

Environmental Management System

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One of Brookhaven National Laboratory's highest priorities is ensuring that its environmental commitment is as strong as its passion for discovery. Brookhaven Science Associates (BSA), the contractor operating the Laboratory on behalf of DOE, takes environmental stewardship very seriously. As part of their commitment to environmentally responsible operations, BSA has established the BNL Environmental Management System (EMS).

An EMS ensures that environmental issues are systematically identified, controlled, and monitored. Moreover, an EMS provides mechanisms for responding to changing environmental conditions and requirements, reporting on environmental performance, and reinforcing continual 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. Annual audits are required to maintain an EMS registration, and recertification audits of the entire EMS occur every 3 years. In 2010, an EMS recertification audit determined that BNL remains in conformance with the ISO 14001: 2004 Standard.

BNL continued its strong support of its Pollution Prevention Program, which seeks ways to eliminate waste and toxic materials. In 2010, pollution prevention projects resulted in more than \$1.9 million in cost avoidance or savings and resulted in the reduction or reuse of approximately 9.1 million pounds of waste. Also in 2010, the BNL Pollution Prevention Council funded three new proposals or special projects, investing approximately \$30,400. Anticipated annual savings from these projects are estimated at approximately \$20,800, for an average payback period of less than 1.5 years. The ISO 14001-registered EMS and the nationally recognized Pollution Prevention Program continue to contribute to the Laboratory's success in promoting pollution prevention.

BNL continues to address legacy issues under the Environmental Restoration Projects group and openly communicates with neighbors, regulators, employees, and other interested parties on environmental issues and cleanup progress on site.

2.1 INTEGRATED SAFETY MANAGEMENT, ISO 14001, AND OHSAS 18001

The Laboratory's Integrated Safety Management System (ISMS) integrates environment, safety, and health management into all work planning. The integrated safety processes within ISMS contributed to BNL achieving ISO 14001 and Occupational Health and Safety Assessment Series (OHSAS) 18001 registrations.

The ISO 14001 Standard is globally recognized and defines the structure of an organization's EMS for purposes of improving environmental performance. OHSAS 18001 mirrors the ISO 14001 structure. The process-based structure of the ISO 14001 and OHSAS 18001 Standards are based on the "Plan-Do-Check-Act" improvement cycle. Both standards require an organization to develop a policy,

create plans to implement the policy, implement the plans, check progress and take corrective actions, and review the system periodically to ensure its continuing suitability, adequacy, and effectiveness.

BNL's EMS was officially registered to the ISO 14001 Standard in July 2001 and was the first DOE Office of Science Laboratory to obtain third-party registration to this environmental standard. BNL was officially registered to the OHSAS 18001 Standard in 2006, and was again the first DOE Office of Science Laboratory to achieve this registration. Each certification requires the Laboratory to undergo annual audits by an accredited registrar to assure that the systems are maintained. An ISO 14001 and OHSAS 18001 reassessment audit was conducted by four NSF auditors in May 2010. The Laboratory was re-certified with no non-conformances, marking the first time BNL has achieved this level of success. Eight opportunities for improvement were noted and are being tracked and addressed.

2.2 ENVIRONMENTAL, SAFETY, SECURITY, AND HEALTH POLICY

The cornerstone of an EMS is a commitment to environmental protection at the highest levels of an organization. BNL's environmental commitments are incorporated into a comprehensive Environmental, Safety, Security, and Health (ESSH) Policy. The policy, issued and signed by the Laboratory Director, makes clear the Laboratory's commitment to environmental stewardship, the safety of the public and BNL employees, and the security of the site. The policy continues as a statement of the Laboratory's intentions and principles regarding overall environmental performance. It provides a framework for planning and action and is included in employee, guest, and contractor training programs. The ESSH Policy is posted throughout the Laboratory and on the BNL website at <http://www.bnl.gov>. The goals and commitments focusing on compliance, pollution prevention, community outreach, and continual improvement include:

- **ENVIRONMENT:** We protect the environment, conserve resources, and prevent pollution.

- **SAFETY:** We maintain a safe workplace, and we plan our work and perform it safely. We take responsibility for the safety of ourselves, coworkers, and guests.
- **SECURITY:** We protect people, property, information, computing systems, and facilities.
- **HEALTH:** We protect human health within our boundaries and in the surrounding community.
- **COMPLIANCE:** We achieve and maintain compliance with applicable ESSH requirements.
- **COMMUNITY:** We maintain open, proactive, and constructive relationships with our employees, neighbors, regulators, DOE, and our other stakeholders.
- **CONTINUAL IMPROVEMENT:** We continually improve ESSH performance.

2.3 PLANNING

The planning requirements of the ISO 14001 Standard require BNL to identify the environmental aspects and impacts of its activities, products, and services; to evaluate applicable legal and other requirements; to establish objectives and targets; and to create action plans to achieve the objectives and targets.

2.3.1 Environmental Aspects

An "environmental aspect" is any element of an organization's activities, products, and services that can interact with the environment. As required by the ISO 14001 Standard, BNL evaluates its operations, identifies the aspects that can impact the environment, and determines which of those impacts are significant. The Laboratory's criteria for significance are based on actual and perceived impacts of its operations and on regulatory requirements. BNL utilizes several processes to identify and review environmental aspects. Key among these is the Process Assessment Procedure. This is an evaluation that is documented on a Process Assessment Form, which consists of a written process description, a detailed process flow diagram, a regulatory determination of all process inputs and outputs, identification of pollution prevention opportunities, and identification of any assessment, prevention, and control measures that should be considered. Environmental

professionals work closely with Laboratory personnel to ensure that environmental requirements are integrated into each process. Aspects and impacts are evaluated annually to ensure that they continue to reflect stakeholder concerns and changes in regulatory requirements.

2.3.2 Legal and Other Requirements

To implement the compliance commitments of the ESSH Policy and to meet its legal requirements, BNL has systems in place to review changes in federal, state, or local environmental regulations and to communicate those changes to affected staff. Laboratory-wide procedures for documenting these reviews and recording the actions required to ensure compliance are available to all staff through BNL's web-based Standards-Based Management System (SBMS) subject areas.

Executive Order (EO) 13514, Federal Leadership in Environmental, Energy, and Economic Performance, signed in 2009, sets sustainability goals for federal agencies and focuses on improving their environmental, energy, and economic performance. In addition to guidance, recommendations, and plans which are due by specific sustainability dates, EO 13514 has set numerical targets for agencies.

Each governmental facility is required to have a Site Sustainability Plan (SSP) in place detailing the strategy for achieving these long-term goals and to provide an annual status. The requirements will influence the future of BNL's EMS program and most have already been incorporated into BNL's SSP. Table 2-1 identifies the EO goal, the actions contained in the SSP, and BNL's performance in 2010.

2.3.3 Objectives and Targets

The establishment of environmental objectives and targets is accomplished through a Performance-Based Management System. This system is designed to develop, align, balance, and implement the Laboratory's strategic objectives, including environmental objectives. The system drives BNL's improvement agenda by establishing a prioritized set of key objectives, called the Performance Evaluation Management Plan. BSA works closely with DOE to clearly

define expectations and performance measures. Factors for selecting environmental priorities include:

- Meeting the intent and goals of EO 13514
- Significant environmental aspects
- Risk and vulnerability (primarily, threat to the environment)
- Legal requirements (laws, regulations, permits, enforcement actions, and memorandums of agreement)
- Commitments (in the ESSH Policy) to regulatory agencies, and to the public
- Importance to DOE, the public, employees, and other stakeholders

Laboratory-level objectives and targets are developed on a fiscal year schedule. In FY 2010 (October 1, 2009 through September 30, 2010), BNL's environmental objectives included:

- Reduce or eliminate the generation and/or toxicity of waste and other pollutants at the source through pollution prevention
- Reduce or eliminate the acquisition, use, and release of toxic and hazardous chemicals and materials
- Maximize the acquisition and use of environmentally preferable products in the conduct of operations
- Reduce or eliminate the environmental impacts of electronics assets
- Reduce degradation and depletion of environmental resources through post-consumer materials recycling
- Increase energy efficiency

2.3.4 Environmental Management Programs

Each organization within BNL develops an action plan detailing how they will achieve their environmental objectives and targets and commit the resources necessary to successfully implement both Laboratory-wide and facility-specific programs. BNL has a budgeting system designed to ensure that priorities are balanced and to provide resources essential to the implementation and control of the EMS. The Laboratory continues to review, develop, and fund important environmental programs to further integrate environmental stewardship into all facets of its missions.

2.3.4.1 Compliance

BNL has an extensive program to ensure that the Laboratory remains in full compliance with all applicable environmental regulatory requirements and permits. Legislated compliance is outlined by the Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAPs), Clean Water Act (e.g., State Pollutant Discharge Elimination System [SPDES]), Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act (RCRA), and other programs. Other compliance initiatives at the Laboratory involve special projects, such as upgrading petroleum and chemical storage tank facilities, upgrading the sanitary sewer system, closing underground injection control devices, retrofitting or replacing air conditioning equipment refrigerants, and managing legacy facilities. (See Chapter 3 for a list of regulatory programs to which BNL subscribes, and a thorough discussion of these programs and their status.)

2.3.4.2 Groundwater Protection

BNL’s Groundwater Protection Management Program is designed to prevent negative impacts to groundwater and to restore groundwater quality by integrating pollution prevention efforts, monitoring groundwater restoration projects, and communicating performance. The Laboratory has also developed a Groundwater Protection Contingency Plan that defines an orderly process for quickly taking corrective actions in

response to unexpected monitoring results. Key elements of the groundwater program are full, timely disclosure of any off-normal occurrences, and regular communication on the performance of the program. Chapter 7 and SER Volume II, Groundwater Status Report, provide additional details about this program, its performance, and monitoring results for 2010.

2.3.4.3 Waste Management

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

Collecting, storing, transporting, and disposing of waste generated at the Laboratory is the responsibility of BNL’s Waste Management Facility (WMF). This modern facility was designed for handling hazardous, industrial, radioactive, and mixed waste and is comprised of three staging areas: a facility for hazardous waste, regulated by 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

Table 2-1. EO 13514 Goals: Status Summary Table for Fiscal Year (FY) 2010.

