

A MESSAGE FROM THE LABORATORY DIRECTOR

As Director of Brookhaven National Laboratory (BNL), I expect nothing less than excellence from our employees and visiting researchers, in terms of the science carried out here, our support operations, and in our role as responsible stewards of the environment. One of BNL's highest priorities is ensuring that the Laboratory's environmental performance measures up to its world-class status in science. The Laboratory's motto, "Exploring Life's Mysteries...Protecting its Future," reflects BNL's management philosophy to fully integrate environmental stewardship into all facets of its missions and operations.

In 2001, BNL became the first Department of Energy (DOE) Office of Science Laboratory, and the first Long Island-based organization, to achieve third-party registration to the internationally recognized ISO 14001 Environmental Standard. In 2003, the Laboratory continued to demonstrate environmental leadership across the DOE complex by having our Environmental Management System (EMS) recertified to the ISO 14001 standard after undergoing a rigorous surveillance audit to confirm that BNL's EMS is being maintained and to document evidence of continued improvement.

BNL's strong Pollution Prevention (P2) Program continues to be a success. To date, pollution prevention projects instituted since 1999 have saved more than \$1.5 million and have resulted in the reduction, recycling, or reuse of approximately 2.3 million pounds of industrial, sanitary, hazardous, and radioactive waste. In 2003, 19 pollution prevention proposals were submitted by BNL staff. Approximately \$96,000 was invested in eight new projects, with an anticipated annual savings of \$88,000 and an average payback period of 1.2 years. Energy improvements in buildings and ongoing conservation efforts continue to save money for the Laboratory.

Under the Laboratory's Environmental Management Program, cleaning up soil and groundwater contamination and preventing additional contamination from moving off site is a primary goal. Since the beginning of active groundwater cleanup activities in December 1996, BNL has removed 4,156 pounds of chemicals from the aquifer, treating nearly 6.8 billion gallons of groundwater. During 2003, seven groundwater remediation systems removed 510 pounds of chemicals and returned approximately 1.3 billion gallons of treated water to the Upper Glacial Aquifer.

The Upton Ecological and Research Reserve continues to produce new ecological data each year. Highlights for 2003 include the discovery of the redbellied snake, a species not seen on Long Island in more than 60 years, and research into the orange striped oakworm, a species capable of decimating the abundant oak forests that make up much of the Long Island ecosystem. Also in 2003, working with the Reserve's Technical Advisory Group, regulatory agencies, and other stakeholders, BNL developed a comprehensive, ecosystem-based Natural Resource Management Plan and approved funding for several research projects.

It is important that the Laboratory maintain stakeholder trust, and we will continue to deliver on our commitments and demonstrate real improvements in environmental performance. The annual publication of the Site Environmental Report is one of many ways the Laboratory keeps our neighbors, regulators, employees, and other interested parties informed about environmental issues and progress at BNL.

Praveen Chaudhari

Praveen Chaudhari,
Laboratory Director



2003

SITE ENVIRONMENTAL REPORT

Summary

Brookhaven National Laboratory

Message from the Laboratory Director.....	1
Preface	2
BNL Mission.....	3
About Brookhaven National Laboratory.....	4
BNL History.....	4
Scientific Discoveries and Research	5
BNL Facilities and Operations.....	6
Geology and Hydrology.....	8
Ecological Resources at BNL	10
Cultural Resources at BNL	12
Environmental Management System.....	13
Environmental Management Program.....	14
Pollution Prevention Program.....	14
Waste Management Program.....	14
Water Conservation Program	15
Energy Management and Conservation Program.....	15
Compliance Monitoring Program.....	16
Air Quality Program.....	16
Water Quality Surveillance Program.....	17
Natural Resource Management Program..	19
Groundwater Protection Management Program.....	20
Radiological Dose Assessment Program	22
Dose in Perspective.....	23
Quality Assurance	24
Communication and Community Involvement.....	25
Acronyms and Abbreviations.....	26
References	26
Reader Response Form	27



BNL Mission

PREFACE

Each year, BNL prepares an annual Site Environmental Report (SER) in accordance with the U.S. Department of Energy Order 231.1A, Environment, Safety and Health Reporting. The report is written to inform regulators, the public, Laboratory employees, and other stakeholders of the Laboratory's environmental performance for the calendar year in review. The report summarizes performance in the areas of environmental management, environmental impacts, compliance with applicable regulations, surveillance monitoring, and restoration. The Laboratory has compiled and recorded nearly all of its environmental history since its inception in 1947. The Site Environmental Report is intended to be a technical document and is available as a downloadable file at <http://www.bnl.ser.htm>.

This summary document provides a general overview of the Laboratory's performance for 2003. It also includes a CD version of the full SER report on the inside back cover of this booklet. The summary is intended for general public distribution in support of educational and community outreach and as part of DOE's commitment to providing updates on environmental performance to people living near DOE sites and to other interested stakeholders. This summary is also available as a downloadable file at <http://www.bnl.ser.htm>.

EXPLORING EARTH'S MYSTERIES
...PROTECTING ITS FUTURE

BNL's broad mission is to produce excellent science in a safe, environmentally responsible manner with the cooperation, support, and appropriate involvement of the scientific and local communities. For more than 50 years, BNL has been one of the leading research institutions in the nation and the world. Much of the Laboratory's effort is directed at the study of the basic nature of matter, including subatomic particles and the structure of the atom. BNL research has also produced extraordinarily useful technology. To date, six Nobel prizes have been awarded for research conducted at BNL. The Laboratory plays a lead role in the DOE Science and Technology mission and contributes to the DOE missions in Energy Resources, Environmental Quality, and National Security. The fundamental elements of BNL's role in support of these key DOE missions are:

- To conceive, design, construct, and operate complex, leading-edge, user-oriented research facilities in response to the needs of DOE and the international community of users.
- To carry out basic and applied research in long-term, high-risk programs at the frontier of science.
- To develop advanced technologies that address national needs and to transfer them to other organizations and to the commercial sector.
- To disseminate technical knowledge, to educate new generations of scientists and engineers, to maintain technical capabilities in the nation's workforce, and to encourage scientific awareness in the general public.

BNL integrates environmental stewardship into all facets of its missions and operations. The Laboratory's Environmental Stewardship Policy, which is posted throughout the site, reflects BNL's commitment to conducting research and operational activities in a manner that protects the health of the public, employees, and the environment. Issued and signed by the Laboratory Director, this policy is a statement of BNL's intentions and principles regarding overall environmental performance, and provides a framework for managing and controlling environmental activities.

Environmental Stewardship Policy

It is Brookhaven National Laboratory's (BNL's) policy to integrate environmental stewardship into all facets of the Laboratory's missions.

We will manage our programs in a manner that protects the ecosystem and public health.

In support of this policy, BNL makes the following commitments:

We are committed to achieving compliance with applicable environmental requirements.

In consideration of the potential impacts of our activities on the environment, we will integrate pollution prevention/waste minimization, resource conservation, and compliance into all of our planning and decision making. We will adopt cost-effective practices that eliminate, minimize, or mitigate environmental impacts.

We will define, prioritize, and aggressively correct and clean up existing environmental problems.

We will work to continually improve our environmental management system and performance. We will establish appropriate environmental objectives and performance indicators to guide these efforts and measure our progress.

We will maintain a positive, proactive, and constructive relationship with our neighbors in the community, regulators, DOE, and our other stakeholders. We will openly communicate with stakeholders on our progress and performance.

In addition to my annual review of BNL's progress on environmental goals and adherence to this policy, I invite all interested parties to provide me with input on our performance relative to this policy, and the policy itself.



Praveen Chaudhari, Laboratory Director

About Brookhaven National Laboratory



Satellite photo showing location of BNL. The small circle is the Relativistic Heavy Ion Collider (RHIC).

BNL HISTORY

Established in 1947, BNL is a national laboratory operated and managed for DOE's Office of Science by Brookhaven Science Associates (BSA), a limited-liability company founded by Stony Brook University and Battelle Memorial Institute, a nonprofit, applied science and technology organization. BSA began operating the Laboratory on March 1, 1998 under DOE Contract No. DE-AC02-98CH10886. From 1947 to 1998, BNL was operated by Associated Universities Incorporated. Prior to 1947, the site was operated as Camp Upton, a U.S. Army training camp, which was active from 1917 to 1920 during World War I and from 1940 to 1946 during World War II. Many of the cultural artifacts from the Army era are preserved in the Camp Upton Museum located on site.

BNL is located in Suffolk County on Long Island, New York, about 60 miles east of New York City. The Laboratory's 5,265-acre site is near Long Island's geographic center and is part of the Town of Brookhaven, the largest township (both in area and population) in Suffolk County. Approximately 150 people live in apartments and cottages on site, and many of the approximately 4,000 scientists and students who visit each year stay in the Laboratory's dormitories. More than 75 percent of BNL's employees live within a 15-mile radius of the site.

BNL is the largest employer on eastern Long Island, with an annual budget approaching \$443 million. Employee salaries, wages, and fringe benefits account for almost 62 percent of the annual budget. This budget directly supports the local economy through purchases of materials and services. An independent Suffolk County Planning Commission report concluded that BNL's spending for operations, procurement, payroll, construction, medical benefits, and technology transfer spreads throughout Long Island's economy, making BNL vital to Long Island's economic health (Kamer 1995).

SCIENTIFIC DISCOVERIES AND RESEARCH

BNL conducts applied research in the physical, biomedical, and environmental sciences, and in energy technologies. BNL also builds and operates major world-class research facilities that are available to university, industrial, and government personnel. Approximately 2,750 scientists, engineers, technicians, and support staff are employed at BNL, and more than 4,000 guest researchers from all over the world visit the site each year to participate in scientific collaborations. Some important scientific discoveries and research at BNL include:

- major discoveries in particle physics
- the use of L-dopa to treat Parkinson's disease
- work on magnetically levitated (Maglev) trains
- the radionuclide thallium-201, used in millions of heart stress tests each year
- x-ray angiography for noninvasive heart imaging
- pioneering solar neutrino studies seeking the answer to the mystery of the "missing" neutrinos from our solar system's sun, and neutrino bursts from supernovae

Some topics of research now being conducted at the Laboratory include:

- pollution-eating bacteria
- structural studies of the Lyme disease protein for developing new vaccines
- studies of the state of matter at the dawn of the universe
- large-scale studies of the effect of increased carbon dioxide on ecosystems
- promising cocaine addiction treatments
- cleaner, more efficient oil burners



Stephen Dewey and a colleague probe the mysteries of the brain.



Raymond Davis Jr., a retired BNL chemist, was one of the recipients of the 2002 Nobel Prize in Physics.



Particle tracks from one of RHIC's first collisions

2003 NOBEL PRIZE The Chemistry of the Cell

Roderick MacKinnon, M.D., a visiting researcher at BNL, shared the 2003 Nobel Prize in Chemistry for work explaining how a class of proteins helps to generate nerve impulses—the electrical activity that underlies all movement, sensation, and perhaps even thought. The work leading to the prize was done primarily at the Cornell High Energy Synchrotron Source and the National Synchrotron Light Source at BNL. The proteins, called ion channels, are tiny pores that stud the surface of all of our cells. These channels allow the passage of potassium, calcium, sodium, and chloride molecules called ions. Rapid-fire opening and closing of these channels releases ions, moving electrical impulses from the brain in waves to their destination in the body.



