

EXECUTIVE SUMMARY

Brookhaven National Laboratory (BNL) is a multi-program national laboratory operated by Brookhaven Science Associates for the U.S. Department of Energy (DOE) and is located on a 5,265-acre site in Suffolk County, Long Island, New York. BNL has a comprehensive Environmental Management System (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 on site enables the Laboratory to make informed decisions concerning the protection of human health and the environment and to be responsive to stakeholder concerns.

BNL's environmental monitoring program was designed in accordance with DOE Order 450.1 (2003), Environmental Protection Program. This order sets forth the requirements for environmental protection programs at DOE facilities to ensure 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) on the BNL site and at locations off site. 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 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 four off-site locations between the southeast site boundary and the river's terminus at Riverhead, New York; at five locations on site; and at one station on site but upstream of all BNL activities. The Carmans River is also sampled 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. Wells are used to monitor 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.

BNL maintains six groundwater production wells to supply potable water to the Laboratory community. 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 four contract analytical laboratories, all of which are certified by New York State for specific parameters and are subject to audits.

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, as required by DOE. The following are highlights of key changes in the 2008 monitoring program. Full descriptions of the changes are detailed in each DQOs.

Air Emissions Source – Ambient Air Quality

- A follow-up evaluation of the potential impacts of lab hood emissions using the DAR-1 computer-based model showed predicted impacts of chloroform and carbon tetrachloride emissions in 2006 continued to be less than one-half their respective Annual Guideline Concentrations (AGCs). An annual evaluation of emission impacts will be performed for CY2007.

Air Emissions Source – Central Steam Facility (CSF) Emissions

- On February 19, 2007, the Boiler 6 continuous opacity monitor recorded five opacity exceedances during soot blowing operations. The exceedances occurred during the first soot blowing cycle after an extended two-month long idle period where only nominal volumes of residual fuel were burned to keep the boiler warm. To prevent a reoccurrence, CSF stationary engineers will conduct intermittent soot blowing during extended boiler idle periods.

Flora, Fauna, Precipitation, Soils, and Peconic River – Fish, Shellfish, Aquatic Vegetation, and Sediment

- Due to long term data sets on fish indicating few pesticides and PCB's within fish off site of BNL, sampling efforts will be reduced to typical food fishes and will limit fish taken to bottom feeders (brown bullhead) and top predators (largemouth bass, chain pickerel, black crappie, or yellow perch). Analysis is being reduced to metals and gamma emitting radionuclides, with metals analysis taking priority over radionuclide analysis.

Flora, Fauna, Precipitation, Soils, and Peconic River – Peconic River Post-Cleanup Monitoring

- After five years of annual monitoring (through 2010), BNL/DOE will evaluate all environmental data collected since completion of the cleanup for each of the ROD-required monitoring activities (sediment, surface water, fish). BNL/DOE will then recommend future monitoring activities and/or response actions, as appropriate, and submit them to EPA, NYSDEC, and SCDHS as part of the BNL Five-Year Review. Previously, this was being performed after three years of data review (through 2008).

Flora, Fauna, Precipitation, Soils, and Peconic River – Farm and Garden Vegetables and Soils

- In order to stagger sampling efforts between various media that are on a 5-year rotation, the sampling date for farm vegetation was changed from 2007 to 2008

Flora, Fauna, Precipitation, Soils, and Peconic River – Small Mammal Sampling

Small mammal sampling will be discontinued for several reasons. After several years of effort, it became apparent that there was a difficulty in obtaining samples on a quarterly basis. In addition, BNL has sufficient data that indicates that for known contaminant monitoring, squirrels are suitable surrogates for large mammal sampling in highly localized areas. Since BNL has conducted significant clean up of contaminated soils, the need for any localized faunal sampling is greatly reduced. Continuation of deer sampling as the primary mechanism to document environmental effects on terrestrial fauna will continue; there are no changes being proposed in deer sampling requirements.

Liquid Effluents – Surface Water Recharge Basins

- Sediment/soil sampling will continue in 2008 for recharge basins or storm water discharges not sampled in 2007. All soil samples will be analyzed for inorganic and radiological parameters. Discharges to be sampled in 2008 include Basin HZ and the Central Steam Facility.

Potable Water – Potable Water Monitoring

- Granular activated carbon vessels installed at Wells 10, 11, and 12 are no longer needed and are in the process of being disconnected. Once disconnection is complete, quarterly sampling for VOCs will include collection of raw water samples only. Years of data showing no significant impact of volatile compounds on groundwater quality enabled these systems to be disconnected. However, due to possible regulatory changes, compliance sampling requirements may change in 2008. Any changes will be incorporated into this plan when received.