DOE Goal	FY10 BNL Performance Status	BNL Planned Actions
28% Scope 1 and 2 GHG reduction by FY20 from a FY08 baseline (related goals indented below)	Did not meet - FY10 cumulative % reduction: inc +14% FY08 baseline: 207,976 MtCO _{2e} FY20 goal: 150,000 MtCO _{2e}	Utility Energy Services Contract (UESC); on-site renewable energy project; steam charge-back; Renewable Energy Credits (RECs) and on-site cogeneration project
30% energy intensity reduction by FY15 from a FY03 baseline	FY03 baseline: 324,917 Btu/GSF FY09: 299,181 Btu/GSF FY10: 290,793 Btu/GSF Cumulative % reduction FY10: 10.5% FY15 Goal: 227,442 Btu/GSF	UESC; steam charge-back; temperature set-back; more efficient office equipment
7.5% of a site’s annual electricity consumption from renewable sources by FY10 (double the credit if the energy is produced on site)	Met - 7.6% from purchase of RECs	Long Island Solar Farm (LISF) Project (32MW PV array); install additional ~1MW PV array as part of LISF

(continued on next page)

CHAPTER 2: ENVIRONMENTAL MANAGEMENT SYSTEM

Table 2-1. EO 13514 Goals: Status Summary Table for Fiscal Year (FY) 2010 (concluded).

DOE Goal	FY10 BNL Performance Status	BNL Planned Actions												
Every site to have at least one on-site renewable energy-generating system by FY10	Met - Solar powered traffic signals and parking lights; solar heating systems for Buildings 30 and 461	Current construction of an on-site 32MW solar PV array should start operations by late 2011.												
10% annual increase in fleet alternative fuel consumption by FY15 relative to a FY05 baseline	Did not meet - waiting for E85 fueling operations FY05 baseline: 26,000 gal FY10: 23,000 gal (8% less) FY10 increase from FY09: 10%	Continue acquiring Alternative Fuel Vehicles (AFVs)												
2% annual reduction in fleet petroleum consumption by FY15 relative to a FY05 baseline	Met - FY05 baseline: 129,000 gal Cumulative % reduction through FY10: 42% FY10 decrease from FY09: 16%	Continue acquiring AFVs												
75% of light duty vehicle purchases must be AFVs by FY15	Met - 19 AFV purchased in FY10 (6.5% of fleet, > 75% of purchases)	Continue acquiring AFVs												
To the maximum extent practicable: advanced metering for electricity (by October 2012), steam, and natural gas (by October 2016); standard meters for water	Met for electric and gas; installing advanced steam metering by 2016 <table border="0"> <tr> <td>Advanced Electrical Meters</td> <td>Steam Meters</td> <td>Water Meters</td> </tr> <tr> <td>Total # installed: 270</td> <td>Total # installed: 8</td> <td>Advanced water meters installed: 4</td> </tr> <tr> <td># Installed in FY10: 6</td> <td># Installed in FY10: 1</td> <td></td> </tr> <tr> <td># Additional planned: 22</td> <td># Additional planned: 50</td> <td></td> </tr> </table>	Advanced Electrical Meters	Steam Meters	Water Meters	Total # installed: 270	Total # installed: 8	Advanced water meters installed: 4	# Installed in FY10: 6	# Installed in FY10: 1		# Additional planned: 22	# Additional planned: 50		Continue installing advanced meters for steam and standard meters for water where appropriate. No additional advanced water meters will be installed
Advanced Electrical Meters	Steam Meters	Water Meters												
Total # installed: 270	Total # installed: 8	Advanced water meters installed: 4												
# Installed in FY10: 6	# Installed in FY10: 1													
# Additional planned: 22	# Additional planned: 50													
Cool roofs, unless uneconomical, for roof replacements unless project already has CD-2 approval; new roofs must have thermal resistance of at least R-30.	Met Total GSF of cool roofs installed in FY10: 139,835 GSF Total GSF of cool roofs installed to-date: 227,293 GSF Design specifications and design guide have been updated to incorporate these requirements	Cool roofs have been specified since 2008; R-30 has been specified, as economically justified												
Training and outreach; DOE facility energy managers to be Certified Energy Managers (CEM) by September 2012	Met - Facility Energy Manager is CEM	Continue to train more staff; update employee orientation programs to include sustainability issues												
Sulfur hexafluoride (SF ₆) capture program by September 2012	Met - Program is in place	Research cost-effective SF ₆ leak-detection devices												
13% Scope 3 GHG reduction by FY20 from a FY08 baseline	Cumulative % reduction at the end of FY10: 14% FY08 baseline: 20,259 MtCO ₂ e FY20 Goal: 17,652 MtCO ₂ e	Plans being developed address goal												
All new construction and major renovations greater than \$5 MM to be LEED® Gold certified. Meet high performance and sustainable building (HPSB) guiding principles if less than or equal to \$5 MM	Interdisciplinary Science Building (ISB) I will be LEED Gold Standards are in place to meet requirements	All new buildings to meet or exceed												
15% of existing buildings larger than 5,000 GSF to be compliant with the five guiding principles of HPSB by FY15	Number of buildings needed to meet the GP goal: 18 Number of buildings meeting GP: 2	ISB I, National Synchrotron Light Source II (NSLS II) Ring Building and three NSLS II lab-office buildings (LOBs) will meet LEED requirements. Additional assessments planned in FY11; energy reduction projects through UESC and operating funds will enable 11 additional buildings to meet goal												
16% water intensity reduction by FY15 from a FY07 baseline, 26% by FY20	Did not meet FY10 cumulative % reduction: -19% FY07 baseline: 101.16 gal/sf FY15 Goal: 85 gal/sf	Several best management practice water conservation projects are planned for the next few years												
20% water consumption reduction of industrial, landscaping, and agricultural (ILA) water by FY20 from FY10	Not applicable	All process water from on-site potable water system; no landscaping or agricultural water use												

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. Due to the relatively small quantities and infrequent generation of mixed waste, BNL has reduced its waste storage footprint by consolidating hazardous and mixed wastes into its RCRA waste building.

The Laboratory has performed sampling pursuant to a permit modification submitted to NYSDEC to effect the closure of its mixed waste building. When sampling has been completed and the results approved by NYSDEC, BNL will submit a permit modification request to NYSDEC to remove the building from its RCRA Permit.

In 2010, BNL generated the following types and quantities of waste from routine operations:

- Hazardous waste: 4.5 tons
- Mixed waste: 26 ft³
- Radioactive waste: 8,518 ft³

Hazardous waste from routine operations in 2010 was basically unchanged from 2009 generation rates, as shown in Figure 2-1a. Mixed waste generation decreased slightly, as shown in Figure 2-1b, and can be attributed primarily to fluctuations in operations and material substitutions. As shown in Figure 2-1c, the radioactive waste quantity from routine operations increased, but is still considered a normal operating quantity, based on historical generation rates and facility operations. The primary contributor to the increase in this waste stream is the Collider Accelerator Department (CAD) due to an increase in the quantity of shielding materials generated. Routine operations are defined as ongoing industrial and experimental operations.

Wastes generated by remediation projects, decommissioning activities performed by the Environmental Restoration Projects (ERP) group, or one-time events (e.g., lab clean-out) are considered non-routine.

In 2010, BNL's Environmental Protection Division (EPD) continued to reduce the inventory of legacy waste materials and disposed of equipment from the Brookhaven Medical Research Reactor (BMRR); dismantled the Building 901 Cyclotron; disposed of low-level radioactive liquid storage tanks from Building 811; and

removed the A2B waste lines and associated perimeter soils. Restoration and decommissioning activities included the removal of the graphite pile and shield plugs from the former Brookhaven Graphite Research Reactor (BGRR), demolition of the Building 704 fan house, removal of old waste lines, soil remediation near the former HWMF, and the continued removal of High Flux Beam Reactor (HFBR) and BGRR components. Other non-routine wastes included disposal of lead contaminated debris, lead shielding, and polychlorinated biphenyl (PCB) wastes.

Figures 2-1d through 2-1f show wastes generated under the ERP group, as well as non-routine operations. Waste generation from these activities has varied significantly from year to year. This is expected, as restoration activities move from remedial investigations and feasibility studies to remedial actions, which change annually based on the progress of the Laboratory's cleanup schedule.

2.3.4.4 Pollution Prevention and Waste Minimization

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

Pollution prevention and waste reduction goals have been incorporated into the DOE contract with BSA, into BNL's ESSH Policy, and into the Performance Evaluation Management Plan associated with the Laboratory's operating contract with DOE. Key elements of the P2 Program include:

- Eliminate or reduce emissions, effluents, and waste at the source where possible, and ensure that they are "as low as reasonably achievable"
- Procure environmentally preferable products (known as "affirmative procurement")
- Conserve natural resources and energy
- Reuse and recycle materials
- Achieve or exceed BNL/DOE waste

minimization, P2, recycling, and affirmative procurement goals

- Comply with applicable requirements (e.g., New York State Hazardous Waste Reduction Goal, Executive Orders, etc.)
- Reduce waste management costs
- Implement P2 projects
- Improve employee and community awareness of P2 goals, plans, and progress

Ten P2 proposals were submitted to the BNL P2 Council for funding in FY 2010. Three proposals were funded, for a combined investment of approximately \$30,400. The anticipated annual savings from these projects is estimated at \$20,800, for an average payback period of approximately 1.5 years. The BNL P2 and recycling programs have achieved significant reductions in waste generated by routine operations, as shown in Figures 2-1a through 2-1c.

This continues a positive trend and is further evidence that pollution prevention planning is well integrated into the Laboratory's work planning process. These positive trends are also driven by the EMS emphasis on preventing pollution and establishing objectives and targets to reduce environmental impacts. Table 2-2 describes the P2 projects implemented through 2010, and provides the number of pounds of materials reduced, reused, or recycled, as well as the estimated cost benefit of each project.

The implementation of pollution prevention opportunities,

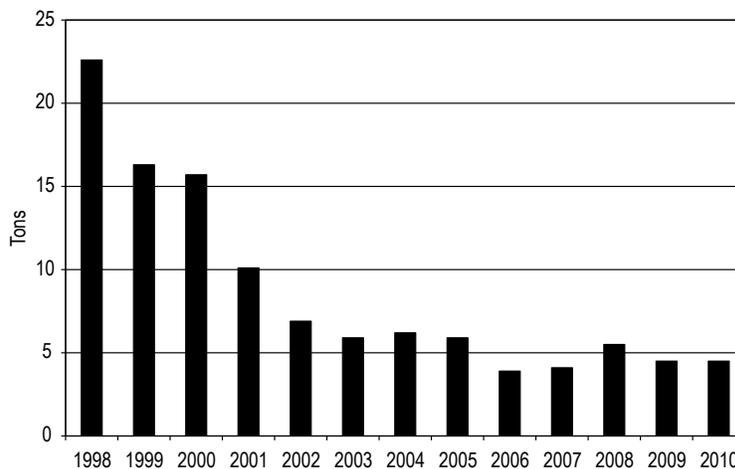


Figure 2-1a. Hazardous Waste Generation from Routine Operations, 1998 – 2010.