National Synchrotron Light Source

BNL FACILITIES AND OPERATIONS

Most of BNL's facilities are located near the center of the site. The developed area is approximately 1,650 acres and includes:

- 500 acres originally developed by the Army (as part of Camp Upton) and still used for offices and other operational buildings
- 200 acres occupied by large, specialized research facilities
- 550 acres occupied by outlying facilities, such as the Sewage Treatment Plant, research agricultural fields, housing facilities, and fire breaks
- 400 acres of roads, parking lots, and connecting areas.

The balance of the site, approximately 3,600 acres, is mostly wooded and represents the native Pine Barrens ecosystem. In November 2000, DOE set aside 530 acres of undeveloped land at BNL currently known as the Upton Ecological and Research Reserve (Reserve). The Reserve is discussed in greater detail on page 11.

The major scientific facilities at BNL are briefly described on the following page. BNL's three research reactors (the Brookhaven Graphite Research Reactor, the High Flux Beam Reactor, and the Brookhaven Medical Research Reactor) are no longer operating. Additional facilities, which are briefly described below, provide basic utilities and environmental services. All of these facilities must undergo periodic environmental review as part of BNL's Environmental Management Program.

- *Water Treatment Plant.* The potable water treatment facility has a capacity of 5 million gallons per day. Potable water is obtained from six on-site wells. Water from three wells located along the western boundary of the site is treated with a lime softening process to remove naturally occurring iron. The plant is also equipped with dual air-stripping towers to ensure that volatile organic compounds (VOCs) are below New York State drinking water standards. Water from the three wells along the eastern section of the developed site is treated with carbon to remove low levels of VOCs that may be present.
- *Central Chilled Water Plant.* This facility provides chilled water sitewide for air conditioning and process refrigeration via underground piping.
- *Central Steam Facility.* This dual-fuel-fired plant provides high-pressure steam for facility and process heating sitewide. Both natural gas and fuel oil can be used to produce the steam, which is distributed to other facilities through underground piping. Condensate is collected and returned to the Central Steam Facility for reuse, to conserve water and energy.
- *Major Petroleum Facility.* This facility provides storage fuel for the Central Steam Facility. With a total capacity of 2.3 million gallons, the Major Petroleum Facility primarily stores No. 6 fuel oil. The 1997 conversion of the Central Steam Facility boilers to burn natural gas as well as oil is reducing BNL's reliance on oil as a fuel.
- *Sewage Treatment Plant.* This facility treats sanitary and certain process wastewater from BNL facilities, similar to the operations of a municipal sewage treatment plant. The plant has a design capacity of 3 million gallons per day. Effluent is monitored and controlled under a permit issued by the New York State Department of Environmental Conservation.
- *Waste Management Facility.* This facility is a state-of-the-art complex for managing the wastes generated through BNL's research and operations. The facility began operation in December 1997 and was built with advanced environmental protection systems and features. It houses two areas that have permits from the New York State Department of Environmental Conservation for storing hazardous wastes prior to shipment for treatment and disposal at other licensed facilities.
- *Fire Station.* The BNL Fire Department provides on-site fire suppression, emergency medical services, hazardous material response, salvage, and damage control. The fire station houses six response vehicles. The fire rescue group responds within 5 minutes to any emergency in the core area of the Laboratory and within 8 minutes to emergencies in the outer areas of the site.

*Aerial photograph
of the BNL site*



Major Scientific Facilities at BNL

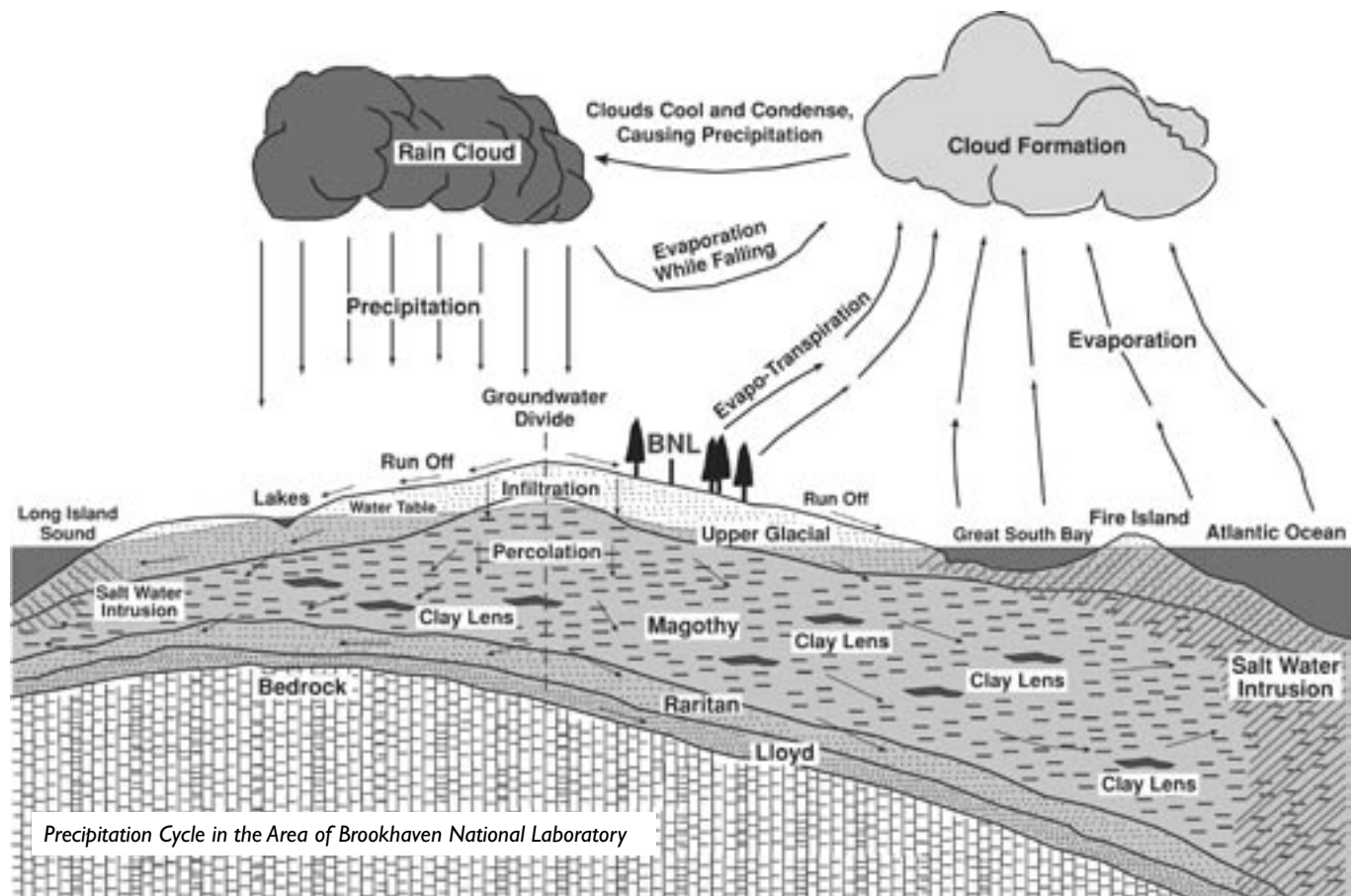
- *Relativistic Heavy Ion Collider (RHIC)*. RHIC is one of the world's largest and most powerful accelerators. RHIC's main physics mission is to study particles smaller than atoms.
- *Alternating Gradient Synchrotron (AGS)*. The AGS is used for high-energy physics research and accelerates protons to very high energies and heavy-ion beams. A linear accelerator, described below, serves as a proton injector for the AGS Booster and also supplies a continuous beam of protons for medical isotope production in the Brookhaven Linac Isotope Producer (BLIP) facility.
- *AGS Booster*. The AGS Booster is a circular accelerator, 200 meters in circumference, that receives either a proton beam from the Linac, or heavy ions from the Tandem Van de Graaff. The AGS Booster accelerates proton particles and heavy ions before injecting them into the AGS Ring. This facility became operational in 1992.
- *Linear Accelerator (Linac) and Brookhaven Linac Isotope Producer (BLIP)*. The Linac provides beams of polarized protons for the AGS and for the RHIC. BLIP utilizes the excess beam capacity of the Linac to produce radioisotopes used in research and medical imaging. It is one of the key production facilities in the nation for radioisotopes, which are crucial to clinical nuclear medicine. It also supports research on new diagnostic and therapeutic radiopharmaceuticals.
- *Heavy Ion Transfer Line (HITL)*. The HITL connects the Tandem Van de Graaff and the AGS Booster. This interconnection permits ions of intermediate mass to be injected into the AGS, where they can be accelerated to an energy of 15 GeV. These ions are then extracted and sent to the AGS experimental area for physics research or to the RHIC.
- *Radiation Therapy Facility (RTF)*. Part of the Medical Research Center, the RTF is a high-energy dual x-ray mode linear accelerator for radiation therapy of cancer patients. This accelerator delivers therapeutically useful beams of x-rays and electrons for conventional and advanced medical radiotherapy techniques.
- *Brookhaven Medical Research Reactor (BMRR)*. The BMRR was the world's first nuclear reactor built exclusively for medical research applications and therapy. It produced neutrons in an optimal energy range for experimental treatment of a type of brain cancer known as glioblastoma multiforme. This reactor stopped operating in December 2000.
- *Scanning Transmission Electron Microscope (STEM)*. This facility includes two microscopes, STEM 1 and STEM 3, used for biological research. Both devices allow scientists to see the intricate details of living things, from bacteria to human tissue.
- *National Synchrotron Light Source (NSLS)*. The NSLS utilizes a linear accelerator and booster synchrotron as an injection system for two electron storage rings that produce ultraviolet, infrared, and x-ray beams. These beams are used to form highly detailed "pictures" of a wide variety of materials.
- *High Flux Beam Reactor (HFBR)*. The HFBR was one of the premier neutron physics research facilities in the world. Neutron beams produced at the HFBR were used to investigate the molecular structure of materials, which aided in pharmaceutical design and materials development, as well as expanded the knowledge base of physics, chemistry, and biology. A leak in the fuel storage pool was discovered in 1997. Since that time, the HFBR has not been in operation and was permanently shut down in November 1999.
- *Tandem Van de Graaff and Cyclotron*. These two facilities are used in medium-energy physics investigations and for producing special nuclides. The heavy ions from the Tandem Van de Graaff also can be injected into the AGS Booster for physics experiments.
- *Brookhaven Graphite Research Reactor (BGRR)*. No longer in operation, the BGRR was used for scientific exploration in the fields of medicine, biology, chemistry, physics, and nuclear engineering.