Groundwater – Chemical/Animal Holes Strontium-90

- Two new extraction wells will be pumped.
- Based on low influent concentrations over 2006 and to help evaluate improving the effectiveness of removing Sr-90 from the aquifer, pulse pumping (EW-1 cycle of one month on and one month off) which was implemented in October 2007, will continue. This will help evaluate rebounding of the Sr-90 influent concentrations. If concentrations in the extraction well increase significantly, the extraction well will be put back into full-time operation.
- Remove gross beta from the analyte list for the treatment system sampling. This sampling was previously used as a means to confirm that there was not rapid breakthrough of the resin. However, based on the 3 years of operations data, breakthrough is a slow and gradual process. Thus, the 2-week turnaround on Sr-90 analyses is now adequate for continued verification.
- Change the monitoring well sampling frequency from startup (semi-annual and quarterly) to the O&M phase (semi-annual and annually). However, monitoring of the new wells to be installed will continue at the semi-annual frequency for approximately two years.

Groundwater – OU I South Boundary (RA V Remedial Action)

- Based on TVOC concentration increases in well 115-13 and upgradient plume core well 107-40, the leading edge of the high concentration segment of the VOC plume is approaching the south boundary and should reach it during 2008. As a result, full-time operation of extraction wells EW-1 and EW-2 during the third quarter of 2007 will resume.
- For consistency with previous changes made to the Current Landfill plume monitoring, delete monitoring of the system influent and effluent for metals (including iron and manganese), pesticides, PCBs, and gross alpha/beta.

Groundwater – OU III North Street

- Change monthly sampling of the extraction wells to quarterly.
- Change system influent, midpoint, and effluent sampling frequency from weekly to twice per month.

Groundwater – OU III High Flux Beam Reactor (HFBR)

- Install and operate a fourth extraction well (EW-16), approximately 400 feet south of Weaver Drive.
- Temporary wells will be installed twice per year over the next several years to characterize the location of the tritium high concentration area, and results will be communicated to the regulators via the IAG conference call and quarterly/annual reports.
- Install and sample five permanent monitoring wells to monitor the effects of the new extraction well on the tritium plume.

Groundwater – OU III BGRR/WCF Strontium-90

- Change the treatment system monitoring frequency from weekly to two times per month.
- Remove gross beta from the analyte list for the treatment system sampling, since this sampling is no longer needed. It was previously used as a means to confirm any rapid breakthrough of the resin. However, based on over 2 years of operations data, breakthrough is a slow and gradual process. Thus, the two-week turnaround on Sr-90 analyses is now adequate for continued verification.

- Change the monitoring well sampling frequency from startup (semi-annual and quarterly) to the O&M phase (semi-annual and annually).

Groundwater – OU III Carbon Tetrachloride

- Change the monitoring well sampling frequency from shutdown phase (quarterly) to standby (semi-annually).
- Move monitoring well 095-92 to the Middle Road Pump and Treat System well network.

Groundwater – OU III Building 96 Area

- As an interim action to maintain hydraulic containment of the source area, modify recirculation well RTW-1 to work as a pumping well and discharge to the nearby surface drainage culvert. This will involve running a discharge line to the culvert approximately 300 feet away and will require a SPDES equivalency permit. Effluent sampling will be performed, as per the SPDES equivalency permit.
- Since VOC concentrations did not show a consistent decline in the source area wells, alternative methods for remediating the contamination in the silt zone upgradient of extraction well RTW-1 will be evaluated. The evaluation will include excavation of the source area, adding an additional extraction well in the source area, or other remedial technologies. The evaluation will be prepared in early 2008.

Groundwater – OU III South Boundary Pump and Treat System

- Extraction wells EW-6 and -7, which were placed in standby mode in October 2007 due to low VOC concentrations, will continue to be in a standby mode. Therefore, four of the seven extraction wells will be in standby mode during 2008. The wells will be restarted if extraction or monitoring well data indicate TVOC concentrations exceed the 50 µg/L capture goal.

Groundwater – OU III Middle Road Pump and Treat System

- One additional temporary well will be installed 150 feet west of MRVP-104 to characterize the high-concentration portion of the plume in this area. Two monitoring wells will be installed, one near MRVP-103 to monitor the high concentrations and one on the western edge of this plume to use as a perimeter monitoring well.

Groundwater – OU III Off-Site Post ROD

- Change the frequency of monitoring from semi-annual to annual.

Groundwater – OU III Industrial Park

- Operations at 60 gpm per well except for wells UVB-1 and UVB-4, which is to remain in a standby mode, will continue. Monthly sampling will continue; if TVOC concentrations greater than 50 µg/L are observed, wells UVB-1 and -4 will be restarted.

