONITORING

Proposed changes include the removal or modification of sections referring to Sewage Treatment Plant (STP) discharges and discussion or notes were added reflecting impacts of low or no water conditions on sampling.

PRECIPITATION MONITORING

Proposed changes include the removal of radiological analysis of precipitation due to the lack of radiological releases to the atmosphere.

TERRESTRIAL VEGETATION AND SOIL MONITORING

Proposed changes include updating the likely sources of radiological impacts from operations and the continuation of monitoring historical sources of cesium-137 (Cs-137) in soils and vegetation.

PECONIC RIVER WATER QUALITY SURVEILLANCE

Proposed changes include updates to reflect changes resulting from the divergence of the STP discharge from the Peconic River. Peconic River monitoring will be reduced to looking only at the potential impacts of the Relativistic Heavy Ion Collider; impacts from spills; impacts from the east central portion of the BNL property through monitoring at station HM-S; and the potential of impacts to off-site locations through station HQ at the eastern boundary. All other off-site monitoring locations have been eliminated except for the control at Station HH on the Carmans River.

CHEMICAL/ANIMAL HOLES STRONTIUM-90 (SR-90)

Proposed changes include installing four permanent shallow wells to monitor the residual Sr-90 upgradient of EW-1.

OU III NORTH STREET

Proposed changes include reducing groundwater monitoring to the standby monitoring frequency (semi-annual for core and bypass wells and annual for perimeter wells) per the Petition for Shutdowns recommendations.

OU III HIGH FLUX BEAM REACTOR (HFBR)

Proposed changes include discontinuing sampling of 24 monitoring wells located south of Temple Place. Due to the attenuation of the plume, the monitoring program has been limited to the wells in the immediate vicinity of the HFBR.

OU III Building 96 Area

Proposed changes include eliminating further sampling due to the significant reduction of hexavalent chromium in the monitoring wells over the last several years.

OU III Middle Road Pump and Treat System

Proposed changes include increasing sampling in well 105-23 from semi-annual to quarterly to monitor for the deeper VOCs in this area.

OU III Off-Site Post ROD

Based on the low levels of VOCs detected and the depth of the screen zone, well 000-107 will be dropped from the sampling program, but will be maintained for water level measurements.

OU III North Street East

Proposed changes include reducing groundwater monitoring to the approved standby monitoring frequency (semi-annual for core and bypass wells and annual for perimeter wells) per the Petition for Shutdowns recommendations.

OU III - Building 452 Freon-11 Source Area and Groundwater Plume

Following regulatory agency approval of a planned Petition of Shutdown, it is anticipated that the Freon-11 treatment system will be placed on standby mode starting in early 2016. All monitoring wells and extraction well EW-18 will be sampled on a quarterly basis during the shutdown period.

OU IV Area of Concern (AOC) 6 - Building 650 Sump Outfall Area

Proposed changes include increasing the frequency of sampling well 076-13 from semiannual to quarterly to monitor the former source area and installing several temporary wells immediately north of the National Synchrotron Light Source II (NSLS-II) to site a place for a permanent sentinel monitoring well.

Groundwater Monitoring For The G-2 Tritium Source Area and Plume

Proposed changes include discontinuing sampling of the downgradient segment of the g-2 tritium plume that was located south of Brookhaven Avenue because tritium concentrations have attenuated to less than the 20,000 pCi/L drinking water standard in this area. Monitoring will be restricted to the g-2 source area.