GEOLOGY AND HYDROLOGY

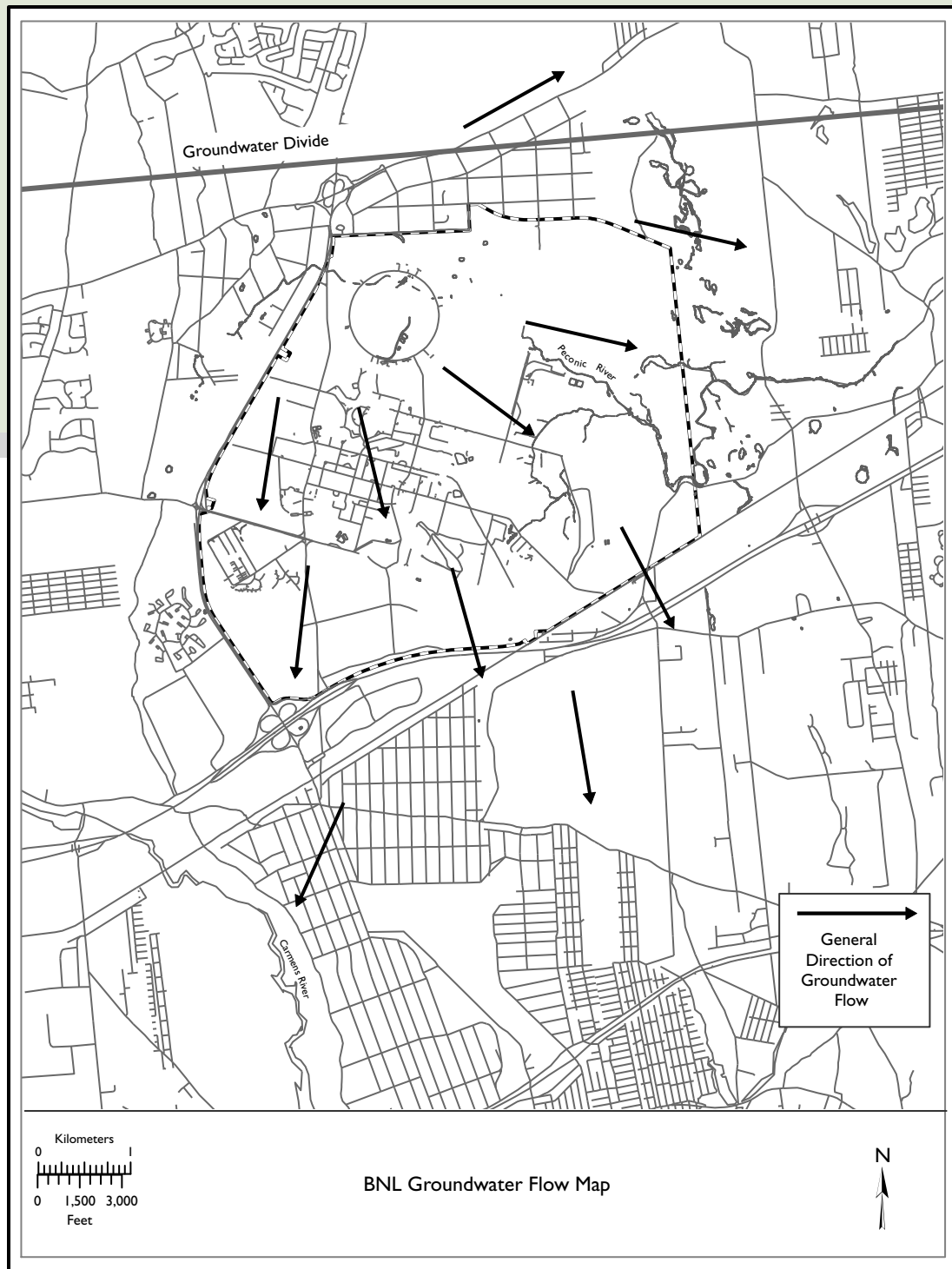
BNL is situated on the western rim of the shallow Peconic River watershed. The marshy areas in the northern and eastern sections of the site are part of the headwaters of the Peconic River. Depending on the height of the water table relative to the base of the riverbed, the Peconic River both recharges to, and receives water from, the sole source aquifer system beneath Long Island. In times of sustained drought, the river water typically recharges to the groundwater; with normal to above-normal precipitation, the river receives water from the aquifer. Due to the high rate of precipitation in 2003, the Peconic River flowed off site 10 months of the year.

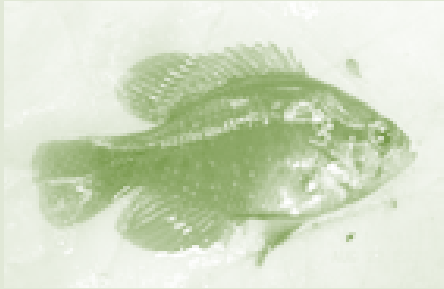
In general, the terrain of the BNL site is gently rolling, with elevations varying between 44 and 120 feet above mean sea level. Depth to groundwater from the surface of the land ranges from 5 feet near the Peconic River to about 80 feet in the higher elevations of the central and western portions of the site. Studies of Long Island hydrology and geology in the vicinity of the Laboratory indicate that the uppermost Pleistocene deposits, composed of highly permeable glacial sands and gravel, are between 120 and 250 feet thick (Warren et al. 1968, Scorca et al. 1999). Water penetrates these deposits readily and there is little direct runoff into surface streams unless precipitation is intense. These sandy deposits store large quantities of water in the Upper Glacial Aquifer. On average, about half of the annual precipitation is lost to the atmosphere through evapotranspiration and the other half percolates through the soil to recharge the groundwater.

The Long Island Regional Planning Board and Suffolk County have identified the BNL site as overlying a deep-flow recharge zone for Long Island groundwater (Koppelman 1978, SCDHS 1987). Precipitation and surface water that recharge within this zone have the potential to replenish the deep Magothy and Lloyd aquifer systems lying below the Upper Glacial Aquifer. Experts estimate that up to two-fifths of the recharge from rainfall moves into the deeper aquifers. The extent to which groundwater at the BNL site contributes to deep flow recharge has been confirmed through the use of an extensive network of shallow and deep wells installed at BNL and surrounding areas (Geraghty and Miller 1996). This groundwater system is the primary source of drinking water for both on- and off-site private and public supply wells and, as such, has been designated a sole source aquifer system by the Environmental Protection Agency.

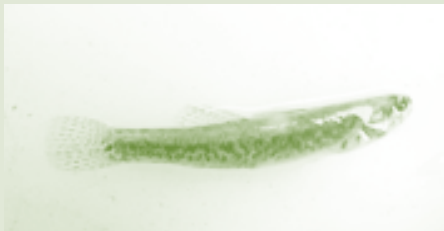


Groundwater flow direction across the BNL site is influenced by natural drainage systems moving eastward along the Peconic River, southeast toward the Forge River, and south toward the Carmans River. Pumping from on-site supply wells affects the direction and speed of groundwater flow in the central, developed areas of the site. The main groundwater divide on Long Island is aligned generally east–west, and lies approximately one-half mile north of BNL. Groundwater north of the divide flows northward and ultimately discharges to the Long Island Sound. Groundwater south of the divide flows east and south, discharging to the Peconic River, Peconic Bay, south shore streams, the Great South Bay, and the Atlantic Ocean. The regional groundwater flow system is discussed in greater detail in *Stratigraphy and Hydrologic Conditions* (Scorca et al. 1999). In most areas at BNL, the horizontal velocity of groundwater is approximately 0.75 to 1.2 feet per day (Geraghty and Miller 1996). In general, this means that groundwater travels for approximately 20 to 22 years as it moves from the central, developed area of the site to the BNL southern boundary.





Banded Sunfish (Enneacanthus obesus)
This fish was released immediately after the picture was taken.



Swamp Darter (Etheostoma fusiforme)
This fish was released immediately after the picture was taken.



Tiger Salamander (Ambystoma t. tigrinum)

ECOLOGICAL RESOURCES AT BNL

BNL is located in the oak/chestnut forest region of the Coastal Plain and constitutes about 5 percent of the 100,000-acre New York State-designated region on Long Island known as the Central Pine Barrens. The section of the Peconic River running through BNL is designated “scenic” under the New York State Wild, Scenic, and Recreational River System Act of 1972. Due to the general topography and porous soil, the land is very well drained and there is relatively little surface runoff or open standing water. However, depressions form small, pocket wetlands with standing water on a seasonal basis (vernal pools), and there are six regulated wetlands on site. Thus, a mosaic of wet and dry areas correlates with variations in topography and depth to the water table.

Vegetation on site is in various stages of succession, which reflects a history of disturbances to the area. For example, when Camp Upton was constructed in 1917, the site was entirely cleared of its native pines and oaks. Portions were then cleared again in 1940 when Camp Upton was reactivated. Other past disturbances include fire, local flooding, and draining. Current operations minimize disturbances to the more natural areas of the site. More than 230 plant species have been identified on site, including one New York State “threatened” species and two that are “rare.”

A wide variety of vegetation, birds, reptiles, amphibians, and mammals inhabit the BNL site. The only New York State endangered species confirmed as now inhabiting BNL property is the tiger salamander (*Ambystoma t. tigrinum*). The New York State endangered Persius duskywing butterfly (*Erynnis p. persius*) and the crested fringed orchid (*Plantathera cristata*) have been identified on the BNL site in the past. The banded sunfish (*Enneacanthus obesus*), the swamp darter fish (*Etheostoma fusiforme*), and the stiff goldenrod plant (*Solidago rigida*) have also been previously reported (BNL 2000). The northern harrier (*Circus cyaneus*) was seen hunting over open fields in November 2003. The frosted elfin butterfly (*Callophrys irus*) has been identified as possibly being at BNL, based on historic documentation and the presence of its preferred habitat and host plant (wild lupine). In addition, stargrass (*Aletris farinose*) has historically been found and is likely to persist. Several other species that either inhabit the BNL site, visit during migration, or have historically been identified at BNL, are listed as rare, species of special concern, or exploitably vulnerable by New York State.

To eliminate or minimize any negative effects that Laboratory operations might cause to these species, precautions are in place to protect the on-site habitat and natural resources. Activities to eliminate or minimize negative effects on sensitive or critical species are either incorporated into BNL procedures or into specific program or project plans. Environmental restoration efforts remove pollutant sources that could contaminate habitats. Human access to critical habitats is limited. In some cases, habitats are enhanced to improve survival or increase populations.

Upton Ecological and Research Reserve

In November 2000, the Upton Ecological and Research Reserve was established on site by DOE. This 530-acre Reserve, managed by the U.S. Fish & Wildlife Service, is used to conduct resource management programs for the conservation, enhancement, and restoration of wildlife and habitat. In 2003, BNL worked with the Reserve's Technical Advisory Group (TAG), regulatory agencies, and other stakeholders to develop a comprehensive, ecosystem-based Natural Resource Management Plan. This plan provides management guidance, promotes stewardship of the natural resources found at BNL, and integrates environmental protection with pursuit of the Laboratory's mission.

Highlights of projects conducted in 2003 include the discovery of the northern redbellied snake, a species not reported on Long Island in 60 years, and research into the orange striped oakworm, a species capable of defoliating large areas of the abundant oak forests that make up much of the Long Island ecosystem. Also, three grants were awarded by the TAG to support research relating to the Pine Barrens.

Additional information on the establishment of the Reserve and accomplishments during 2003 can be found at <http://www.bnl.gov/esd/reserve/default.htm>.

Jeremy Feinberg, Wildlife Biologist with the U.S. Fish & Wildlife Service, holding an eastern hognosed snake. The snake was released immediately after this picture was taken.



Longwood High School teacher and students on an ecology research field trip to the Reserve.



 Upton Ecological and Research Reserve



A student from the Community College of Rhode Island surveying aquatic insects at a BNL pond.



A video of the history of the former Brookhaven Graphite Research Reactor was produced by BNL in 2003.



Historical assets associated with World War I Camp Upton include remnants of the training trench networks, depicted in 1918 (photo on left), and as they appear today (photo above).



