Chapter 3

ENVIRONMENTAL PROGRAM INFORMATION

3.1 Environmental Program Elements

Brookhaven National Laboratory is committed to environmental compliance and accountability. To evaluate BNL's impact on the environment, the Laboratory developed an environmental monitoring program that is designed to address the following issues:

- Evaluate the impact of Laboratory operations on the environment;
- Design and operate a program for assessing radiation exposures resulting from environmental releases;
- Determine trends in environmental radiological and nonradiological levels; and,
- Address government and public concerns about site operations.

3.1.1 Environmental Regulations

The BNL environmental monitoring program is designed to ensure that human health is adequately protected, to reflect environmental stewardship, and to verify that state and federal regulatory requirements for radiological and nonradiological programs are met. These requirements are stated in DOE Order 5400.1 (General Environmental Protection Program) and 5400.5 (Radiation Protection of the Public and the Environment), NESHAP, CERCLA, RCRA, CAA, SDWA, CWA, TSCA, and in NEPA. Compliance is monitored by USEPA, NYSDEC, NYSDOH, SCDHS, and by the DOE. Brookhaven National Laboratory's compliance activities for CY1997 are discussed in Chapter 2.

3.1.2 Program Objectives

The objectives of BNL's environmental monitoring program incorporate the requirements of DOE Order 5400.1, "General Environmental Protection Program," DOE/EH-0173T, "Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance," and other applicable regulations. These objectives include the following:

- Assess actual or potential exposures of critical groups and populations to radioactive and nonradioactive materials resulting from normal operations or from accidents;
- Ensure that air and water discharges comply with authorized limits and regulatory requirements;
- Verify the adequacy of effluent controls in facilities;
- Notify proper officials of unusual or unforeseen conditions and, where appropriate, activate monitoring or remediation programs;
- Accurately communicate results of environmental monitoring and surveillance to DOE, other government agencies, and the public;
- Maintain an accurate, continuous record of the impact of the BNL operations on the environment;
- Determine concentrations of radioactive and nonradioactive-contaminants in environmental mediamedia to assess the immediate and long-term consequences of normal and accidental releases;
- Establish a baseline of environmental quality to characterize trends in the physical, chemical, and biological condition of environmental media;
- Evaluate and revise the environmental monitoring program in response to changing conditions dictated by facility operations and the results of environmental analyses;

- Provide site-specific data for use in assessing risk to human populations near BNL;
- Identify and quantify new or existing problems in environmental quality and evaluate the need for remedial actions or mitigating measures; and
- Pinpoint exposure pathways in which contaminants are accumulated and transmitted to the public.

To meet these objectives, approximately 6,000 samples were collected and nearly 100,000 analyses were performed as part of the routine environmental monitoring programs during 1997. Additional samples were collected and analyzed (approximately 2,000 and 10,000, respectively) to characterize the nature and extent of the HFBR tritium plume.

3.2 Program Organization

The environmental protection initiatives discussed above are coordinated by three Laboratory organizations: the Environmental Restoration Division, the Environment, Safety and Health Services Division, and the Waste Management Division.

3.2.1 Environmental Restoration Division

The Environmental Restoration Division (ERD), formerly known as the Office of Environmental Restoration, was established in response to the BNL site being placed on the National Priority List (NPL) on November 21, 1989. The NPL is a list of hazardous waste sites that are considered high priority for cleanup under the federal Superfund Program, officially known as the CERCLA. BNL is one of 22 Superfund sites on Long Island. In May 1992, an IAG between the DOE, the USEPA, and the NYSDEC became effective to insure compliance with the CERCLA, the corrective action requirements of the RCRA, the NEPA, as well as corresponding NYS regulations. In particular, the IAG was established to ensure that environmental impacts associated with past activities at BNL are thoroughly investigated and that appropriate response actions can be formulated, assessed, and implemented. It is mandated that all environmental restoration actions have the approval of the IAG signatories. The ERD has prime responsibility to remediate areas of known contamination, and identify, mitigate, and eliminate other areas of potential contamination. In this process, the ERD identifies areas of concern, prioritizes them, conducts Remedial Investigation/Feasibility Studies (RI/FSs), conducts characterization studies, identifies preferred remediation processes, and prepares a final Record of Decision (ROD) on the area of concern. When the preferred remedial alternative is approved by the IAG signatories, the ERD designs and implements remedial action and initiates programs for operating and maintaining the areas. Throughout this process, the ERD maintains an active, integrated public-involvement program.