Groundwater – Building 650 Sump Outfall Area

- The sampling frequency for monitoring wells 076-07, -09, -10, -22, -181, -182, -184, and -265 will be reduced to annual.
- Since the primary contaminant for this plume is Sr-90, further monitoring of gross alpha/beta, gamma spectroscopy, and tritium, will discontinue.

Groundwater – OU V Sewage Treatment Plant TVOC Plume Distribution

- The monitoring program sampling frequency will change from semi-annual to annual.

Groundwater – OU VI Ethylene Dibromide (EDB)

- Since there were no detections above the DWS for EDB in well 000-498 for 2006, the sampling frequency for this well was changed from quarterly (system start-up phase) to semi-annually (O&M phase) during the 4th quarter of 2007. This will allow for consistency with the remainder of the wells in this monitoring program.

Groundwater – Alternate Gradient Synchrotron (AGS)

- The routine groundwater monitoring well sampling frequency at the AGS Booster and NASA Space Radiation Laboratory (NSRL) facilities will be reduced from semi-annually to annually. Implementation of the monitoring requirements defined in the g-2/BLIP/UST Record of Decision (April 2007) will not result in any changes to the previously established routine monitoring program for the g-2 source area. However, additional temporary wells will need to be installed to monitor the downgradient segments of the g-2 tritium plume. The ROD has also established a contingency action trigger if tritium is detected above 1,000,000 pCi/L in any segment of the g-2 tritium plume.

Groundwater – Waste Management Facility

- Five new downgradient groundwater monitoring wells were installed in 2007. The wells will be integrated into the Waste Management Facility monitoring program starting in 2008. Wells are located as close as possible to potential WMF source areas to allow for early detection of contaminant releases. When the WMF monitoring program began in 1997, the predominant groundwater flow pathway in the WMF area was to the north. However, since 1997, there has been a significant reduction in cooling water discharges to basin HO and restrictions have been placed on prolonged pumpage of water from supply wells 11 and 12. This has resulted in a return to a more natural southeasterly flow pathway in the WMF area. In late 2007, five new downgradient monitoring wells were installed to account for this change in groundwater flow direction. The current sampling protocol, as described in the RCRA Part B Permit, calls for the running of supply wells 11 and 12 for a two-week period prior to sampling the WMF wells in order to establish a south to north groundwater flow direction. However, starting in 2008, the natural southeasterly groundwater flow pathway will be maintained for at least one month prior to sampling the new downgradient monitoring wells. The older downgradient wells will be kept in reserve, and will only be sampled if supply wells 11 and 12 have been in continuous operation for two or more weeks prior to the sampling period.

Groundwater – BNL Medical Research Reactor

- Because tritium levels in the groundwater have been consistently below the 20,000 pCi/L drinking water standard since the start of the monitoring program in 1997, and all cooling water systems within the Brookhaven Medical Research Reactor (BMRR) have been drained, the sampling frequency has been changed from annually to once every 2 years. No sampling was conducted during 2007; sampling will resume in 2008

Groundwater – OU III Airport

- As per the recent groundwater investigation, an additional extraction well (RW-6A) was added west of Airport well RTW-1A. Five new monitoring wells were installed.
- The extraction well sampling was changed to quarterly, except for well RTW-1A, which will be maintained at the monthly schedule.
- System sampling and analysis has been reduced from weekly to two times per month.

Groundwater – OU III Long Island Power Authority (LIPA)

- Groundwater monitoring frequency will be changed from the startup phase to O&M phase (core and perimeter wells sampled semi-annually, and sentinel wells sampled quarterly).
- Extraction well sampling will change to quarterly.
- LIPA wells EW-1L and -3L will be shut down and placed in a standby mode.

Groundwater – OU III Industrial Park East

- Extraction wells will be pulse pumped, one month on and one month off at 115 gpm for EWI-1 and 75 gpm for EWI-2. The extraction wells will be restarted if data indicate that the capture goal of 50 µg/L TVOC is exceeded. If no rebound is seen (i.e., TVOC concentrations exceeding 50 µg/L) in extraction or monitoring wells after one year of pulse pumping, then a petition for shutdown of this system will be initiated.
- The monitoring well network sampling frequency will be changed from the O&M phase (semi-annual sampling) to the shutdown phase (quarterly sampling)

Groundwater – OU III North Street East

- Since this system has been operating for over two years, the sampling frequency for the monitoring wells will be changed from start-up to the O&M phase (core and perimeter wells sampled semi-annually and sentinel wells sampled quarterly). However, plume core wells 000-481, -482, -483, and -484 will be maintained at the quarterly sampling frequency, since they are immediately upgradient of extraction well NSE-2.

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