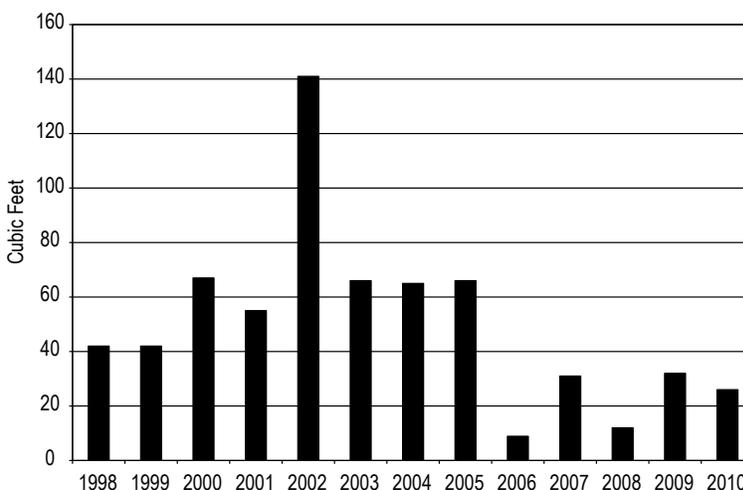


Figure 2-1b. Mixed Waste Generation from Routine Operations, 1998 – 2010.

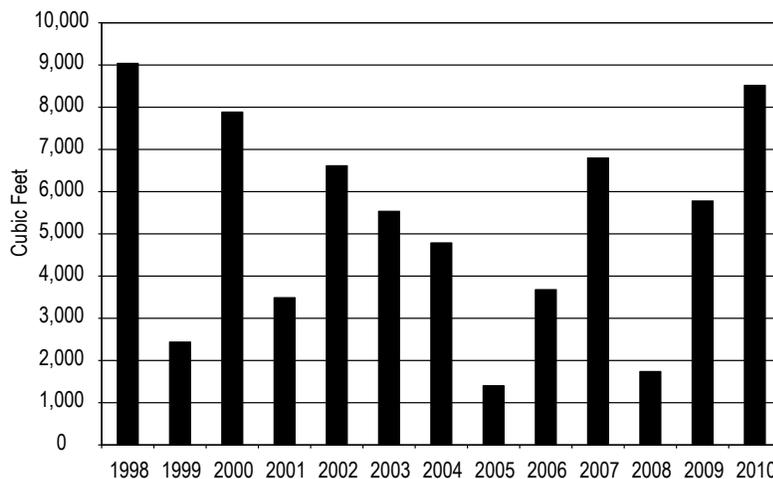


Figure 2-1c. Radioactive Waste Generation from Routine Operations, 1998 – 2010.

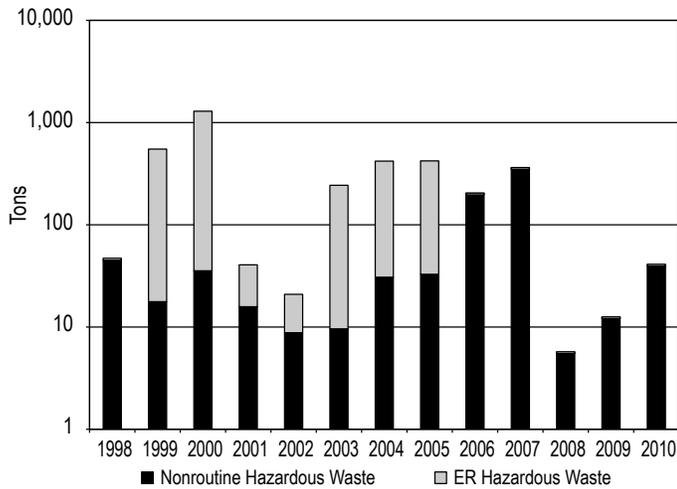


Figure 2-1d. Hazardous Waste Generation from ER and Nonroutine Operations, 1998 – 2010.

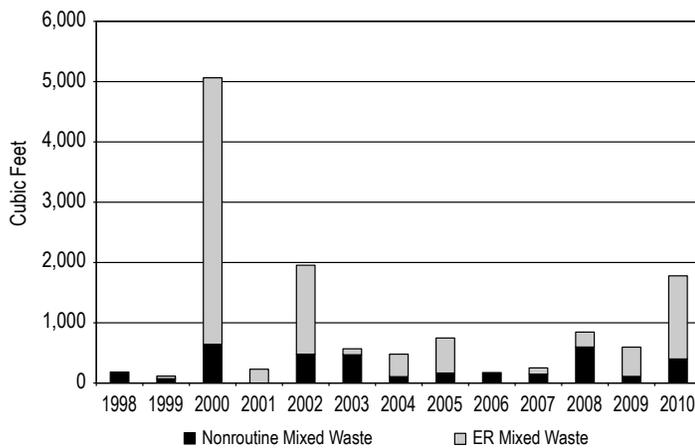


Figure 2-1e. Mixed Waste Generation from ER and Nonroutine Operations, 1998 – 2010.

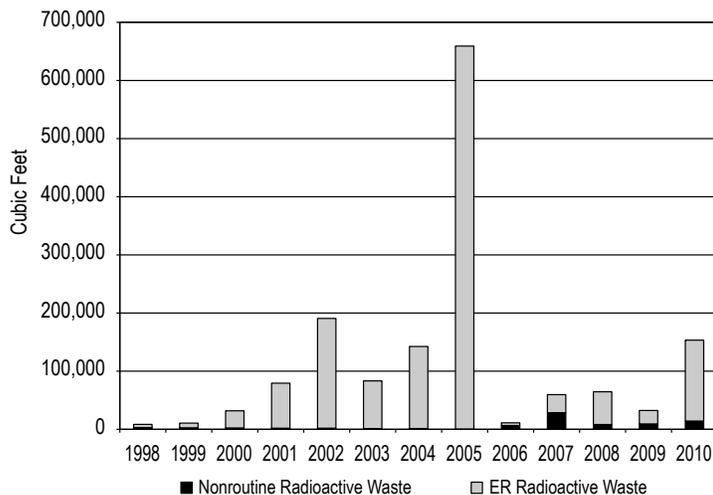


Figure 2-1f. Radioactive Waste Generation from ER and Nonroutine Operations, 1998 – 2010.

recycling programs, and conservation initiatives has significantly reduced both waste volumes and management costs. In 2010, these efforts resulted in more than \$1.9 million in cost avoidance or savings and approximately 9.1 million pounds of materials being reduced, recycled, or reused annually.

The Laboratory also has an active and successful solid waste recycling program, which involves all employees. In 2010, BNL collected approximately 174 tons of office paper for recycling. Cardboard, bottles and cans, construction debris, motor oil, scrap metals, lead, automotive batteries, electronic scrap, fluorescent light bulbs, and drill press/machining coolant were also recycled. Table 2-3 shows the total number of tons (or units) of the materials recycled in 2010.

2.3.4.5 Water Conservation

BNL’s water conservation program has achieved dramatic reductions in water use since the mid 1990s. The Laboratory continually evaluates water conservation as part of facility upgrades or new construction initiatives. These efforts include more efficient and expanded use of chilled water for cooling and heating/ventilation and air conditioning (HVAC) systems, and reuse of once-through cooling water for other systems, such as cooling towers. The goal is to reduce the consumption of potable water and reduce the possible impact of clean water discharges on Sewage Treatment Plant (STP) operations. Figure 2-2 shows the 12-year trend of water consumption. A slight rise in water consumption in 2010 was the primarily due to increased research

activity and the associated increase in evaporative cooling. In each of the past 5 years, the water consumption total was approximately half the 1998 total—a reduction of nearly a half-billion gallons per year.

2.3.4.6 Energy Management and Conservation

Since 1979, the Laboratory’s Energy Management Group has been working to reduce energy use and costs by identifying cost-effective, energy-efficient projects, monitoring energy use and utility bills, and assisting in obtaining the least expensive energy sources possible. The group is responsible for developing, implementing, and coordinating BNL’s Energy Management Plan and assisting DOE in meeting the energy goals in EO 13514 and the Secretary’s initiatives. The Laboratory’s SSP addresses all aspects of the DOE energy, water, and sustainability goals.

The Laboratory has more than 4 million square feet of building space. Many BNL scientific experiments use particle beams generated and accelerated by electricity, with the particles controlled and aligned by large electromagnets. In 2010, the Laboratory used approximately 272 million kilowatt hours (kWh) of electricity, 0.68 million gallons of fuel oil, 25,000 gallons of propane, and 537 million ft³ of natural gas. Fuel oil and natural gas produce steam at the Central Steam Facility (CSF). Responding to market conditions, fuel oil and natural gas were used whenever each respective fuel was least expensive. However, wherever possible, BNL will purchase natural gas over oil in order to help reduce GHG emissions. Additional information on natural gas and fuel oil use can be found in Chapter 4. In addition, over 3,000 gallons of bio-fuels were used in several applications.

BNL is a participant in the New York Independent System Operator (NYISO) Special Case Resource (SCR) Program, which is an electric load reduction curtailment program. Through this program, the Laboratory has agreed to reduce electrical demand during critical days throughout the summer when NYISO expects customer demand to meet or exceed the available supply. In return, BNL receives a rebate for each megawatt reduced on each curtailment day. No curtailment days were required in 2010,

Table 2-2. BNL Pollution Prevention, Waste Reduction, and Recycling Programs.

Waste Description	Type of Project	Pounds Reduced, Reused, Recycled or Conserved in 2009	Waste Type	Potential Costs for Treatment and Disposal	Cost of Recycle, Prevention	Estimated Cost Savings	Project Description Details *
Replacement of mercury utility devices	Substitution	7	Mercury	\$4,000	\$6,750	\$4,000	Approximately 25 mercury-containing thermometers were removed from the Collider Accelerator pump house. Savings are based on the cost of one mercury spill and cleanup.
Sewage sludge	Publicly Owned Treatment Works (POTW)	3,000	Low-level radiological waste	\$500,000	\$35,000	\$465,000	Radiological constituents were eliminated from the Sewage Treatment Facility and the sludge was sent to a POTW facility.
Alkaline batteries	Recycling	200	Industrial waste	\$10	\$0	\$10	200 pounds of alkaline batteries were collected and sent for recycling.
Solar-powered street lamp	Energy conservation	N/A	Greenhouse gas/ Energy conservation	\$10,000	\$0	\$5,386	Installation of a solar-powered streetlamp in the rear parking area of Building 490; cost savings based on avoided costs of trenching and wire pulling.
Bio-diesel tank	Alternative fuels	0	Greenhouse gas/ Energy conservation	\$0	\$0	\$0	Per Executive Order 13514, BNL is utilizing different alternatives to operate maintenance vehicles.

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Table 2-2. BNL Pollution Prevention, Waste Reduction, and Recycling Programs (continued).