E-Co. 302 Ammunition Train Camp, Upton, L.I., 1918

CULTURAL RESOURCES AT BNL

BNL is currently developing a Cultural Resource Management Program to ensure that the Laboratory fully complies with the numerous cultural resource requirements. Development of a formal Cultural Resources Management Plan will guide the management of all of BNL's cultural resources. Along with achieving compliance with applicable regulations, one of the major goals of the program is to fully assess both known and potential cultural resources on site. The potential range of BNL cultural resources includes buildings and structures, World War I earthwork features, the Camp Upton Historical Collection, scientific equipment, photo archives, and institutional records. As various cultural resources are identified, plans for their long-term stewardship will be developed and implemented. Achieving these goals will ensure that the contributions BNL and the BNL site have made to the nation's history and culture are documented and available for interpretation.

BNL has three structures or sites that have been determined to be eligible for listing on the National Register of Historic Places: the BGRR complex, the HFBR complex, and the World War I training trenches associated with Camp Upton.

In 2003, BNL produced geo-referenced digital overlay maps depicting the World War I and World War II Camp Upton maps (including camp buildings, roads, etc.) overlying the present-day BNL site map. These maps are useful tools that clearly demonstrate the extent of the two Army camps as compared to BNL's current developed facilities. A history video of the former BGRR at BNL was completed and submitted to the New York State Historic Preservation Officer in October 2003. The video presents a history of the BGRR through the recollections of key individuals who contributed to its success as a premier research tool throughout its 18-year operating history (1950–1968). Physicists, engineers, and scientists describe the challenges and rewards of their accomplishments, along with the experiences of everyday life associated with the BGRR. The film's narrator guides viewers through the design, construction, operation, scientific research, and shutdown of America's first nuclear reactor designed for peacetime civilian applications.

Additional projects in 2003, performed by outside contractors, included identifying and developing draft regulatory compliance processes, and formally evaluating archeological survey requirements for the BNL site.

BNL's Environmental Management System

“We will work to continually improve our environmental management system and performance.”

One of BNL's highest priorities is ensuring that the Laboratory's environmental performance measures up to its world-class status in science. In 2001, an Environmental Management System (EMS) was established at BNL ensuring that environmental issues are systematically identified, controlled, and monitored. It also provides mechanisms for responding to changing environmental conditions and requirements, reporting on environmental performance, and reinforcing continual environmental improvement.

The Laboratory's EMS was designed to meet the rigorous requirements of the globally recognized International Organization for Standardization (ISO) 14001 Environmental Management Standard, with additional emphasis on compliance, pollution prevention, and community involvement. BNL was the first DOE Office of Science Laboratory to become officially registered to this standard. Annual audits are required to maintain the registration, to validate that BNL's EMS is being maintained, and to identify evidence of continual improvement. In 2003, an EMS Surveillance Audit determined that BNL remains in full conformance to the standard.

Further information regarding the Laboratory's Environmental Management System can be found at <http://www.bnl.gov/esh/ems/>.



Environmental Management Program

“In consideration of the potential impacts of our activities on the environment, we will integrate pollution prevention/waste minimization, resource conservation, and compliance into all of our planning and decision making.”

BNL's Environmental Management Program consists of Laboratory-wide and facility-specific environmental programs. The Laboratory maintains a comprehensive monitoring program that identifies potential pathways of exposure of the public and the environment, measures potential environmental impacts from Laboratory operations, and provides data to verify compliance with regulations and allowable limits.

POLLUTION PREVENTION PROGRAM

A strong Pollution Prevention (P2) Program is an essential element of the successful accomplishment of BNL's mission and EMS. The BNL 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 BNL operating philosophy. 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 at the Laboratory.

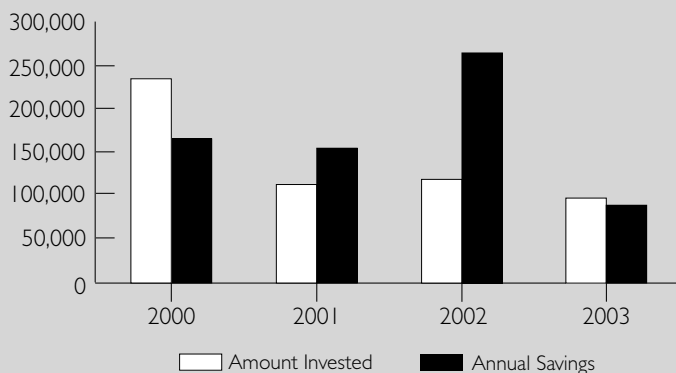
To date, pollution prevention projects have saved the Laboratory more than \$1.5 million and have resulted in the reduction or reuse of approximately 2.3 million pounds of waste. In 2003, BNL invested approximately \$96,000 in newly funded pollution prevention projects, with an annual anticipated savings of \$88,000, for an average payback period of 1.2 years.

WASTE MANAGEMENT PROGRAM

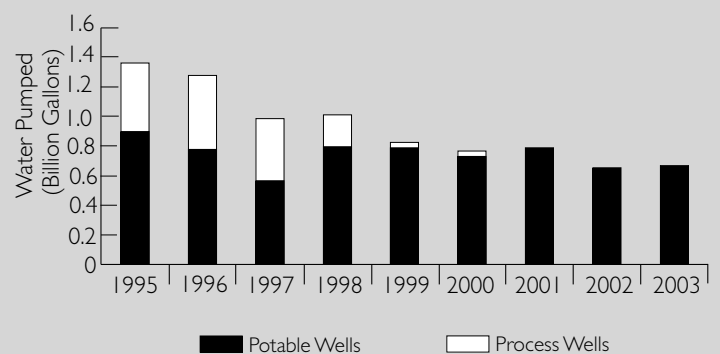
As a byproduct of the world-class research it conducts, BNL generates a large range of wastes. These include materials common to many businesses and industries, such as aerosol cans, batteries, paints, and oils. However, BNL's unique scientific activities also generate waste streams that are subject to additional regulation and special handling, including radioactive, hazardous, and mixed radioactive and hazardous waste.

In 2003, waste management operations were streamlined by combining the Environmental Services Division and the Waste Management Division. This successful merger

Pollution Prevention Investments



BNL Water Consumption Trend



resulted in significant cost savings to BNL. The combined group, known as the Environmental and Waste Management Services Division (EWMSD), is responsible for the collection, transportation, storage, and off-site disposal of site-generated waste. Waste is managed at a state-of-the-art facility designed especially for managing hazardous, industrial, radioactive, and mixed materials.

The Waste Management Facility complex is comprised of three staging areas: a facility for hazardous waste, regulated by Resource Conservation and Recovery Act (RCRA); a mixed-waste building for material that is both hazardous and radioactive; and a reclamation building for radioactive material. The RCRA and mixed-waste buildings are managed under a permit issued by the New York State Department of Environmental Conservation (NYSDEC). These buildings are used for short-term storage of waste before it is packaged or consolidated for off-site shipment to permitted treatment and disposal facilities. In 2003, BNL generated 5.9 tons of hazardous waste, 66 cubic feet of mixed waste, and 5,534 cubic feet of radioactive waste. These quantities represent significant reductions from previous years.

BNL is currently cleaning up facilities and areas containing radioactive and chemical contamination resulting from former operations. Waste recovered through restoration and decommissioning activities is managed by the Environmental Restoration group with oversight by BNL's EWMSD. Waste generation from these activities varies significantly from year to year. This is to be expected as environmental restoration activities move from remedial investigations and feasibility studies to remedial actions, which change annually based on the progress of BNL's cleanup schedule.

WATER CONSERVATION PROGRAM

BNL has a strong Water Conservation Program and has achieved dramatic reductions in water use since the mid 1990s. The Laboratory continuously evaluates water conservation as part of facility upgrades and new construction projects. These efforts include more efficient and expanded use of

chilled water for cooling, heating, ventilation, and air conditioning systems, and reusing once-through cooling water for other systems such as cooling towers. BNL's goal is to reduce the consumption of potable water and to reduce the possible impact of clean water discharges on Sewage Treatment Plant operations. In 2003 (as in 2002), the Laboratory used approximately half as much water as in 1995—nearly 700 million gallons less, in each of those years.

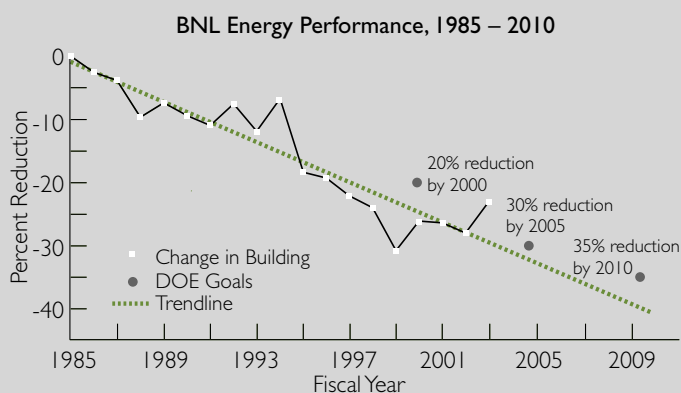
ENERGY MANAGEMENT AND CONSERVATION PROGRAM

BNL's Energy Management Group works to reduce BNL's energy use and costs by identifying economical energy-efficient products, monitoring energy use and utility bills, and helping to obtain the least expensive energy sources possible. In 2003, BNL used approximately 290 million kilowatt hours of electricity, 4.7 million gallons of fuel oil, 39.4 thousand gallons of propane, and 568 thousand cubic feet of natural gas. Fuel oil use increased in 2003, due to a larger number of heating degree days, but favorable market conditions resulted in a cost savings of approximately \$1 million.

BNL is a participant in the Long Island Power Authority's (LIPA) Peak Load Reduction Curtailment Program. Through this program, the Laboratory has agreed to reduce electrical demand during critical days throughout the summer when LIPA expects customer demand to meet or exceed the company's available supply. In return, BNL receives a rebate for each megawatt reduced on each critical day. In 2003, participation in this program produced a rebate of \$65,000. The Laboratory's participation is significant to LIPA: BNL's portion represents more than 12 percent of the 95-megawatt load-curtailment program total, making the Laboratory the single largest program contributor. In 2003, additional projects for energy reduction included lighting improvements in Buildings 510 and 515 that are expected to generate an estimated savings of \$10,000.

The National Energy Conservation Policy Act, as amended by the Federal Energy Management Improvement Act of 1988 and the Energy Policy Act of 1992, requires federal agencies to apply energy conservation measures and to improve federal building design to reduce energy consumption per square foot. Current goals are to reduce energy consumption per square foot, relative to 1985, by 20 percent in 2000, 30 percent by 2005, and 35 percent by 2010. BNL energy use per square foot in 2003 was 23 percent less than in 1985.

BNL also maintains a contract with New York Power Authority (NYPA), resulting in an overall cost avoidance of \$15 million. Participation in NYPA's 2003 Load Curtailment Program produced a rebate worth \$1 million. BNL will continue to seek out alternative energy sources to meet its future energy needs, support federally required "green" initiatives, and reduce energy costs.



“We are
committed to achieving
compliance with
applicable environmental
requirements.”

COMPLIANCE MONITORING PROGRAM

BNL has an extensive program to ensure compliance with all applicable environmental regulatory requirements and permits. BNL must comply with more than 100 sets of federal, state, and local environmental regulations, numerous site-specific permits, equivalency permits for the operation of nine groundwater remediation systems, and several other binding agreements. The Laboratory is committed to achieving and maintaining full compliance with these environmental requirements and agreements to help eliminate or minimize any impact Laboratory operations might have on the environment. In 2003, BNL operated in compliance with the majority of these requirements, and programs are in place to address areas for continued improvement. Routine inspections conducted during the year found no significant instances of noncompliance.