3.2.2 Environment, Safety and Health Services Division - Environmental Protection Office

The ES&HS Division's Environmental Protection Office (EPO) assists and advises the Laboratory in all areas of regulatory compliance, and prepares and submits compliance reports and permit applications to the regulatory agencies. This Office also provides technical oversight and assistance in conducting environmental monitoring and reviewing data for determining the impact on the environment from Laboratory operations. Reports based upon the review and assessment of the environmental data are disseminated to BNL, the DOE, and regulatory agencies. The Office also is responsible for preparing the annual Environmental Monitoring Plan (EMP) that outlines the sampling program conducted by the ES&HS Division and the ERD. The EMP specifies the required environmental sample locations, media, frequencies, and analyses. The Office also reviews plans for construction projects to identify potential environmental impacts and regulatory requirements. These environmental reviews are undertaken for new construction projects, as well as for modifications to existing facilities to assure that environmental protection requirements are satisfied, and that all necessary regulatory permits are obtained. Approximately 100

projects were reviewed during CY 1997. Several members of the EPO are emergency responders, and are on 24-hour call in the event of a spill at BNL.

The EPO's Field Sampling Team is responsible for collecting environmental samples and submitting them to the ASL for radiological and non-radiological-analysis. The Team also responds to emergency situations where environmental sampling is required, and undertakes special sampling tasks for other BNL organizations.

3.2.3 Waste Management Division

The Waste Management Division (WMD) is responsible for the safe handling and disposal of all radioactive, hazardous, and mixed-wastes generated at BNL. During most of 1997, waste materials continued to be transferred to the HWMF for processing, storage, packaging, and preparation for off-site disposal. Starting in December 1997, waste management operations were transferred to a new centrally located WMF. This state-of-the-art facility contains separate buildings designed to safely store and package each type of waste. All waste material is properly tracked, and the final disposition is fully documented in accordance with applicable regulations. In addition to maintaining waste-storage facilities, the WMD supports BNL's hazardous waste management program in the following areas:

- Regulatory Compliance Program;
- Waste Minimization and Pollution Program;
- Quality Assurance Program;
- Training and Procedures Program; and,
- Special sample analyses.

3.2.4 Supporting Groups

The ES&HS Division's Instrumentation and Calibration Group maintain monitoring equipment located in facility stacks and liquid-effluent systems. The assigned QA staff oversees the functions of the EPO in terms of the directives on QA pertaining to environmental sampling, analytical processes, and documentation, which include reviews of data. The Analytical Services Laboratory performs radiological and nonradiological analyses on most environmental surveillance samples (non-CERCLA).

3.3 Regulatory Agency Monitoring Program

The NYSDOH monitors the ambient-air quality on-site, and the NYSDEC participates jointly with BNL in the aquatic-and terrestrial-radioecological sampling. Samples collected under these joint programs are analyzed by these agencies, and the data are published in their departmental annual reports. In 1997, the SCDHS established an office on-site to closely monitor BNL's environmental protection activities.

3.4 Environmental Programmatic Changes in 1997

In 1997, the Laboratory initiated the following new programs to support the Site Environmental Monitoring Program, and the Environmental Restoration Program:

Brookhaven National Laboratory, in conjunction with the NYSDEC, expanded its surveillance program of the Peconic River. In addition to extending sampling in the river and adjoining freshwater bodies (started in 1995), sampling and radioactive analyses of clams, mussels, sediments, and seawater from the Peconic Estuary and other areas along the coast line (which serve as background locations as they are not influenced by the Peconic River's flow) were continued in 1997. Sampling enables the Laboratory to examine the potential impact on the estuarine and marine fauna of BNL releases through the intermittent Peconic River's off-site flow, ultimately reaching Peconic Bay at the river's mouth. The ERD also started special sampling of the Peconic River for

nonradiological parameters after finding mercury and PCBs in the sediment from the Peconic River on-site.

As part of the ongoing restoration and facility monitoring programs, additional groundwater monitoring and remediation wells were installed. Over 75 new permanent monitoring wells were installed in the HFBR, BMRR and BGRR areas. During 1997, the BNL ERD made significant progress in its ongoing efforts to characterize and remediate contaminated soil and groundwater resulting from past spills, releases and disposal practices.

3.5 Special Projects

3.5.1 High Flux Beam Reactor Tritium Investigation

In January 1997, tritium was detected at concentrations that exceeded federal drinking water standards in a monitoring well located immediately south (downgradient) of the HFBR. The presence of tritium at nearly twice the drinking water standard resulted in an intensive 60-day campaign to identify the source of the tritium, characterize the extent of the contamination, and install a groundwater pumping system at the leading edge of the tritium plume. The tritium plume was delineated by the installation of over 120 temporary groundwater characterization wells, 70 permanent monitoring wells, and two horizontal wells that extend beneath the HFBR. BNL was able to characterize the tritium plume and begin pumping from the leading edge of the plume within 60-days. In addition to the groundwater investigation, BNL conducted an intensive evaluation of all HFBR components that had the potential to release tritium into the environment. As a result, the HFBR's Spent Fuel Pool was found to have been leaking at a rate of 6 to 9 gallons per day, and was determined to be the primary source of the tritium detected in the groundwater. Details on this investigation were summarized in several published reports prepared by the DOE, the US General Accounting Office (GAO), and BNL.