Waste Description	Type of Project	Pounds Reduced, Reused, Recycled or Conserved in 2009	Waste Type	Potential Costs for Treatment and Disposal	Cost of Recycle, Prevention	Estimated Cost Savings	Project Description Details *
Timer switches*	Energy conservation	N/A	Greenhouse gas/Energy conservation	N/A	\$0	\$5,386	Installation of motion detector and infrared lighting in labs in Building 535.
Water timers	Water conservation	80,000	Potable water	N/A	\$0	\$164	Water timers allow the taps to be shut off after a specific amount of time running or a specified number of gallons is released, saving water and energy required to run the still.
Motion sensors for labs*	Energy conservation	N/A	Greenhouse gas/Energy conservation	N/A	\$0	\$5,817	Installation of motion detector lighting in common areas of Buildings 490 and 463.
"Bio Circle Cleaner" parts washer	Substitution	640	Hazardous waste	\$10,000	\$0	\$10,000	Eliminates the need for toxic solvents, chemical storage, and disposal associated with the cleaning of vacuum parts.
Aerosol can disposal system	Recycling	528	Hazardous waste	\$42,708	\$0	\$42,708	Empty aerosol cans are recycled as scrap, rather than sent to the Waste Management Division as hazardous waste. Eight units (Facilities & Operations=5, Collider Accelerator=1, National Synchrotron Light Source=1, Basic Energy Sciences=1) each handle 66 lbs. of hazardous waste.
Portable closed-head drum mixer	Neutralization	1,600	Hazardous waste	\$15,089	\$0	\$15,089	The National Synchrotron Light Source bought a closed drum mixer to neutralize Rydlyme, used to descale cooling pipes.
Fluorescently-labeled oligonucleotides	Waste minimization	3,144	Radiological waste (396 ft ³), Mixed waste (35 gallons), Hazardous Waste (108 gallons)	\$72,600	\$0	\$72,600	This project was cost-shared with Biology. The process avoids the use of radioactivity, avoiding radiological waste generation, and won a 2008 DOE Pollution Prevention Star Award.
Electronic recycling	Recycling	33,470		\$83,675	\$0	\$83,675	After an extensive audit review, BNL's e-waste is now collected by the Laboratory's metals recycler, which guarantees that e-waste is recycled in the most environmentally friendly manner.
Electronic reuse	Reuse	34,095	E-waste	\$85,238	\$0	\$85,238	The Laboratory tracks electronic equipment and earns a reuse credit for transfer of equipment to another user.
Building demolition recycling	Recycling	7,040,000	Industrial waste	\$372,000	\$32,000	\$340,000	On-site demolition products (steel and concrete) are segregated, recycled, and reused.

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Table 2-2. BNL Pollution Prevention, Waste Reduction, and Recycling Programs (continued).

Waste Description	Type of Project	Pounds Reduced, Reused, Recycled or Conserved in 2009	Waste Type	Potential Costs for Treatment and Disposal	Cost of Recycle, Prevention	Estimated Cost Savings	Project Description Details *
System One parts cleaner	Substitution	1,280	Hazardous waste	\$10,677	\$0	\$10,677	Central Fabrications and the Motor Pool each purchased a System One parts washer to re-distill dirty solvent, eliminating the need for a vendor, such as Safety Kleen. Removed grit and sludge are mixed with the waste oil.
Photon-counting spectro-fluorimeter	Substitution	54	Mixed waste (2 ft ³)	\$28,842	\$0	\$78,842	Eliminated the need for radioactive assays and their radioactive waste. Savings include 1,000 work hours, as well as savings on material costs.
Animal bedding conveying system	Composting	82,000	Low-level Radiological Waste	\$780,192	\$0	\$780,192	Animal bedding material is no longer sent to the sanitary landfill; it is now conveyed to a dumpster that is emptied or composted at the stump dump.
Organic solvents	Purification/reuse	44	Hazardous waste	\$110	\$0	\$3,510	The primary savings of the Basic Energy Sciences solvent purification system are in not purchasing new solvent and labor savings from not running the stills.
Lead acid batteries	Recycled	3,200	Universal waste	\$22,778	\$0	\$22,778	Avoids hazardous waste disposal costs for approximately 40 lbs. of lead per battery.
Short half-life waste - Collider Accelerator	Decay in storage	142	Radioactive waste	\$48,848	\$0	\$48,848	During 2010, 21 boxes of filters from Buildings 914 and 918 (147 ft ³) were managed in accordance with BNL decay-in-storage requirements, rendering the wastes eligible for volumetric release.
Short half-life waste - Medical Department	Decay in storage	12	Radioactive waste	\$4,128	\$0	\$4,128	During 2010, 9 boxes (12 ft ³) were managed as Regulated Medical Waste in accordance with BNL decay-in-storage requirements, rendering the wastes eligible for volumetric release.
Cooling Tower chemicals	Source reduction	9,563	Industrial waste	\$22,500	\$0	\$22,500	Ozone water treatment units were installed on cooling towers at SEM, the National Space Radiation Laboratory, and the Relativistic Heavy Ion Collider Research Facility for biological control of cooling water. These systems eliminate the need for water treatment chemicals (typically toxic biocides), save labor, and reduce analytical costs for monitoring cooling tower blowdown.

(continued on next page)

Table 2-2. BNL Pollution Prevention, Waste Reduction, and Recycling Programs (concluded).

Waste Description	Type of Project	Pounds Reduced, Reused, Recycled or Conserved in 2009	Waste Type	Potential Costs for Treatment and Disposal	Cost of Recycle, Prevention	Estimated Cost Savings	Project Description Details *
Blasocut machining coolant	Recycled/ Reused	38,640	Industrial waste	\$66,490	\$0	\$74,490	Central Shops Division operates a recycling system that reclaims Blasocut machining coolant and supplies it Laboratory-wide. In 2010, 4,830 gallons (38,640 lbs.) of Blasocut lubricant were recycled. Recycling involves aeration, centrifuge, and filtration, and avoids the cost of disposal as industrial waste and an avoided cost of buying 10 drums of concentrate (\$800/drum) and 97 empty drums for shipping (\$50/drum).
Fluorescent bulbs	Recycled	8,839	Universal waste	\$62,916	\$20,000	\$42,916	Fluorescent bulbs are collected and sent to a recycling facility under the Universal Waste exemption rule.
Tyvek	Recycled	180	Industrial waste	\$11	\$0	\$11	BNL is recycling tyvek through Garment Recovery Systems.
Used motor oil	Energy recovery	13,600	Industrial waste	\$31,140	\$0	\$31,140	Used motor oil from the motor pool and the on-site gas station is given to Stirebel's Laundry Service to fire their boilers. In 2010, they collected 1,700 gallons of oil at no charge to BNL, which avoided the costs for disposal and 34 shipping drums (\$50/drum).
Office paper	Recycled	348,000	Industrial waste	\$21,750	\$0	\$21,750	Cost avoidance based on \$106/ton for disposal as trash.
Cardboard	Recycled	282,000	Industrial waste	\$17,625	\$0	\$17,625	Cost avoidance based on \$106/ton for disposal as trash.
Metals	Recycled	262,000	Industrial waste	\$16,375	\$0	\$42,575	Cost avoidance based on \$106/ton for disposal as trash, plus \$150/ton revenue.
Bottles/cans	Recycled	48,000	Industrial waste	\$3,000	\$0	\$3,000	Cost avoidance based on \$106/ton for disposal as trash.
Construction debris	Recycled	832,000	Industrial waste	\$22,880	\$0	\$18,720	Cost avoidance based on \$45/ton difference for disposal as trash
	TOTALS	9,123,231		\$1,851,581	\$52,000	\$1,889,774	

* Cost savings of projects funded by the BNL Pollution Prevention Council will be tracked for 3 years.

but the Laboratory participated in some test exercises. Limited participation in this program produced a rebate of \$43,000. The Laboratory continues to keep electric loads at a minimum during the summer by scheduling operations at the Relativistic Heavy Ion Collider (RHIC) to avoid peak demand periods. This scheduling reduces the electric demand by 25 MW, which allowed BNL to save \$2.5 million in electric costs in 2010, and greatly helps maintain the reliability of the Long Island Power Authority (LIPA) electric system to meet all of its users' needs.

BNL also maintains a contract with the New York Power Authority (NYPA) that resulted in an overall cost avoidance of \$24.5 million in 2010. The Laboratory will continue to seek alternative energy sources to meet its future energy needs, support federally required "green" initiatives, and reduce energy costs.

Also in 2010, BP Solar began construction of one of the Nation's largest solar photovoltaic arrays on DOE/BNL property. The 32 MW of solar photovoltaics (PV) is being developed for LIPA and financed by BP Solar. BNL worked extensively with LIPA, BP Solar, the State of New York, and other organizations to evaluate the site and develop the project. Upon start-up in late 2011, the array will be the largest single PV array in the Northeast. The array will span 195 acres and will result in an avoidance of approximately 31,000 tons of carbon per year over its 30- to 40-year life span. As an outcome of constructing this large array at BNL, BP Solar and the Laboratory will be developing a solar research program that will look at impacts of climate change on large utility-scale PV systems, as well as research and development for solar power storage and inverter efficiencies. The DOE Office of Science (SC), the Brookhaven Site Office (BHSO), and BNL are working with the Federal Energy Management Program (FEMP) to explore the possibility of taking credit for the siting of this large array towards BNL's SSP.

To reduce energy use at non-research facilities, several additional activities also were undertaken in 2010:

- *NYPA Power Contract:* Provided considerable support to BNL Management and

BHSO. Work included numerous meetings, presentations, economic evaluations, document reviews, and development of terms and conditions. On track for final approval before the end of 2010, this 15-year contract is estimated to save in excess of \$22 million per year compared to prevailing energy rates.

- *DOE Sustainability Initiative:* Provided substantial support to the Federal/DOE-wide Sustainability Initiative; responded to numerous data requests as DOE continued to develop their Strategic Sustainability Performance Plan (SSPP); fostered the creation of a BNL Sustainability Leadership Team, which will develop a formal site-wide sustainability program beyond the DOE requirements; is part of three sub-committees for DOE on sustainability initiatives; and provided numerous evaluations and estimates on energy use, GHG, renewable energy, and energy efficiency options.
- *Substantial Progress on Several Initiatives included in BNL's 2010 Executable Plan (the SSP),* including: new electric and steam meter installations; development of a temperature set-back policy; funding requests for energy conservation initiatives; new energy-efficient lighting installed in parking lots and offices; purchase of Renewable Energy Credits (REC's); initiation of a steam recharge program; training of building managers on energy conservation initiatives and a set-back policy; and selected an Energy Services Company (ESCO) for BNL's Utility Energy Services Contract (UESC).
- *Energy Savings Performance Contract (ESPC)/Utility Energy Services Contract:* Major support to DOE/BHSO in developing a methodology to initiate a UESC. A UESC process was started and a preliminary energy audit is underway.
- *Energy Conservation:* Evaluated several projects for energy conservation opportunities that were submitted by Laboratory employees, development of an Energy Dashboard, and development of GHG and new billing program development.