Compliance monitoring in 2003 showed that emissions of nitrogen oxides, carbon monoxide, and sulfur dioxide were all within permit limits; the potable water supply met all drinking water requirements; groundwater monitoring at the Major Petroleum Facility continued to demonstrate that current oil storage and transfer operations are not affecting groundwater quality; and liquid effluents discharged to surface water met all applicable New York State Pollutant Discharge Elimination System (SPDES) permit requirements, with the exception of one excursion (iron) at the Sewage Treatment Plant (STP) and three at other outfalls (two aluminum and one tolyltriazole, a cooling water treatment reagent used to prevent corrosion of dissimilar metals). There were 22 reportable spills of petroleum products or antifreeze on site in 2003. All releases were cleaned up or addressed to the satisfaction of the NYSDEC.

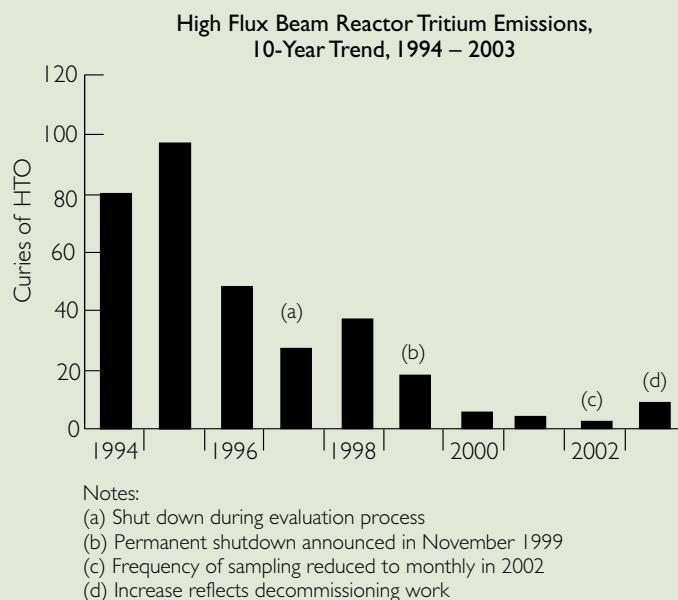
BNL underwent nine environmental audits by external regulatory agencies in 2003. These audits included inspections of petroleum storage, air emissions from the Central Steam Facility, STP operations, other regulated outfalls and recharge basins, and the potable water system. Immediate corrective actions were taken to address issues raised during these inspections.

AIR QUALITY PROGRAM

BNL monitors radioactive emissions at several facilities on site to ensure compliance with the requirements of the Clean Air Act. Facilities that have the potential to deliver an annual radiation dose of greater than 0.1 millirem (mrem) to a member of the public must be continuously monitored for emissions. Facilities capable of delivering radiation doses below that limit require periodic, confirmatory monitoring. The BLIP is the only BNL facility that requires continuous monitoring. The BGRR, HFBR, and the Target Processing Lab require periodic monitoring. During 2003, BNL facilities released a total of 3,725 curies of short-lived radioactive gases. Oxygen-15 (half-life: 122 seconds) and carbon-11 (half-life: 20.48 minutes) emitted from the BLIP constituted more than 99.7 percent of these air emissions.

Various state and federal regulations governing nonradiological releases require facilities to conduct periodic or continuous emission monitoring to demonstrate compliance with emission limits. The CSF is the only BNL facility that requires monitoring for nonradiological emissions. Two of the four boilers at the CSF are equipped with continuous emission monitors to measure nitrogen oxides and opacity. In 2003, there were no measured exceedances above the regulatory limits of nitrogen oxides from boiler emissions.

The Laboratory also conducts ambient radiological air monitoring to verify local air quality and assess possible environmental impacts from BNL operations. Air monitoring stations are in place around the perimeter of the BNL site to measure tritium and gross alpha and beta airborne activity. Results in 2003 demonstrated that on-site radiological air quality was consistent with results observed at locations in New York State not located near radiological facilities.





WATER QUALITY SURVEILLANCE PROGRAM

BNL discharges treated wastewater into the headwaters of the Peconic River via the STP, and to groundwater via recharge basins. Some wastewater may contain very low levels of radiological, organic, or inorganic contaminants. Monitoring, pollution prevention, and careful operation of treatment facilities helps ensure that wastewater discharges comply with all applicable requirements.

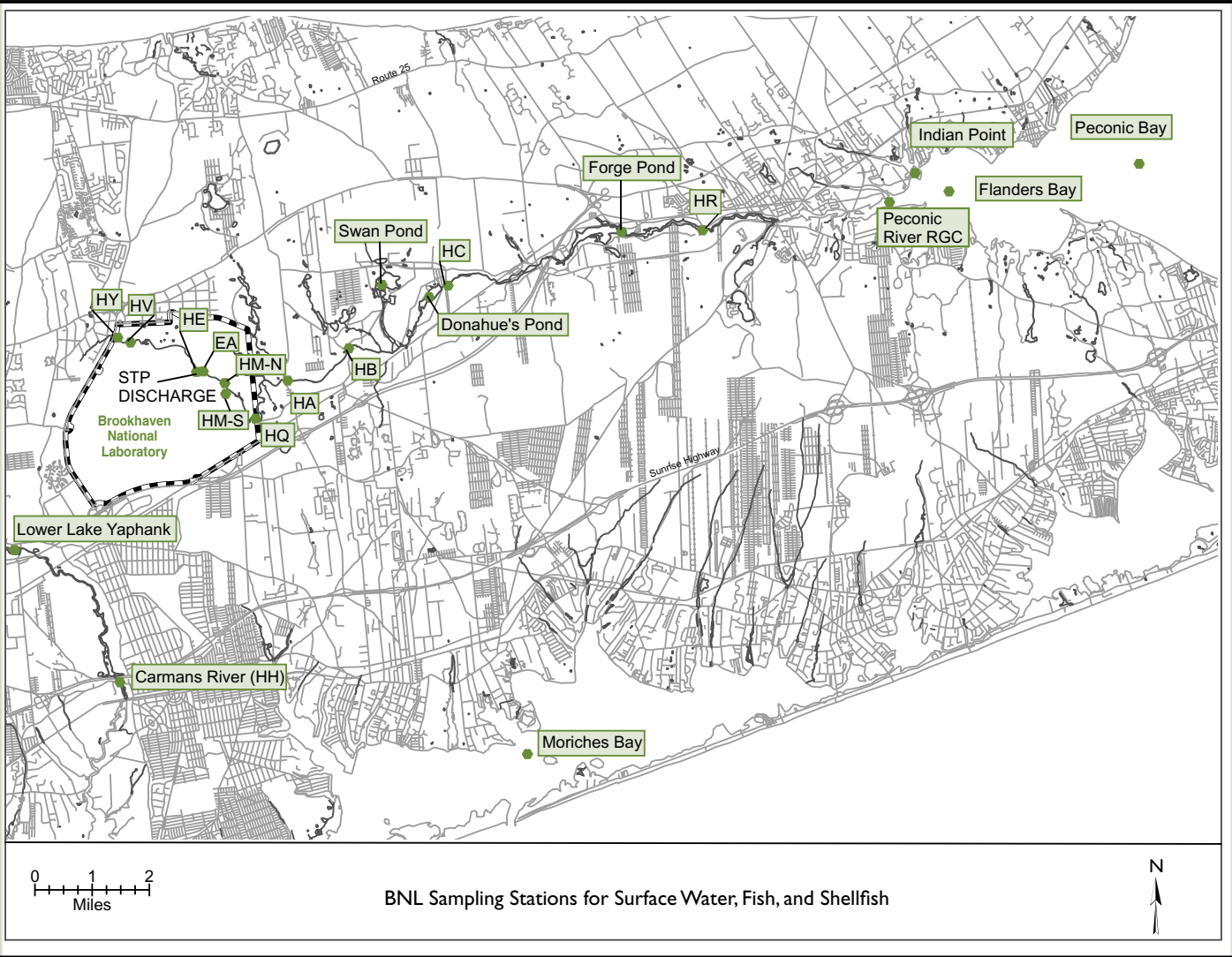
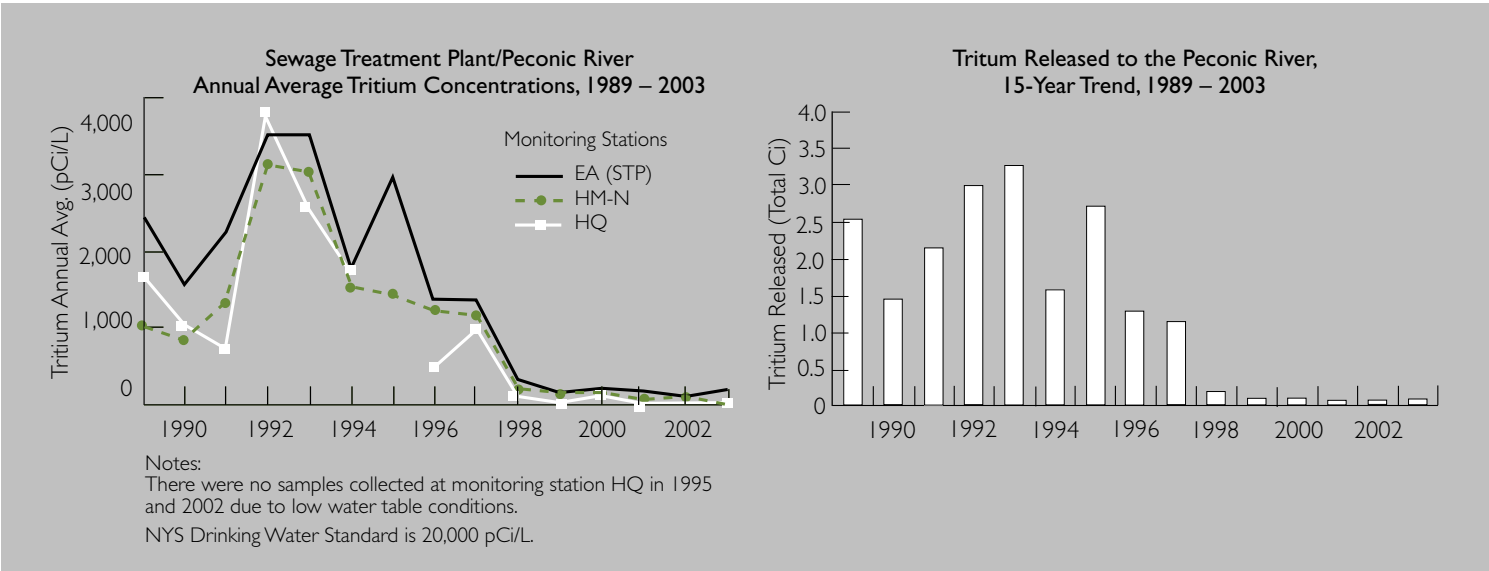
To assess the impact of discharges on the quality of the Peconic River, surface water monitoring is conducted at several locations upstream and downstream of the STP effluent. The nearby Carmans River is monitored as a geographical control location for comparative purposes, as it is not affected by BNL operations. In 2003, the average gross alpha and beta activity levels in the STP discharge were within the typical range of historical levels and were well below drinking water standards. Tritium releases were slightly higher

than in 2002 (maximum concentration less than 4 percent of the drinking water standard), due to activities at the HFBR in preparation for its decommissioning. As a result of STP filter bed remediation activities in 2002 and 2003, there were no detections of cesium-137 (Cs-137) or strontium-90 (Sr-90) in the STP effluent. Nonradiological monitoring of the effluent showed that most organic and inorganic parameters were within the SPDES effluent limitations or other applicable standards.