3.5.2 Facility Review Project

In the spring of 1997, BNL began a comprehensive examination of site facilities to identify any past or current activities that have the potential to degrade the environment. The operating history of each building (both existing and previously demolished structures) was obtained: to identify environmental vulnerabilities (i.e., potential contaminant release sites), and to recommend corrective actions, as needed.

This effort was an important element of BNL's and DOE's comprehensive plan to delineate, characterize, and remediate environmental issues at the Laboratory site. The findings will be used to develop strategies for making operational changes that will reduce the potential for future environmental impacts. To ensure long-term protection, review of BNL operations will be coordinated on an ongoing basis with the U.S. Environmental Protection Agency, the New York State Department of Environmental Conservation, and various Suffolk County agencies.

The Facility Review Project was coordinated by the Environment, Safety and Health Services (ES&HS) Division. This extensive effort involved all Laboratory organizations, particularly the Environmental Restoration Division (ERD), the Plant Engineering Division (PE), and the Department of Advanced Technology (DAT); extensive support was provided by the Department of Energy (DOE). The Chief, Office of Water Resources, from the Suffolk County Department of Health Services (SCDHS) actively participated in the planning and review of the project. In addition, SCDHS inspectors and engineers took part in the physical examinations of the buildings.

All buildings and structures were categorized as either a Priority One or Priority Two Facility. This grouping of the buildings was based primarily on previous uses and age of the facility. In particular, because of public concerns about radioactivity, facilities, which used or generated significant quantities of radioactive material during the 1950s and 1960s, were selected for Priority One consideration. This period was selected since the more modern environmental regula-

tions and standards were developed in the 1970s. All other Laboratory buildings were considered Priority Two Buildings.

The program managers of each Building were responsible for conducting each facility review. Every organization was responsible for reviewing the facility's design and layout drawings, inspection reports, safety analysis reports, annual Site Environmental Reports, and other pertinent documents, such as operating reports and log books. Current and former employees with knowledge of the operations or practices over the operating history were interviewed. Extensive walk-downs and examinations of the interior and exterior of the facilities were also performed.

To ensure the timely completion of this review, BNL technical staff were supplemented with staff from the following institutions: the Pacific Northwest National Laboratory (PNNL); Pantex; Lawrence Berkeley National Laboratory (LBNL); Lawrence Livermore National Laboratory (LLNL); Idaho National Engineering and Environmental Laboratory (INEEL); Princeton Plasma Physics Laboratory (PPPL); Argonne National Laboratory (ANL); Fermi National Accelerator Laboratory; and, the Oak Ridge National Laboratory (ORNL).

The Interim Report for Priority One Buildings was issued on September 9, 1997 (Royce, 1997) and the Interim Report for Priority Two Buildings was issued on December 3, 1997 (Royce and Collins, 1997). Thirty-five "Significant" findings were reported in the Priority One and Two Reports. The interim reports also identified findings of lesser potential impact. Issues that were deemed "lesser" had the potential to contaminate the groundwater, but at levels below the drinking water standards. A significant finding was defined as a potential environmental vulnerability where there is, or was, a possibility for chemical or radiological releases that would result in concentrations of contaminants above either soil or drinking water standards. The significant findings identified in the Priority One Interim Report are summarized in two broad categories: underground sumps, tanks, lines and ducts; and historic discharges of solvents, oils and mercury. Some of the most serious findings were the sumps identified at the BGRR. The significant findings identified in the Priority Two Interim Report are summarized in two broad categories: underground tanks, pipes, pits and sumps; and cesspools and drywells. Corrective action plans were developed for each of them. Significant progress has been made at eliminating or reducing the potential for environmental impact from them. Implementation of the corrective actions will remain a high priority until they are completed.

3.6 Waste Minimization and Pollution Prevention Programs

The BNL Waste Minimization and Pollution Prevention (Wmin/P2) Plan establishes the Wmin/P2 program. The plan combines the need for separate Waste Minimization and Pollution Prevention Awareness Plans required under DOE Order 5400.1, and lays out a strategy for implementing a formal waste-minimization and pollution-prevention program. Since initiating this program in 1995, DOE has realized a payback of about $8 for each $1 invested and has seen most projects pay for themselves in less than three years. The plan also discusses Waste Minimization accomplishments.