CHAPTER 2: ENVIRONMENTAL MANAGEMENT SYSTEM

Table 2-3. BNL Recycled Program Summary.

Recycled Material	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mixed paper	246	209	182	185	193	184	177	151	127	174
Cardboard	127	157	176	179	143	135	121	147	152	141
Bottles/Cans	29	19	23	22	22.1	27.7	24.4	19.6	23.7	24
Tires	0	3.5	12.3	11	12.8	32.5	19.9	34.5	15.5	10.1
Construction debris	289	304	334	367	350	297	287	302	312	416
Used motor oil (gallons)	3,335	1,920	3,920	3,860	4,590	2,780	2,020	1,500	1,568	1,700
Metals	38	48	193	128	559	158	382	460	91	131
Lead	0	0	–	5	0	0	0	0	0	0
Automotive batteries	4.8	6.3	4.6	5	4.6	5.5	2.5	2.7	4	1.6
Printer/Toner cartridges (units)	363	449	187	105	0	0	0	3,078	1,251	4,132
Fluorescent bulbs (units)	17,112	25,067	13,611	12,592	7,930	11,740	25,448	36,741	10,223	8,839
Blasocut coolant (gallons)	10,660	8,180	5,030	6,450	3,890	3,970	2,432	3,340	3,810	4,830
Antifreeze (gallons)	200	0	165	325	0	0	0	0	0	0
Tritium exit signs (each)	190	28	181	142	0	0	0	0	0	0
Smoke detectors (each)	171	40	0	0	0	0	0	0	0	0
Road base	–	2,016	0	2,666	0	0	0	0	0	0
Electronic reuse	–	–	–	–	–	–	–	16.3	11.4	12
Scrap electronics	–	–	–	–	6.1	70.3	40.5	48.9	17	16.7
Animal Bedding (composted)	–	–	–	–	--	6.3	19.6	42	41	52
Tyvek (lbs.)	–	–	–	–	–	–	–	–	84	60
Metals (building demolition)	–	8	23	11	6	35	--	–	–	–
Concrete (building demolition)	–	891	590	3,000	328	5,505	6175	–	–	4,050
Other construction and debris (building demolition)	–	790	388	1,200	157	818	--	–	–	–

Notes:
All units are tons unless otherwise noted.

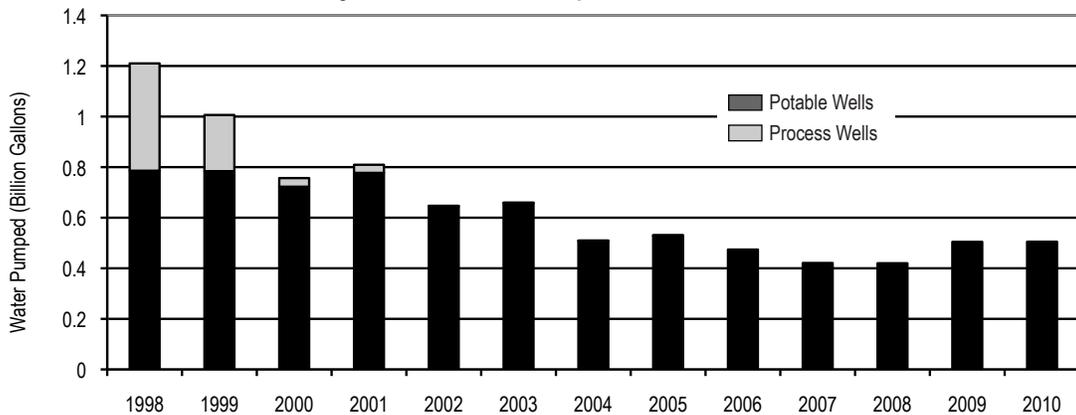


Figure 2-2. BNL Water Consumption Trend, 1998–2010.

- *Renewable Energy*: Provided considerable project support to BHSO for the BP/LIPA Long Island Solar Farm (LISF) Project at BNL including: various evaluations; project plans; work permits; digging permits; general work coordination; presentations; hosted tours and escorted engineering and construction personnel; and provided project management for the Building 30 Renewable Energy demonstration project, which is on line and operating.
- *Central Chilled Water Facility (CCWF)-Phase II*: Continued to support the project team in constructing the \$15 million CCWF expansion project, produced project change orders for increased scope of architectural and engineering services, provided technical assistance for Energy Conservation Measures (ECM's) and other changes, and assisted with commission plans and activities.
- *Research Support Labs, Research Support Building, and other Project Support*: Reviewed design and energy reports and provided technical assistance relative to energy matters.
- *Natural gas purchase contract*: estimated to save \$2 million compared to oil and \$300k compared to purchasing directly from National Grid.
- *Energy Savings*: 25 MW of demand was rescheduled to avoid coinciding with the utility summer peak, saving over 2 million dollars in electricity charges, and work continued in the replacement of aging, inefficient T-40 fluorescent lighting fixtures with new, efficient T-8 and T-5 units (two to three hundred fixtures are typically replaced annually), saving tens of thousands of kWhs and reducing costs by several thousand dollars.

Due to continued conservation efforts, overall facilities energy usage for FY 2010 was approximately 11 percent less than in FY 2003, saving over \$1.3 million. In addition, approximately 24,000 gasoline gallon equivalents (gge) of natural gas were used in place of gasoline for the Laboratory's vehicle fleet.

The National Energy Conservation Policy Act, as amended by the Federal Energy

Management Improvement Act of 1988 and the Energy Policy Acts of 1992 and 2005, as well as the Energy Independence and Security Act (EISA) of 2007, 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 2003, by 2 percent per year from FY 2006–FY 2015. Further, DOE Order 430.2B and other pending requirements have set even more stringent requirements, including renewable energy and transportation fuels that go significantly beyond the previous goal of a 30 percent reduction by FY 2005, compared to FY 1985. BNL's energy use per square foot in 2010 was 30 percent less than in FY 1985 (see Figure 2-3) and 11 percent less than in FY 2003. It is important to note that energy use for buildings and facilities at the Laboratory is largely weather dependent.

2.3.4.7 *Natural and Cultural Resource Management Programs*

BNL continues to enhance its Natural Resource Management Program in cooperation with the Foundation for Ecological Research in the Northeast (FERN) and the Upton Ecological and Research Reserve. The Laboratory also continues to enhance its Cultural Resource Management Program. A BNL Cultural Resource Management Plan has been developed to identify and manage properties that are determined to be eligible or potentially eligible for inclusion on the National Register of Historic Places. See Chapter 6 for further information about these programs.

2.3.4.8 *Environmental Restoration*

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as Superfund, was enacted by Congress in 1980. As part of CERCLA, EPA established the National Priorities List, which identifies sites where cleanup of past contamination is required. BNL was placed on the list with 27 other Long Island sites, 12 of which are in Suffolk County.

Each step of the CERCLA cleanup process

is reviewed and approved by DOE, EPA, and NYSDEC, under an Interagency Agreement (IAG). This agreement was formalized in 1992. Although not a formal signatory of the IAG, the Suffolk County Department of Health Services (SCDHS) also plays a key role in the review process. Most of the contamination at the Laboratory is associated with past accidental spills and outmoded practices for handling, storing, and disposing of chemical and radiological material.

BNL follows the CERCLA process, which includes the following steps:

- Conduct a Remedial Investigation to characterize the nature and extent of contamination and assess the associated risks
- Prepare a Feasibility Study and Proposed Plan to identify and evaluate remedial action alternatives and present the proposed best alternative
- Issue a Record of Decision (ROD), which is the remedy/corrective action agreed to by DOE, EPA, and NYSDEC
- Perform the Remedial Design/Remedial Action, which includes final design, construction specifications, and carrying out the remedy selected

In 2010, significant work was performed for

the BGRR and HFBR, and routine work continued for the groundwater treatment systems. The BGRR ROD requires the removal of the graphite pile and the biological shield, and the installation of a water infiltration control and monitoring system. With preliminary work planning and facility preparations completed in 2009, removal of the 700-ton graphite pile was completed in May 2010. Immediately upon the completion, preparations for the removal of the BGRR biological shield commenced. Special torch-cutting tools were designed, fabricated, and deployed and interferences such as the balconies and experimental equipment were removed. In addition, the neutron shields and the east and west airtight membranes were removed and work commenced on the removal of the 5'-9" thick biological shield roof. A competitively-bid contract for the installation of the water infiltration control system (engineered cap) was awarded and the contractor began work in December 2010.

In April 2009, the HFBR ROD was finalized. The final remedy incorporates many completed interim actions, several near-term actions, and the long-term segmentation, removal, and disposal of the remaining HFBR structures, systems, and activated components, including the reactor vessel. The near-term actions specified

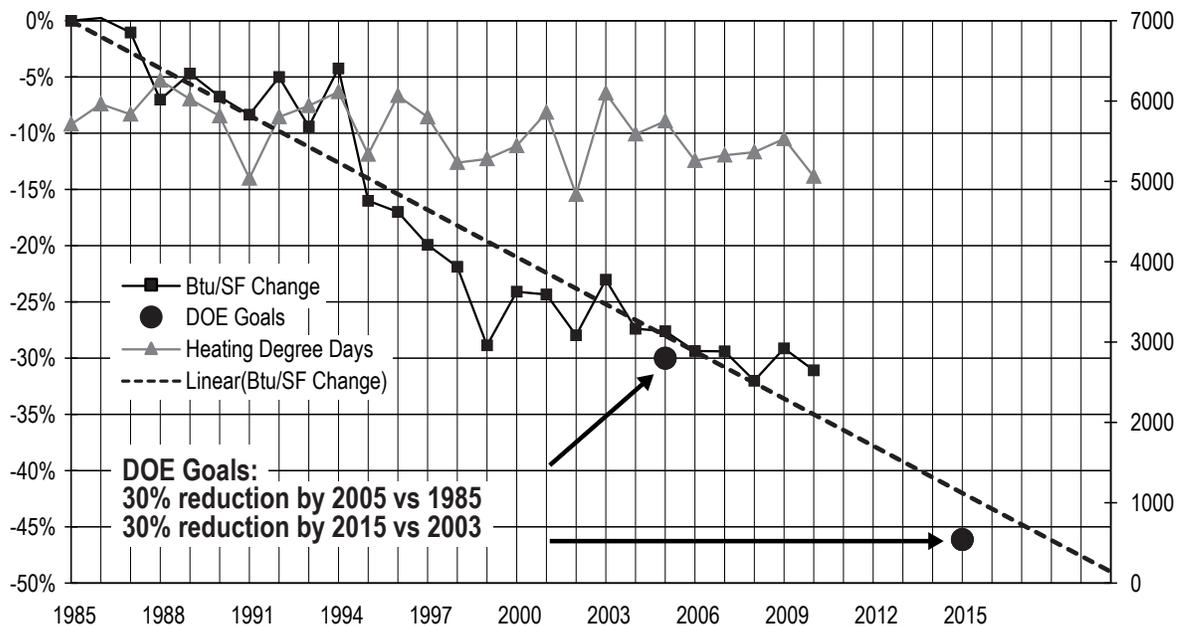


Figure 2-3. BNL Building Energy Performance (BTU/FT² Change % vs. Baseline Years).