Recharge basins are used for the discharge of “clean” wastewater streams, including once-through cooling water, stormwater runoff, and cooling tower blowdown, and are suitable for direct recharge to the groundwater aquifer. Radiological analysis showed only natural levels of alpha and beta activity in most of the basin discharges. This activity is not attributable to BNL operations. The presence of sediment

in the stormwater may explain the low level of gross alpha/beta activity. Tritium was not detected in the discharge to any basin above the Minimum Detection Limit (MDL) during 2003.

Nonradiological analyses showed that all parameters, except for iron, complied with the respective groundwater discharge or water quality standards.



NATURAL RESOURCE MANAGEMENT PROGRAM

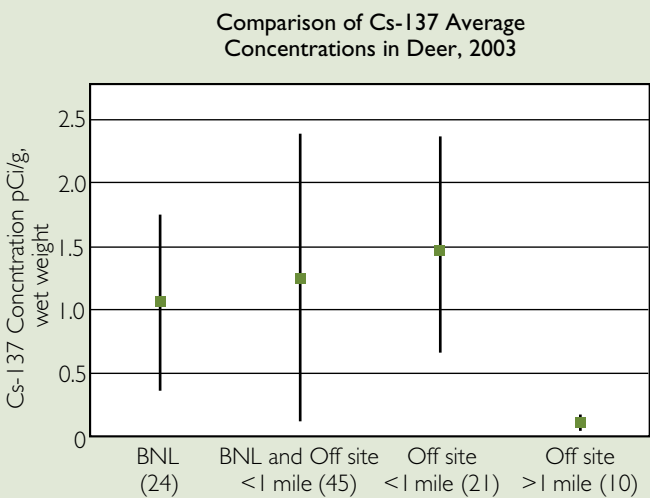
The BNL Natural Resource Management Program was designed to promote stewardship of the natural resources found on site and to integrate natural resource management and protection with BNL's scientific mission. The goals of the program include protecting and monitoring the ecosystem, conducting research, and communicating these efforts with staff and the public. Precautions are taken to protect and enhance habitats and natural resources at the Laboratory. Activities to eliminate or minimize negative effects on sensitive or critical species (such as the tiger salamander, eastern hognosed snake, and the banded sunfish) are incorporated into BNL procedures or into specific program or project plans. Restoration efforts continue to remove pollutant sources that could contaminate habitats. In some cases, habitats are enhanced to improve survival or increase populations. BNL also monitors other animal populations, such as the white-tailed deer and the wild turkey, to ensure that they are sustained, and monitors invasive plant species to control their spread.

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. In 2003, deer sampling results were consistent with previous years. Deer sampled on the BNL site contain higher concentrations of Cs-137 than deer sampled from greater than 1 mile off site. This is most likely the result of deer consuming contaminated soil and grazing on vegetation growing in soil where low-level contamination levels are known to exist. Removal of areas of contaminated soil at BNL began in 2000 and will continue. The New York State Department of Health (NYSDOH) has reviewed the

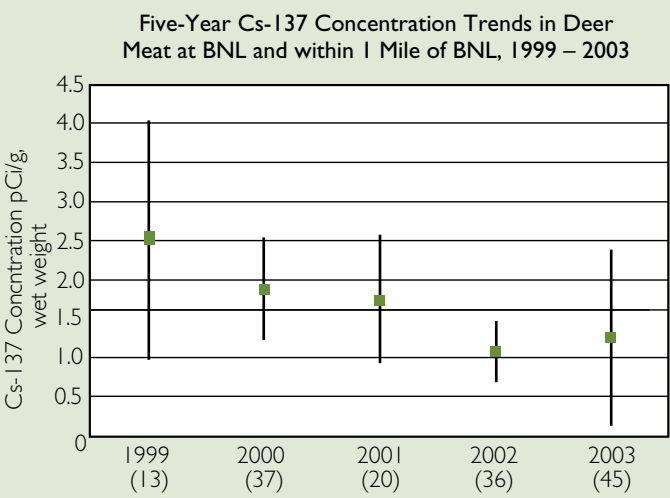
potential public health risk associated with elevated Cs-137 levels in on-site deer and determined that neither hunting restrictions nor formal health advisories are warranted.

BNL and the local NYSDEC Fisheries Division maintain an on-going program for analyzing fish from the Peconic River and surrounding freshwater bodies. BNL stopped sampling shellfish in 2003, as historical records indicated there were no impacts attributable from BNL operations. Fish sampling results in 2003 were consistent with previous years. Low levels of Cs-137 were found in all samples taken from the Peconic River system. Aquatic sampling of sediment, vegetation, and freshwater in the Peconic River and a control location on the Carmans River showed low levels of Cs-137 in sediments at all locations, with levels on site slightly higher than off site. Metal analyses indicated levels both on and off site were above Suffolk County Department of Health Services (SCDHS) cleanup objectives, but below action levels. Pesticides and PCB analyses of sediment, vegetation, and freshwater samples from nearly all locations found the pesticide DDT or its breakdown products, DDD and DDE. These banned pesticides were historically used all across Long Island, including BNL. Although concentrations of metals, pesticides, and polychlorinated biphenyls (PCBs) were not considered to have any health impact on fish or humans who may have consumed the fish, planned cleanup of portions of the river on and off the Laboratory property will begin in 2004 to address these contaminants.

Vegetables grown in the BNL garden plot continue to support historical analyses that there are no Laboratory-generated radionuclides in the produce. Sampling of off-site farm vegetation was discontinued in 2003, since historic data



Notes:
Averages are shown for samples collected at BNL, on site and off site within a 1-mile radius, off site but within a 1-mile radius, and off site greater than a 1-mile radius. Numbers in parentheses indicate the number of samples in that data set.
All values are shown with a 95% confidence interval.



Notes:
Averages are shown for samples collected at BNL and within a 1-mile radius. Numbers in parentheses indicate the number of samples in that data set.
All values are shown with a 95% confidence interval.

indicated that there were no BNL-related radionuclides in off-site vegetation. Periodic confirmatory sampling will be conducted on a reduced frequency.

A new 5-year testing cycle for recharge basin sediment sampling was established in 2003. Sediment samples taken from a new recharge basin on site associated with one of the outfalls that receives discharges permitted under the SPDES permit showed that there were no PCBs or pesticides present. However, semivolatile organic compounds were detected in sediments and were likely attributable to residual diesel from a fuel spill that was cleaned up in April.

Precipitation samples were collected quarterly at air monitoring stations and analyzed for radiological content. Samples collected in 2003 showed sporadic detections of gross alpha activity above the MDL. In general, radioactivity in precipitation comes from naturally occurring radionuclides in dust and from activation products that result from solar radiation. Gamma analyses detected beryllium-7, another naturally occurring radionuclide resulting from solar flare activity, in one sample. Lead-212 and thallium-208 were also detected in one of the samples. These two naturally occurring radionuclides are found in soil and are likely due to dust in the samples.

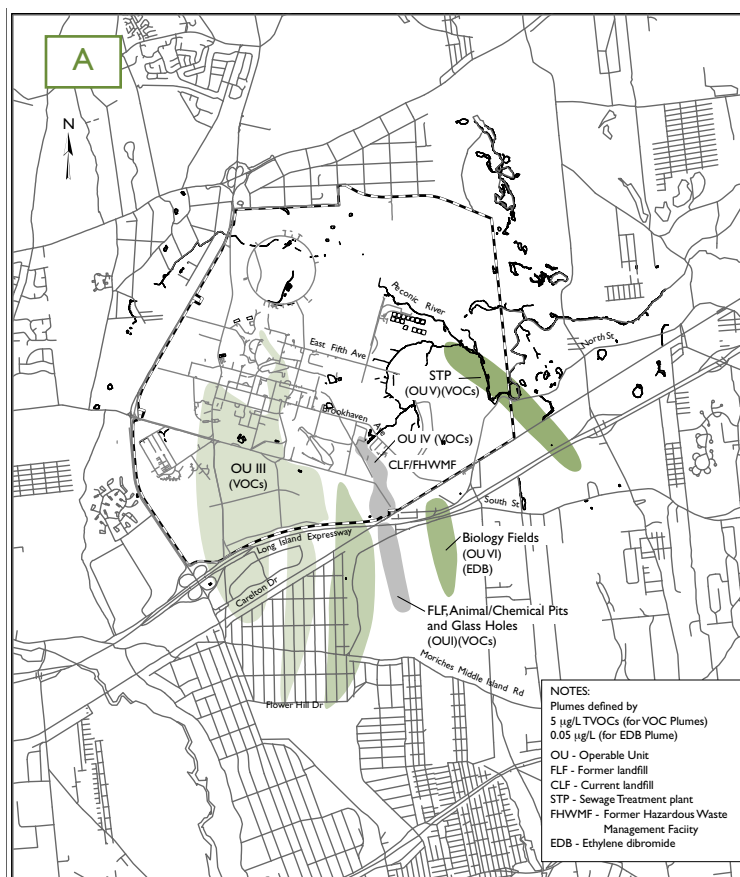
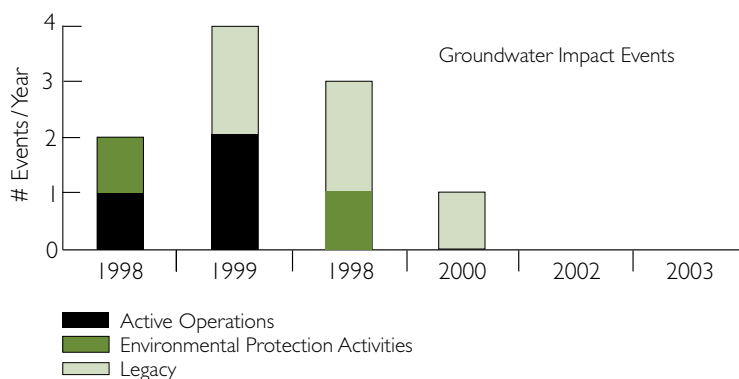
“We will define, prioritize, and aggressively correct and clean up existing environmental problems.”

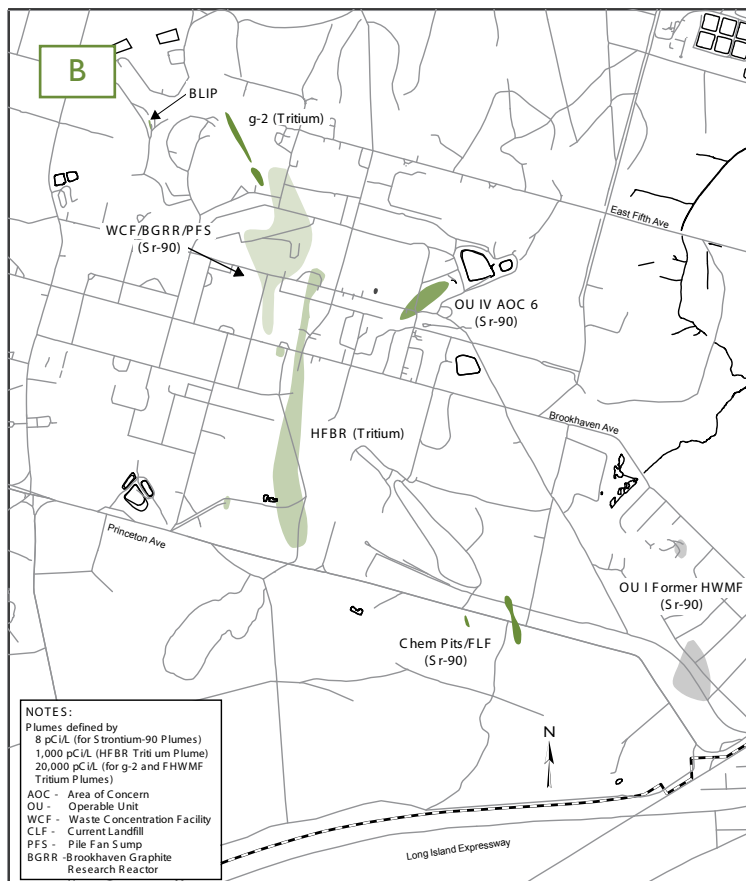
GROUNDWATER PROTECTION MANAGEMENT PROGRAM

The goal of BNL's Groundwater Protection Management Program is to ensure that plans for groundwater protection, management, monitoring, and restoration are fully defined, integrated, and managed in a cost-effective manner that is consistent with federal, state, and local regulations. BNL is committed to protecting groundwater resources from further impacts from current and past practices, and to remediating existing contaminated groundwater.

BNL's extensive groundwater monitoring well network is used to evaluate BNL's progress in restoring groundwater quality, to comply

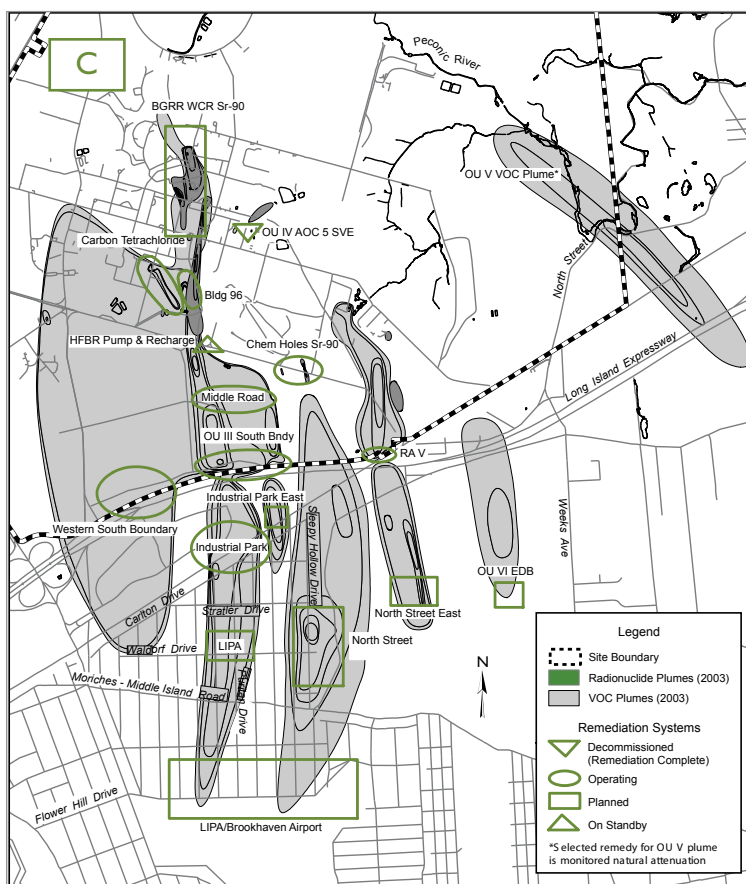
Groundwater Protection Performance, 1998 – 2003





with regulatory permit requirements, to monitor active research and support facilities, and to assess the quality of groundwater entering and leaving the BNL site. Program elements for groundwater monitoring include planning and scheduling; the installation of monitoring wells; developing and following quality assurance protocols; collecting and analyzing samples; verifying, validating, and interpreting data; and reporting results.

In 2003, BNL collected groundwater samples from 754 monitoring wells during 2,817 individual sampling events. Since the beginning of active groundwater remediation activities in December 1996, BNL has removed 4,156 pounds of VOCs by treating nearly 6.8 billion gallons of groundwater. During 2003, seven groundwater remediation systems removed 510 pounds of VOCs and returned approximately 1.3 billion gallons of treated water to the Upper Glacial Aquifer. Under the Laboratory's Environmental Restoration Program, a primary goal is to remediate soil and groundwater contamination and prevent additional contamination from migrating off site. Although widespread improvements in groundwater quality at BNL are expected to require approximately 10 years of aquifer treatment, noticeable improvements are already evident in some areas.



BNL is classified as a public water purveyor and maintains water supply wells and associated treatment facilities for the distribution of potable water on site. The quality of the BNL potable water supply is monitored as required by the Safe Drinking Water Act, and the analytical results are reported to SCDHS. BNL also prepares an annual Consumer Confidence Report that is distributed to all employees and guests. Monitoring of BNL's potable water system in 2003 showed that the potable water supply met all drinking water requirements.

A. Extent of Volatile Organic Compound Plumes

B. Extent of Radionuclide Plumes On Site

C. Locations of BNL Groundwater Remediation Systems

RADIOLOGICAL DOSE ASSESSMENT PROGRAM

BNL routinely assesses its operations to ensure that any potential radiological dose to the public, BNL workers, and the environment is “As Low As Reasonably Achievable.” The potential radiological dose is calculated as the maximum dose to a hypothetical Maximally Exposed Individual (MEI) at the BNL site boundary, considering all direct and indirect pathways. For dose assessment purposes, the pathways included direct radiation exposure, inhalation, ingestion, and skin absorption. Radiological dose assessments at BNL routinely show that the Effective Dose Equivalent (EDE) from BNL operations is well below the EPA and DOE regulatory dose limits for the public and the environment.

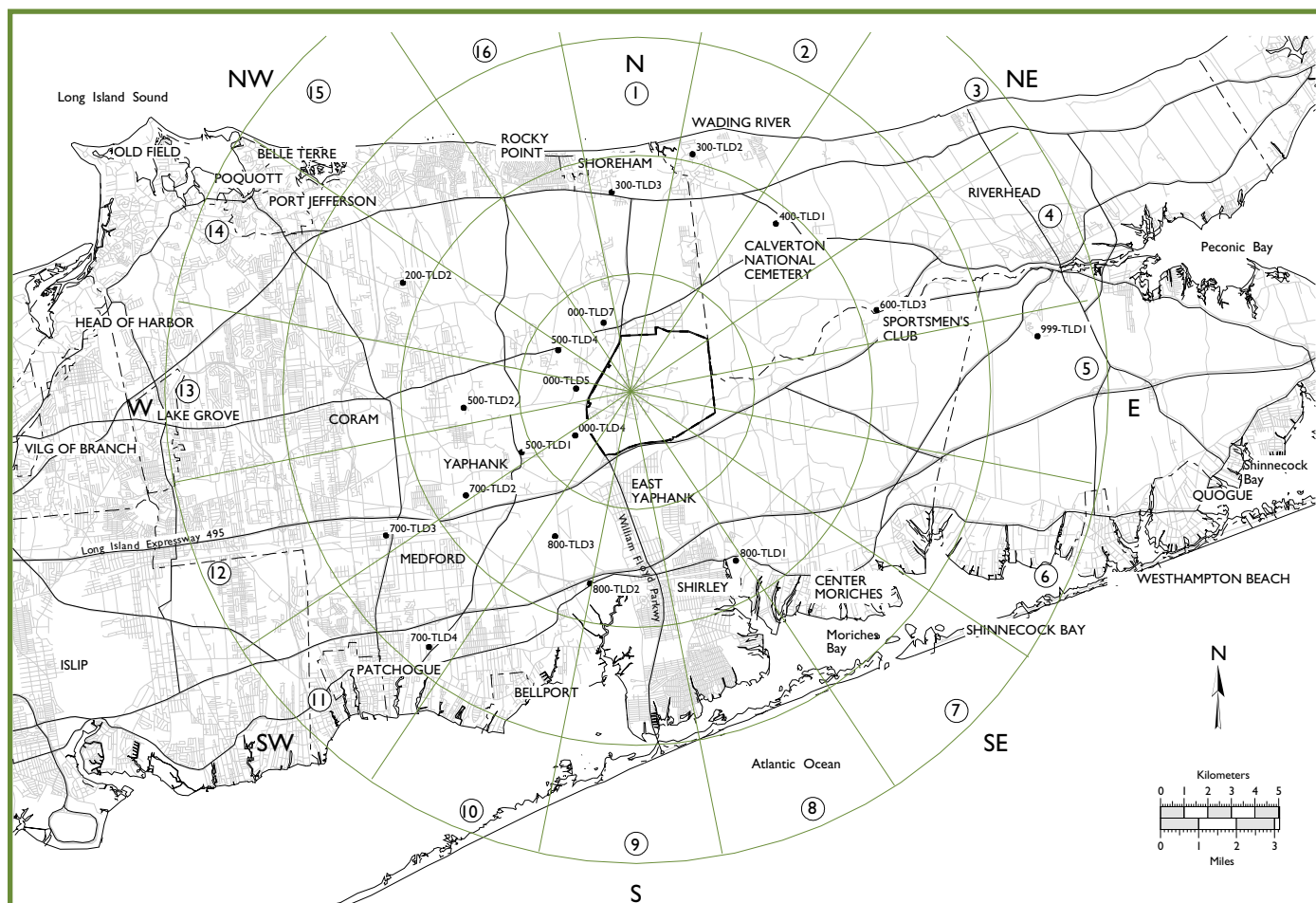
To assess the impact of direct radiation from BNL operations, thermoluminescent dosimeters (TLDs) are deployed at the BNL site and in the 16 wind sectors of the surrounding communities. In 2003, the average doses from 56 on-site and 18 off-site TLDs showed that there was no additional dose contribution from BNL operations above natural background radiation, on or off the site. The yearly average ambient external dose was calculated to be 64 ± 10 mrem (640 ± 100 μ Sv)

on the BNL site and 61 ± 9 mrem (610 ± 90 μ Sv) at off-site locations. Both these measurements include contributions from cosmic and natural background sources.

The EDE from the air pathway was calculated as 0.06 mrem (0.6 μ Sv) to the MEI. The ingestion pathway dose was estimated as 2.18 mrem (22 μ Sv) from deer meat consumption and 0.19 mrem (1.9 μ Sv) from consumption of fish caught at Swan Pond. BNL’s total annual dose to the MEI from all pathways was estimated as 2.43 mrem (24 μ Sv). In comparison, EPA’s annual regulatory dose limit is 10 mrem (100 μ Sv) for the air pathway, and DOE’s annual dose limit is 100 mrem (1,000 μ Sv) from all pathways. In 2003, doses to aquatic animals, terrestrial plants, and terrestrial animals were found to be well below the DOE regulatory limits.

Remediation and waste management projects conducted in 2003 were evaluated for radiological emissions and dose impact. It was concluded that there was no significant dose and radiological risk to the public or the environment from these activities.

Off-Site TLD Locations



DOSE IN PERSPECTIVE

Radiological materials are used in many research activities conducted at the Laboratory. This fact sheet explains Brookhaven National Laboratory's (BNL) maximum possible contribution to the radiation dose that a member of the public might receive in any given year and compares that dose to other typical radiation exposures.

What radiation dose might I receive each year?