in the ROD include dismantling the remaining ancillary buildings, removing contaminated underground utilities and piping, and preparing the reactor confinement building for safe storage. The ROD requires that these near-term actions be completed no later than 2020. The ROD also lays out a plan for the long-term segmentation, removal, and disposal of the remaining HFBR structures, systems, and components (including the reactor vessel and thermal and biological shields). These long-term actions will be conducted following a safe storage period (not to exceed 65 years) to allow for the natural reduction of high radiation levels to a point where conventional demolition techniques can be used to dismantle these reactor components. As a result of funding made available through the American Recovery and Reinvestment Act of 2009, a number of these activities were completed in 2010: the stabilization activities to prepare the HFBR confinement building for long-term safe storage, removal of the underground utilities and piping and the A&B waste lines, and the demolition of Building 704. During 2010, a contract was awarded for the demolition of the HFBR stack; DOE decided to defer this activity until a later date.

The productive operation and maintenance (O&M) of the Laboratory's groundwater treatment systems removed approximately 183 pounds of solvents and 23 mCi of strontium-90 (Sr-90) from the sole source aquifer in 2010. Since the operation of the first treatment system in 1996, a cumulative total of approximately 6,553 pounds of solvents and 1.4 mCi of Sr-90 have been removed from the groundwater. Removal of the high concentrations of perchloroethylene-contaminated source area soils was conducted in 2010 to help ensure that groundwater cleanup objectives will be met.

Other work performed in 2010 included the installation of four additional extraction wells to the Brookhaven Graphite Research Reactor/Waste Concentration Facility Groundwater Treatment System to remediate the downgradient high concentration area of Sr-90 identified in 2008. The Carbon Tetrachloride Groundwater Treatment System was dismantled following approval from regulators; this is the second

treatment system that has met its cleanup goals. Post-cleanup monitoring of Peconic River surface water, sediment, fish, and wetland vegetation continued, and the results were reported in the Annual Peconic River Monitoring Report (see Chapter 6.) Sediment remediation of three small areas of the Peconic River with continued elevated concentrations of mercury was also conducted, which included the removal of the Peconic River sediment trap.

The groundwater systems operate in accordance with the O&M manuals, while the Peconic and surface soil cleanup areas are monitored via the OU I Soils and OU V Long-Term Monitoring and Maintenance Plan. Institutional controls are also monitored and maintained for the cleanup areas in accordance with the RODs to help ensure the remedies remain protective of human health and the environment. An annual evaluation of these controls is submitted to the regulators. In addition to the annual evaluation, a second comprehensive Five-Year Review report was prepared and submitted to the regulators. This review evaluates the protectiveness of the various remedies implemented on site.

Table 2-4 provides a description of each OU and a summary of environmental restoration actions taken. See Chapter 7 and SER Volume II, Groundwater Status Report, for further details.

2.4 IMPLEMENTING THE ENVIRONMENTAL MANAGEMENT SYSTEM

2.4.1 Structure and Responsibility

All employees at BNL have clearly defined roles and responsibilities in key areas, including environmental protection. Employees are required to develop and sign their own Roles, Responsibilities, Accountabilities, and Authorities (R2A2) document, which must also be signed by two levels of supervision. BSA has clearly defined expectations for management and staff which must be included in this document. Under the BSA performance-based management model, senior managers must communicate their expectation that all line managers and staff take full responsibility for their actions and be held accountable for ESSH performance. Environmental and waste management technical support personnel assist the line organizations with

identifying and carrying out their environmental responsibilities. The Environmental Compliance Representative Program, initiated in 1998, is an effective means of integrating environmental planning and pollution prevention into the work planning processes of the line organizations. A comprehensive training program for staff, visiting scientists, and contractor personnel is also in place, thus ensuring that all personnel are aware of their ESSH responsibilities.

2.4.2 Communication and Community Involvement

Communication and community involvement are commitments under BNL's EMS. The Laboratory maintains relationships with its employees, key stakeholders, neighbors, elected officials, regulators, and other community members. The goals are to provide an understanding of BNL's science and operations, including environmental stewardship and restoration activities, and to incorporate community input into the Laboratory's decision-making.

BNL staff participates in or conducts: on- and off-site meetings, which include discussions, talks, presentations, and roundtables; workshops; local civic association meetings; canvassing surrounding neighborhoods; Laboratory tours; and informal information sessions and formal public meetings held during public comment periods for environmental projects.

2.4.2.1 Communication Forums

To facilitate effective dialogue between the Laboratory and key stakeholders, several forums for communication and involvement have been established:

- The Brookhaven Executive Roundtable (BER), established in 1997 by DOE's Brookhaven Site Office, meets routinely to update local, state, and federal elected officials and their staff, and regulators and other government agencies on environmental and operational issues, as well as on scientific discoveries and initiatives.
- The Community Advisory Council (CAC), established by BNL in 1998, advises the Laboratory Director and members of the Laboratory's management team, primarily

on environmental, health, and safety issues related to BNL that are of importance to the community. The CAC is composed of approximately 25 member organizations representing business, civic, education, employee, community, environmental, and health organizations. The CAC sets its own agenda in cooperation with the Laboratory and meets monthly. The CAC is one of the primary ways the Laboratory keeps the community informed. Meeting schedules and agendas are published on the Community Relations website and are open to the public. Organizations interested in participating on the CAC are encouraged to attend the meetings and voice their interest in becoming a member.

- Weekly phone calls with federal, state, and local regulators keep them up-to-date on project status, obtain feedback and input, and provide an opportunity to discuss emerging environmental findings.
- The Community Relations Office website has increasingly been used to host links to important cleanup documents and to announce public meeting dates. The website links to the CAC webpage, which contains meeting agendas, presentations, and meeting minutes.
- The Community Relations Office manages several outreach programs that provide opportunities for stakeholders to become familiar with the Laboratory's facilities and research projects, as well as new initiatives.
- The Tour Program offers the opportunity for college, university, professional, and community groups to learn about BNL. Groups visit throughout the year to meet scientists who conduct research and visit the Laboratory's scientific machines and research facilities. Agendas are developed to meet the interests of the visiting groups and may include environmental stewardship issues.
- The Speakers' Bureau Program provides speakers for educational and other organizations, such as Rotary Clubs, civic organizations, professional societies, and other groups to update the community about Laboratory research and/or operations ac-

Table 2-4. Summary of BNL 2010 Environmental Restoration Activities.

Project	Description	Environmental Restoration Actions
Soil Projects	Operable Unit (OU) I/II/III/VII	<ul style="list-style-type: none"> ▪ Prepared the second comprehensive Five-Year Review for all the projects for submittal to the regulators. ▪ Performed monitoring and maintenance of institutional controls for cleanup areas. ▪ Completed excavation and disposal of perchloroethylene-contaminated soil at the former Building 96 source area.
Groundwater Projects	OU I, OU III, OU IV, OU V, OU VI	<ul style="list-style-type: none"> ▪ Continued operation of 12 groundwater treatment systems that remove volatile organic compounds (VOCs) and two systems that remove strontium-90 (Sr-90). ▪ 183 pounds of VOCs and 1.4 mCi of Sr-90 were removed during the treatment of 1.8 billion gallons of groundwater. Since the first groundwater treatment system started operating in December 1996, approximately 6,553 pounds of VOCs and 23 mCi of Sr-90 have been removed, while treating nearly 18 billion gallons of groundwater. ▪ Collected and analyzed over 1,500 sets of groundwater samples from 789 monitoring wells. ▪ Installed 104 temporary wells and collected multiple samples from each location. ▪ Continued monitoring and operation of the High Flux Beam Reactor (HFBR) tritium pump and recharge system. ▪ Dismantled the Carbon Tetrachloride groundwater treatment system. ▪ Continued post-closure groundwater monitoring at Operable Unit (OU) IV. ▪ Continued installing temporary wells to characterize Sr-90 in the Waste Concentration Facility (WCF) plume. ▪ Installed four additional Sr-90 extraction wells that are necessary to achieve cleanup goals. ▪ Continued monitoring the g-2 tritium plume using temporary and permanent monitoring wells.
Peconic River	OU V	<ul style="list-style-type: none"> ▪ Performed fifth year of long-term post-cleanup monitoring of Peconic River surface water, sediment, fish, and wetland vegetation. ▪ Excavated and disposed of via rail approximately 0.3 acres of mercury-contaminated sediment from the River. Revegetation of area will be performed in the summer 2011. ▪ As required by the Record of Decision, the sediment trap was also removed.
Reactors	Brookhaven Graphite Research Reactor (BGRR)	<ul style="list-style-type: none"> ▪ Completed removal of the graphite pile. ▪ Transported and disposed of over 700 tons of graphite blocks and secondary radiological waste. ▪ Completed design and fabrication of special torch-cutting tools required for the biological shield dismantlement. ▪ Completed installation of the bulk gas storage system required to supply the cutting torches used in the biological shield dismantlement. ▪ Completed removal of interferences such as balconies and experimental equipment required for biological shield dismantlement. ▪ Commenced dismantlement of the biological shield, completed removal of the east and west airtight membranes, and removal of the north and south neutron shields. ▪ Completed demolition of the Duct Service Building and constructed roof cover over below ground duct openings. ▪ Completed preparations for installation of the Building 701 engineered cap. ▪ Mobilized contractor for installation of the Building 701 engineered cap.
	High Flux Beam Reactor (HFBR)	<ul style="list-style-type: none"> ▪ Completed stabilization of the HFBR confinement; work included removal of miscellaneous combustible materials, draining of primary and secondary piping systems, isolation and air-gapping of utilities which penetrated the confinement wall, and installation of a leak detection system. ▪ Reconfigured the containment electrical system to allow convenient de-energization of electrical and lighting systems when the building is not occupied, for inspection and tours. ▪ Installed a 4,000-CFM HEPA ventilation fan.
	Building 704 Fanhouse Demolition	<ul style="list-style-type: none"> ▪ Completed demolition of Building 704.

(continued on next page)

Table 2-4. Summary of BNL 2010 Environmental Restoration Activities (concluded).