The radiation dose received by a person is commonly expressed in "rem" or "millirem" (a millirem is one-thousandth of a rem). The average U.S. (and Long Island) resident's radiation dose from natural sources is approximately 300 millirems per year. This originates from natural cosmic and terrestrial radiation, radon, and minerals in food, water, and air. The average U.S. resident is also exposed to about 60 millirems per year from manmade sources, including medical procedures and consumer products. People who smoke tobacco receive a much higher dose, as do people who live in areas where radon is prevalent in the soil or at high altitudes where cosmic radiation is not so effectively shielded by the atmosphere.

Here are some examples of radiation doses from common sources, in millirem per year:

- Cigarette smoking (one pack per day) — 1,300
- Radon from the ground — 200
- Minerals in water, food, and air — 40
- Cosmic radiation — 26
- Chest x-ray — 9
- Fallout from historical worldwide nuclear weapons testing — 1

What radiation dose might I receive from BNL?

The largest hypothetical radiation dose that a member of the public could receive in 2003 from all pathways potentially affected by Laboratory operations—including air, water, deer, and fish — is 2.4 millirems. This is less than 1 percent of the dose Long Island residents receive from natural sources of radiation each year, and 3 percent of the limit set by DOE for man-made sources of radiation. The radiation dose is calculated for a hypothetical person living at the Laboratory boundary for the entire year, eating 64 pounds of local deer meat and 15 pounds of fish caught on site.

The largest portion of this worst-case dose (2.2 millirems) would result from eating deer meat. (Testing of deer killed by cars on and near Laboratory grounds, and by hunters near the site, shows elevated amounts of cesium-137 in the meat.) How-

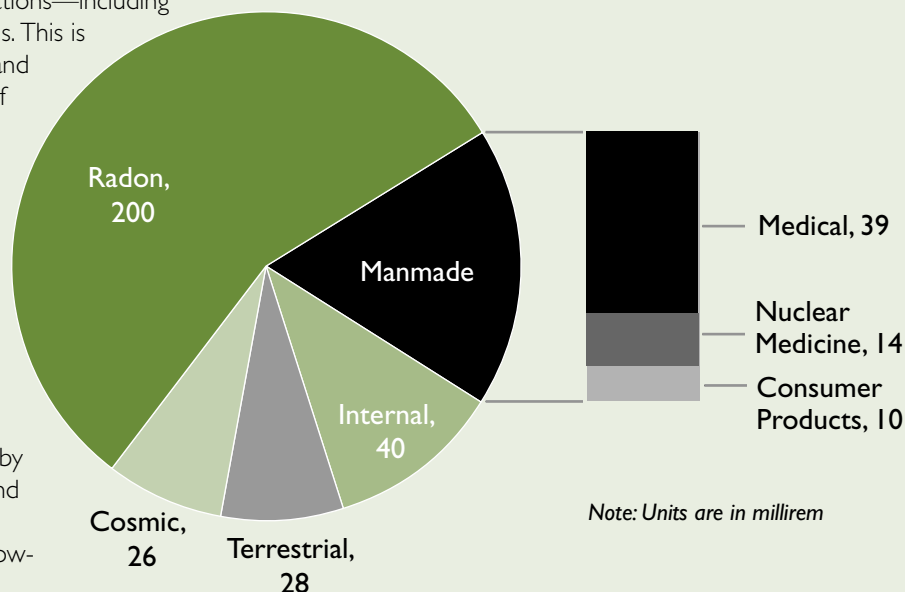
ever, a person could eat four times as much (256 pounds) and still not exceed the New York State Department of Health "action level" of 10 millirems. In 1999, the state department of health formally concluded that there was no reason to issue health restrictions on consumption of deer taken near the Laboratory. (Hunting is not allowed on site, but deer typically range up to one mile.) The N.Y. State Department of Environmental Conservation and BNL have informed hunters of the test results so they may make their own decisions about whether to eat meat from deer taken near the site.

The radiation dose a person would receive from eating 15 pounds of fish containing cesium-137 at the highest level seen in any part of the Peconic River system would be 0.2 millirem. This dose can be compared to the dose of about 40 millirems a person receives annually from naturally occurring radionuclides in food, air, and water.

The maximum credible radiation dose a member of the public could receive due to Laboratory air emissions in 2003 was 0.6 millirem.

The internal radiation dose from drinking groundwater was expected to be zero. No radionuclides at levels above the Environmental Protection Agency's drinking water standards have been detected off the Laboratory site. On site, there are pockets of groundwater that contain radionuclides; these areas are regularly monitored and drinking water is not drawn from these areas.

For a person to be exposed to even the low levels cited in this fact sheet is an extremely unlikely "worst case" scenario. In reality, it is unlikely that anyone receives the maximum dose from any one pathway and implausible that anyone receives all of the individual pathway doses together.



Quality Assurance

The multilayered components of the BNL Quality Assurance (QA) Program ensure that all analytical data presented in this report are reliable and of high quality, and that all environmental monitoring data meet quality assurance and quality control objectives. Samples are collected and analyzed in accordance with standard operating procedures that are designed to ensure that samples are representative and that the 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.

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. All of the laboratories achieved satisfactory ratings in 2003.

a. The annual Earth Day Awards Ceremony honors employees who have shown outstanding efforts in environmental stewardship throughout the year.

b and c. BNL participated in the Heckscher Spring Park Festival. This annual event offers a unique opportunity for BNL to join with other local organizations to promote environmental stewardship to the general public.

d and e. The BNL annual 4-mile on-site run was held in honor of Earth Day 2003. Some of Long Island's top runners participated in the race, which was awarded Grand Prix status.

“We will maintain a positive, proactive, and constructive relationship with our neighbors in the community, regulators, DOE, and our other stakeholders. We will openly communicate with stakeholders on our progress and performance.”

a



b



c



d



e



Communication and Community Involvement

BSA is committed to an effective partnership among DOE, the Laboratory, and community members to address issues that affect the community's quality of life. At the core of the Laboratory's communication and community-involvement programs are the Environmental Stewardship Policy and the Community Involvement Plan (BNL 1999), which both contain a commitment to maintain a positive, proactive, and constructive relationship with the community and regulators, and to promote open communication on environmental performance. The Laboratory continues efforts to build positive relationships with regulatory agencies by sharing information and working to resolve issues on plans, priorities, and corrective actions. BNL meets regularly with regulators from NYS-DEC, EPA Region II, and SCDHS. A SCDHS inspector has a permanent office on site.

Another forum for communication is the Brookhaven Executive Roundtable, which was established by DOE in August 1997 and includes staff from the offices of local, state, and federal elected officials, regulatory agencies, and representatives from DOE and the Laboratory. Members are updated on the Laboratory's science initiatives, operations, and environmental issues at bimonthly meetings. In addition, the Community Advisory Council (CAC) was established in September 1998, and consists of representatives from 26 different stakeholder groups, including civic, business, union, health, education, employee, and environmental organizations. The CAC meets monthly and sets its own agenda in cooperation with the Laboratory to discuss issues regarding environmental remediation activities. Feedback and recommendations from the CAC on issues that are of concern to the community are considered in the Laboratory's decision making. In 2003, the CAC advised the Laboratory Director of the community's priorities regarding the cleanup of the Peconic River, as well as the cleanup of the Magothy Aquifer on and off the Laboratory site. Also in 2003, to gain a better understanding of the topics the CAC is considering, they hosted a panel discussion with EPA, NYS-DEC, and SCDHS representatives, as well as a presentation on cleanup remedies by a consultant to Neighbors Expecting Accountability and Remediation. Due to their interest in BNL's Pollution Prevention Program, the CAC plans to host a Pollution Prevention Workshop at BNL in April 2004.



The "Your Environment" Art Contest challenged local students to create a poster depicting environmental stewardship on Long Island. The winning posters are published on the back cover of this Summary.

Through working groups, roundtables, and one-on-one interactions with BNL managers and subject-matter experts, stakeholders are provided with many other opportunities to learn about and provide input on issues of importance to them. In 2003, BNL reached out to the public through briefings to local civic and community groups; meetings with and presentations to local, state, and federal regulators and elected officials; canvassing of community members; and regular interactions with nearby businesses and local educators. Laboratory employees and retirees who are up-to-date on current issues at BNL regularly interact with their neighbors and community groups, thereby acting as the Laboratory's envoys. They provide information about Laboratory science, gather feedback, and respond to concerns.

During 2003, BNL hosted more than 29,000 visitors to the Laboratory site, including students, teachers, and other community members who participated in "Summer Sunday" open houses, science museum visits, tours for students from high school through college, and other outreach programs. Earth Day was celebrated with a variety of activities, including environmental awards, a student art contest, a 4-mile run, and an on-site office-supply swap event. The Laboratory also participated with other local organizations and businesses in the nearby Heckscher State Park Spring Festival, using interactive displays to promote environmental awareness. BSA contributed corporate funds in support of these events as part of their commitment to environmental stewardship.

The Laboratory maintains an informative website at <http://www.bnl.gov>; issues press releases; publishes *The Bulletin* (a weekly employee newsletter), *discover Brookhaven* (the Laboratory's science magazine), *cleanupupdate* (a periodic newsletter on environmental cleanup), *Laboratory Link* (a monthly brief on research activities); and e-mails updates to keep the public and employees informed about the Laboratory's research, activities, and issues, including those concerning the environment.

ACRONYMS AND ABBREVIATIONS

AGS	Alternating Gradient Synchrotron
ASL	Analytical Services Laboratory (BNL)
BGRR	Brookhaven Graphite Research Reactor
BLIP	Brookhaven Linac Isotope Producer
BMRR	Brookhaven Medical Research Reactor
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
CAC	Community Advisory Council
CRM	Cultural Resource Management
Cs	cesium
CSF	Central Steam Facility
DDT	dichlorodiphenyltrichloroethane
DOE	Department of Energy
EDE	Effective Dose Equivalent
EMS	Environmental Management System
EPA	Environmental Protection Agency
EWMSD	Environmental and Waste Management Services Division
FWS	Fish & Wildlife Service
HFBR	High Flux Beam Reactor
ISO	International Organization for Standardization
LIPA	Long Island Power Authority
Linac	Linear Accelerator
MDL	minimum detection limit
MEI	maximally exposed individual
mrem	milli (thousandth of a) rem
mSv	millisievert
µg/L	micrograms per liter
NEPA	National Environmental Policy Act
NSLS	National Synchrotron Light Source
NYPA	New York Power Authority
NYSDEC	NYS Department of Environmental Conservation
NYSDOH	NYS Department of Health
P2	pollution prevention
PCBs	polychlorinated biphenyls
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
RHIC	Relativistic Heavy Ion Collider
SCDHS	Suffolk County Department of Health Services
SER	Site Environmental Report
SPDES	State Pollutant Discharge Elimination System
Sr	strontium
STP	Sewage Treatment Plant
Sv	sievert; unit for assessing radiation dose risk
TAG	Technical Advisory Group
TLD	thermoluminescent dosimeter
VOC	volatile organic compound



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2003 Site Environmental Report Reader Response Form

The 2003 Site Environmental Report (SER) and the Summary were written to inform outside regulators, the public, and BNL employees of the Laboratory's environmental performance for the calendar year. The report summarizes BNL's on-site environmental data; environmental management performance; compliance with applicable regulations; and environmental, restoration, and surveillance monitoring programs.

BNL welcomes your comments, suggestions for improvements, or any questions you may have. Please fill in the information below, and mail your response form to:

Brookhaven National Laboratory
Environmental and Waste Management Services Division
Attention: SER Project Coordinator
Building 120
P.O. Box 5000
Upton, NY 11973-5000

Name _____

Address _____

Phone _____

E-mail _____

Comments, Suggestions, or Questions

☐

I would like to be added to your Environmental Issues mailing list.



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