Project	Description	Environmental Restoration Actions
	Underground Utilities	<ul style="list-style-type: none"> ▪ Completed removal of the 30" concrete exhaust line from Building 750 to the stack. ▪ Completed removal of the 1,110-foot long D/F waste line which ran from Building 750 to Building 801. ▪ Completed removal of the 42" and the 15" off gas lines between Building 801 and 802.
	Building 801-811 Waste Transfer Lines	<ul style="list-style-type: none"> ▪ Completed removal of over 700 feet of abandoned buried waste transfer lines between Building 801 and 811, including the 2" A, B, and original D-waste lines, a new 1-1/2" D-waste line, the 10" non-acid off-gas line, and the abandoned steam line.
	Stack (Building 705)	<ul style="list-style-type: none"> ▪ Issued contact and mobilized contractor for the demolition of the stack. ▪ Contractor completed work preparations for the demolition of the stack. ▪ Demobilized stack D&D contractor under direction from DOE.
	Brookhaven Medical Research Reactor (BMRR) (Project managed by the BNL Environmental and Waste Management Services Division)	<ul style="list-style-type: none"> ▪ Continued surveillance and maintenance activities.
Buildings 810/811	Radiological Liquid Processing Facility	<ul style="list-style-type: none"> ▪ Performed routine surveillance and maintenance of the facility.
Building 801	Inactive Radiological Liquid Holdup Facility	<ul style="list-style-type: none"> ▪ Performed routine surveillance and maintenance of the facility.
Building 650	Inactive Radiological Decon Facility	<ul style="list-style-type: none"> ▪ Performed routine surveillance and maintenance of the facility.

accomplishments, including environmental stewardship efforts.

- The Summer Sundays Program enables the public to visit BNL science facilities, experience hands-on activities, and learn about research projects and environmental stewardship initiatives.
- The Envoy Program educates employee volunteers regarding Laboratory issues and provides a link to local community organizations. Feedback shared by envoys helps BNL gain a better understanding of local community concerns.
- The Laboratory participates in various annual events, such as BNL's week-long celebration in honor of Earth Day and the Suffolk County Department of Park's Earth Day Festival.
- Lunchtime tours are held once a month and offer employees the opportunity to learn about the Laboratory's science facilities, program areas, and activities outside the scope of their jobs.
- Brown bag lunch meetings, held periodically,

cover topics of interest to employees, including project status updates, newly proposed initiatives, wildlife management concerns, and benefits information.

- BNL's Media and Communications Office issues press releases and publishes *The Bulletin*, a weekly employee newsletter. A Director's Office web-based publication, Monday Memo, is issued bi-weekly to employees and focuses on administrative topics important to the Laboratory population.
- The Laboratory maintains an informative website at <http://www.bnl.gov>, where these publications, as well as extensive information about BNL's science and operations, past and present, are posted. In addition, employees and the community can subscribe to the Laboratory's e-mail update service at <http://lists.bnl.gov/mailman/list-info/bnl-announce-1>.
- Community questions and comments may be submitted to the Community Relations Office by visiting the website at <http://www>.

bnl.gov/community/ and completing the “Contact Us” form.

2.4.2.2 Community Involvement in Cleanup Projects

In 2010, BNL stakeholders had the opportunity to provide input on:

- *Site-wide Five-Year Review:* Five-year reviews conducted under CERCLA are performed on cleanup remedies to ensure that they continue to be effective in protecting human health and the environment. In July 2010, a Legal Notice was published by DOE announcing the commencement of the second site-wide CERCLA Five-Year Review. Stakeholders, including regulators, CAC members, and BNL employees were interviewed for their perspective on the issues that should be covered during the review. The Review is expected to be finalized and available to the public in the fall of 2011.
- *New York State SPDES Permit Renewal:* The Laboratory’s SPDES permit, up for renewal, authorizes discharges of waste water to surface and ground water. Established under the Clean Water Act (1972), the goals of the SPDES program are to eliminate the discharge of pollutants into the nation’s waters and to achieve water quality to protect fishing and recreational interests. In May 2010, the CAC received presentations on completed studies conducted by the Laboratory’s consultant on proposed permit modifications. In June 2010, the CAC compiled a consensus recommendation outlining their support for the consultant’s recommendation to meet the modifications that called for diverting BNL’s Sewage Treatment Plant effluent from the Peconic River to recharge basins. The permitting process is discussed in detail in Chapter 3, section 3.6, of this report.
- *American Recovery and Reinvestment Act (ARRA) projects* completed during 2010 included the removal of the BGRR graphite pile, stabilization and closure of the HFBR, and removal of the 704 Fan House. The

CAC and BER received periodic updates on the progress of these projects at their respective meetings throughout the year.

- *Additional remediation at Building 96 and in the Peconic River:* The CAC and BER were given detailed presentations on additional remediation planned for these projects during 2010. Under the June 2000 OU III ROD, the remedy for Building 96 consisted primarily of a groundwater treatment system to capture contamination from VOCs. When contaminants failed to respond to treatment, further characterization of the area was conducted. As a result, a change to the remedy that called for the excavation and off-site disposal of the soil discovered to be the source of the VOC contamination was proposed. The excavation of a 25 x 25 x 15 ft. area was planned to address the VOC contamination. Remediation of contaminated Peconic River sediments occurred according to the 2004 OU V ROD during 2004/2005. A total of 19.8 acres of river corridor were cleaned up, re-vegetated, and are being monitored annually. Following several years of monitoring data, the additional removal of approximately 1/3 acre of contaminated sediment was planned for two locations within the river. The sediment trap, which had been constructed in 2002 to minimize the potential for migration of contaminants beyond the BNL boundary, was also removed and the area beneath it remediated.

In addition to the projects outlined above, stakeholders were updated on the progress of other environmental cleanup projects and health and safety issues via briefings and presentations given at CAC and BER meetings:

- The Laboratory’s 2009 Annual Site Environmental Report provided an overall update on BNL’s pollution prevention efforts and waste generation, compliance status, water and air monitoring, and radiological dose assessment information.
- Environmental Management clean-up projects under the American Recovery and Reinvestment Act that included numerous updates on the BGRR and HFBR decom-

missioning projects and removal of the waste transfer lines from the Waste Concentration Facility.

- The 2009 Peconic River monitoring highlights included data on sediment, surface water, and fish sampling. The presentation included information on planned additional sediment removal in two locations and removal of the sediment trap.
- The 2009 Annual Groundwater Report gave specific information on the protection and monitoring of groundwater and the remediation process, including the operational status of treatment systems, progress toward achieving cleanup goals, and recommended or proposed actions in response to monitoring data.
- Remediation of the perimeter soils at the former Hazardous Waste Management Facility.

In addition to the projects noted above, the CAC continues to express interest in the science and research that is conducted at BNL, as well as educational opportunities. In October 2010, CAC members and members of the community participated in a tour of the National Synchrotron Light Source II construction site. The CAC also received presentations on Bioenergy Research, Energy Conservation and Sustainability Efforts at BNL, and on BNL's Office of Education's NSLS InSynC Program, which seeks to introduce synchrotron science into the classroom.

Working closely with the community, employees, elected officials, and regulatory agency representatives, DOE and BNL continue to openly share information on issues and projects and provide feedback on how the input is used.

2.4.3 Monitoring and Measurement

The Laboratory monitors effluents and emissions to ensure the effectiveness of controls, adherence to regulatory requirements, and timely identification and implementation of corrective measures. BNL's Environmental Monitoring Program is a comprehensive, sitewide program that identifies potential pathways for exposure of the public and employees, evaluates the impact activities have on the environment,

and ensures compliance with environmental permit requirements. The monitoring program is reviewed and revised, as necessary or on an annual basis, to reflect changes in permit requirements, changes in facility-specific monitoring activities, or the need to increase or decrease monitoring based on a review of previous analytical results.

As required under DOE Order 450.1A, Environmental Protection Program, BNL prepares an Environmental Monitoring Plan, which outlines annual sampling goals by media and frequency. The plan uses the EPA Data Quality Objective approach for documenting the decisions associated with the monitoring program. In addition to the required triennial update, an annual electronic update is also prepared.

As shown in Table 2-5, in 2010 there were 7,027 sampling events of groundwater, potable water, precipitation, air, plants and animals, soil, sediment, and discharges under the Environmental Monitoring Program. Specific sampling programs for the various media are described further in Chapters 3 through 8.

The Environmental Monitoring Program addresses three components: compliance, restoration, and surveillance monitoring.

2.4.3.1 Compliance Monitoring

Compliance monitoring is conducted to ensure that wastewater effluents, air emissions, and groundwater monitoring data comply with regulatory and permit limits issued under the federal Clean Air Act, Clean Water Act, Oil Pollution Act, Safe Drinking Water Act, and the New York State equivalents. Included in compliance monitoring are the following:

- *Air emissions monitoring* is conducted at reactors, accelerators, and other radiological emission sources, as well as the CSF. Real-time, continuous emission monitoring equipment is installed and maintained at some of these facilities, as required by permits and other regulations. At other facilities, samples are collected and analyzed periodically to ensure compliance with regulatory requirements. Analytical data are routinely reported to the permitting authority. See Chapters 3 and 4 for details.

- *Wastewater monitoring* is performed at the point of discharge to ensure that the effluent complies with release limits in the Laboratory's SPDES permits. Twenty-four point-source discharges are monitored under the BNL program: 12 under the ER Program and 12 under the SPDES permit. As required by permit conditions, samples are collected daily, weekly, monthly, or quarterly and monitored for organic, inorganic, and radiological parameters. Monthly reports that provide analytical results and an assessment of compliance for that reporting period are filed with the permitting agency. See Chapter 3, Section 3.6 for details.
- *Groundwater monitoring* is performed to comply with regulatory operating permits. Specifically, monitoring of groundwater is required under the Major Petroleum Facility License for the CSF and the RCRA permit for the Waste Management Facility. Extensive groundwater monitoring is also conducted under the CERCLA program (described in Section 2.4.3.2 below). Additionally, to ensure that the Laboratory maintains a safe drinking water supply, BNL's potable water supply is monitored as required by SDWA, which is administered by SCDHS.

2.4.3.2 Restoration Monitoring

Restoration monitoring is performed to determine the overall impact of past operations, to delineate the real extent of contamination, and to ensure that Removal Actions are effective and remedial systems are performing as designed under CERCLA.

This program typically involves collecting soil and groundwater samples to determine the lateral and vertical extent of the contaminated area. Samples are analyzed for organic, inorganic, and radiological contaminants, and the analytical results are compared with guidance, standards, cleanup goals, or background concentrations. Areas where impacts have been confirmed are fully characterized and, if necessary, remediated to mitigate continuing impacts. Follow-up monitoring of groundwater is conducted in accordance with a ROD with the regulatory agencies (see Chapter 7 and SER Volume II, Groundwater

Status Report, for details).

2.4.3.3 Surveillance Monitoring

Pursuant to DOE Order 450.1, surveillance monitoring is performed in addition to compliance monitoring, to assess potential environmental impacts that could result from routine facility operations. The BNL Surveillance Monitoring Program involves collecting samples of ambient air, surface water, groundwater, flora, fauna, and precipitation. Samples are analyzed for organic, inorganic, and radiological contaminants. Additionally, data collected using thermoluminescent dosimeters (devices to measure radiation exposure) strategically positioned on and off site are routinely reviewed under this program. Control samples (also called background or reference samples) are collected on and off the site to compare Laboratory results to areas that could not have been affected by BNL operations.

The monitoring programs can be broken down further by the relevant law or requirement (e.g., Clean Air Act) and even further by specific environmental media and type of analysis. The results of monitoring and the analysis of the monitoring data are the subject of the remaining chapters of this report. Chapter 3 summarizes environmental requirements and compliance data, Chapters 4 through 8 give details on media-specific monitoring data and analysis, and Chapter 9 provides supporting information for understanding and validating the data shown in this report.

2.4.4 EMS Assessments

To periodically verify that the Laboratory's EMS is operating as intended, audits are conducted as part of BNL's Self-Assessment Program. The audits are designed to ensure that any nonconformance to the ISO 14001 Standard is identified and addressed. In addition, compliance with regulatory requirements is verified through routine inspections, operational evaluations, and focused compliance audits. BNL's Self-Assessment Program consists of several processes:

- *Self-assessment* is the systematic evaluation of internal processes and performance. The

CHAPTER 2: ENVIRONMENTAL MANAGEMENT SYSTEM

Table 2-5. Summary of BNL 2010 Sampling Program Sorted by Media.

Environmental Media	No. of Sampling Events(a)	Purpose
Groundwater	1,732 (b) 216 ES/C (c)	Groundwater is monitored to evaluate impacts from past and present operations on groundwater quality, under the Environmental Restoration, Environmental Surveillance, and Compliance sampling programs. See Chapter 7 and SER Volume II, Groundwater Status Report for further detail.
On-Site Recharge Basins	68	Recharge basins used for wastewater and stormwater disposal are monitored in accordance with discharge permit requirements and for environmental surveillance purposes. See Chapter 5 for further detail.
Potable Water	46 ES 216 C	Potable water wells and the BNL distribution system are monitored routinely for chemical and radiological parameters to ensure compliance with Safe Drinking Water Act requirements. In addition, samples are collected under the Environmental Surveillance Program to ensure the source of the Laboratory's potable water is not impacted by contamination. See Chapters 3 and 7 for further detail.
Sewage Treatment Plant (STP)	674	The STP influent and effluent and several upstream and downstream Peconic River stations are monitored routinely for organic, inorganic, and radiological parameters to assess BNL impacts. The number of samples taken depends on flow. For example, samples are scheduled for collection at Station HQ monthly, but if there is no flow, no sample can be collected. See Chapters 3 and 5 for further detail.
Precipitation	7	Precipitation samples are collected from two locations to determine if radioactive emissions have impacted rainfall, and to monitor worldwide fallout from nuclear testing. The data are also used, along with wind speed, wind direction, temperature, and atmospheric stability to help model atmospheric transport and diffusion of radionuclides. See Chapter 4 for further detail.
Air – Tritium	193	Silica gel cartridges are used to collect atmospheric moisture for subsequent tritium analysis. These data are used to assess environmental tritium levels. See Chapter 4 for further detail.
Air – Particulate	469 ES/C 52 NYSDOH	Samples are collected to assess impacts from BNL operations and to facilitate reporting of emissions to regulatory agencies. Samples are also collected for the New York State Department of Health Services (NYSDOH) as part of their program to assess radiological air concentrations state-wide. See Chapter 4 for further detail.
Air – Charcoal	48	Samples are collected to assess impacts from BNL operations and to facilitate reporting of emissions to regulatory agencies. See Chapter 4 for further detail.
Fauna	295	Fish, deer, and small mammals are monitored to assess impacts on wildlife associated with past or current BNL operations. See Chapter 6 for further detail.
Flora	18	Vegetation is sampled to assess possible uptake of contaminants by plants and fauna, since the primary pathway from soil contamination to fauna is via ingestion. See Chapter 6 for further detail.
Soils	267	Soil samples are collected as part of the Natural Resource Management Program to assess faunal uptake, during Environmental Restoration investigative work, during the closure of drywells and underground tanks, and as part of preconstruction background sampling.
Miscellaneous	368	Samples are collected periodically from potable water fixtures and dispensers, manholes, spills, to assess process waters, and to assess sanitary discharges.
Groundwater Treatment Systems and Remediation Monitoring	1,525	Samples are collected from groundwater treatment systems and as long-term monitoring after remediation completion under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program. The Laboratory has 14 operating groundwater treatment systems. See discussion in Chapter 7.
Vehicle Monitor Checks	240	Materials leaving the Laboratory pass through the on-site vehicle monitor that detects if radioactive materials are present. Any radioactive material discovered is properly disposed of through the Waste Management Program. The vehicle monitor is checked on a daily basis.
State Pollutant Discharge Elimination System (SPDES)	339	Samples are collected to ensure that the Laboratory complies with the requirements of the New York State Department of Environmental Conservation (NYSDEC)- issued SPDES permit. Samples are collected at the STP, recharge basins, and four process discharge sub-outfalls to the STP.

(continued on next page)

Table 2-5. Summary of BNL 2010 Sampling Program Sorted by Media (concluded).

Environmental Media	No. of Sampling Events(a)	Purpose
Flow Charts	636	Flowcharts are exchanged weekly as part of BNL's SPDES permit requirements to report discharge flow at the recharge basin outfalls.
Floating Petroleum Checks	103	Tests are performed on select petroleum storage facility monitoring wells to determine if floating petroleum products are present. The number of wells and frequency of testing is determined by NYSDEC licensing requirements (e.g., Major Petroleum Facility), NYSDEC spill response requirements (e.g., Motor Pool area), or other facility-specific sampling and analysis plans.
Radiological Monitor Checks	435	Daily instrumentation checks are conducted on the radiation monitors located in Buildings 569 and 592. These monitors are located 30 minutes upstream and at the STP. Monitoring at these locations allows for diversion of wastes containing radionuclides before they are discharged to the Peconic River.
Quality Assurance/ Quality Control Samples (QA/QC)	386	To ensure that the concentrations of contaminants reported in the Site Environmental Report are accurate, additional samples are collected. These samples detect if contaminants are introduced during sampling, transportation, or analysis of the samples. QA/QC samples are also sent to the contract analytical laboratories to ensure their processes give valid, reproducible results.
Total number of sampling events	8,333	The total number of sampling events includes all samples identified in the Environmental Monitoring Plan (BNL 2009), as well as samples collected to monitor Environmental Restoration (CERCLA) projects, air and water treatment system processes, and by the Environmental Protection Division Field Sampling Team as special requests. The number does not include samples taken by Waste Management personnel, waste generators, or Environmental Compliance Representatives for waste characterization purposes.

Notes:

- (a) A sampling event is the collection of samples from a single georeferenced location. Multiple samples for different analyses (i.e., tritium, gross alpha, gross beta, and volatile organic compounds) can be collected during a single sample event.
- (b) Includes 86 temporary wells; many of which are used to collect multiple samples at different depth intervals.
- (c) Includes 29 temporary wells, many of which are used to collect multiple samples at different depth intervals.
- C = Compliance
ER = Environmental Restoration (CERCLA)
ES = Environmental Surveillance

approach for the environmental self-assessment program includes evaluating programs and processes within organizations that have environmental aspects. Conformance to the Laboratory's EMS requirements is verified, progress toward achieving environmental objectives is monitored, operations are inspected to verify compliance with regulatory requirements, and the overall effectiveness of the EMS is evaluated. BNL environmental staff routinely participate in these assessments. Laboratory management conducts assessments to evaluate BNL environmental performance from a programmatic perspective, to determine if there are Laboratory-wide issues that require attention, and to facilitate the identification and communication of "best management" practices used in one part of the Laboratory that

could improve performance in other parts. BNL management also routinely evaluates progress on key environmental improvement projects. The Laboratory and DOE periodically perform assessments to facilitate the efficiency of assessment activities and ensure that the approach to performing the assessments meets DOE expectations.

- *Independent assessments* are performed by BNL staff members who do not have line responsibility for the work processes involved, to ensure that operations are in compliance with Laboratory requirements. These assessments verify the effectiveness and adequacy of management processes (including self-assessment programs) at the division, department, directorate, and Laboratory levels. Special investigations are also conducted to identify the root causes

of problems, as well as identify corrective actions and lessons learned.

The Laboratory's Self-Assessment Program is augmented by programmatic, external audits conducted by DOE. BSA staff and subcontractors also perform periodic independent reviews. An independent third party conducts ISO 14001 registration audits of BNL's EMS. The Laboratory is also subject to extensive oversight by external regulatory agencies (see Chapter 3 for details). Results of all assessment activities related to environmental performance are included, as appropriate, throughout this report.

2.5 ENVIRONMENTAL STEWARDSHIP AT BNL

BNL has extensive knowledge of its potential environmental vulnerabilities and current operations due to ongoing process evaluations, the work planning and control system, and the management systems for groundwater protection, environmental restoration, and information management. Compliance assurance programs have improved the Laboratory's compliance status and pollution prevention projects have reduced costs, minimized waste generation, and reused and recycled significant quantities of materials.

BNL is openly communicating with neighbors, regulators, employees, and other interested parties on environmental issues and progress. To maintain stakeholder trust, the Laboratory will continue to deliver on commitments and demonstrate improvements in environmental performance. The Site Environmental Report is an important communication mechanism, as it summarizes BNL's environmental programs and performance each year. Additional information about the Laboratory's environmental programs is available on BNL's website at <http://www.bnl.gov>.

Due to external recognition of the Laboratory's knowledge and unique experience implementing the EMS program, BNL is often asked to share its experiences, lessons learned, and successes. The Laboratory's environmental programs and projects have been recognized with international, national, and regional awards. Audits have consistently observed a high level of management involvement, commitment, and

support for environmental protection and the EMS.

For more than 50 years, the unique, leading-edge research facilities and scientific staff at BNL have made many innovative scientific contributions possible. Today, BNL continues its research mission while focusing on cleaning up and protecting the environment. The Laboratory's environmental motto, which was generated in an employee suggestion contest, is "Exploring Earth's Mysteries ... Protecting Its Future," and reflects the Laboratory's desire to balance world-class research with environmentally responsible operations.

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