The Wmin/P2 program focuses on identifying and implementing cost-effective opportunities for waste reduction. Such opportunities are identified by formal Pollution Prevention Opportunity Assessments (PPOAs), Waste Minimization Working Groups, and employee's suggestions. Funding for implementation is sought through the ES&H Management Plan, the High Return on Investment Program, and internal sources. Since 1995, BNL received about $1,000,000 in grants covering about a dozen Wmin/P2 projects. In 1997, the following Wmin/P2 projects were implemented:

I. As a result of a PPOA of Photographic Waste completed in 1995, BNL applied for, and was awarded, funding from the High Return on Investment program, to convert much of the traditional wet-photographic processes in Photography and Graphic Arts to digital processes. (This was considered as the largest routine hazardous-waste stream.) Al-

though this investment required an initial outlay of about $350,000, nearly $130,000 in reduced waste management costs was realized in the first year. The project was implemented in 1996, and has reduced the quantity of hazardous waste by over 60 percent in 1997.

II. A proposal to fund the recommendations of the PPOA of AGS low-level radioactive wastewater (conducted in 1995) was submitted to the High Return on Investment program. The project seeks to retrofit or replace ion-exchange vessels to allow resins to be easily removed and disposed of as LLW instead of regenerating them. Its adoption will significantly reduce LLW water, cutting 15,000 gallons of radioactive waste annually.

III. An activated metal-waste-compactor for the AGS LLW stream was purchased through the High Return on Investment program. This opportunity, identified by the Wmin/P2 Working Group in AGS, will significantly reduce the volume of the active-metal waste stream (the largest LLW stream at BNL), saving BNL $170,000 and 1,600 cubic feet of LLW waste per year.

IV. The PPOA of the NSLS Acid Cleaning process successfully developed a new process that uses ultrasonic cleaning and mild organic acid and detergent-based cleaning solutions. Construction of the new Centralized Degreasing Facility was completed in 1997. The process eliminates the use of hydrofluoric and nitric acids. Chemical analysis of the contents of the cleaning baths show the liquids to be nonhazardous. In addition, this process does not require any environmental permits, is significantly safer for workers, and is expected to save $5,000 in the first year of operation.

V. Hazardous waste production by the BNL's vehicle maintenance facility was completely eliminated.

VI. Nonhazardous substitutes were used to replace solutions containing lead and mercury in scientific work and fabrication processes.

VII. In 1997, the Riverhead School District began a white-paper recycling program based on suggestions made in 1996 by BNL and DOE. BNL's staff, working with the school district's administration and facilities maintenance staff, went "dumpster diving" to characterize the amounts and types of potentially recyclable materials that the schools were throwing away. This has resulted in savings for the District in trash hauling expenses.

VIII. BNL joined forces with the Suffolk County Water Authority (SCWA), New York Institute of Technology, State University of New York at Stony Brook, Polytechnic University, Rhode Island Center for Pollution Prevention, and New York State Department of Environmental Conservation's Pollution Prevention Unit to form the Long Island Pollution Prevention Partnership. Under a grant from EPA, SCWA managed the partnership's "Students and Industries for Pollution Prevention" project, in which 25 college students learned pollution-prevention techniques and conducted free pollution-prevention assessments for local and businesses and industry.

3.7 Public Outreach

1997 was marked by heightened public awareness of BNL operations because of the discovery of the HFBR tritium leak. The DOE and BNL established various communication programs aimed at informing the public, responding to feedback about groundwater contamination, and responding to the news media to ensure timely, accurate, and consistent distribution of information.

As part of BNL's environmental program, the ES&HS Division, the ERD, and the Community Involvement, Government and Public Affairs Division engage in routine public-outreach activities. Many BNL staff members participate in public meetings, civic–organization briefings, the Speakers Bureau, tours and educational programs, all of which encourage public interaction with

the Laboratory. Print and broadcast media, as well as the Brookhaven Bulletin, are the traditional communication channels used to inform on-site staff and the public about environmental activities. Due to mounting public interest in BNL activities, BNL conducted public tours of the research and support facilities, held public forums on groundwater quality and protection, and on the planned facility improvements at the Sewage Treatment Plant. The Laboratory also hosted meetings on Pine Barrens research and pollution-prevention, sponsored jointly by BNL, state, and local governmental agencies. The BNL home page was expanded to include additional environmental information.

The newly formed Community Work Group also served as a focal point for discussions on a range of environmental issues. The environment was also the main focus of the BNL "Summer Sunday" public tour program, and BNL also presented exhibits at the Pine Barrens Discovery Day. Through the Community Summer Science Program, local high-school students assisted in research on the Pine Barrens ecosystem on BNL's site. In 1997, approximately 24,250 people visited BNL.

3.8 Environmental Audits

Several audits, assessments, and appraisals of environmental functions were conducted in 1997:

- Immediately following the discovery of the HFBR tritium plume in January 1997, the DOE's Office of Oversight conducted a Safety Management Evaluation (ISME). The ISME consisted of an in-depth examination of BNL operations in the area of ES&H (DOE, 1997b). They looked at BNL's activities, and those of the DOE organization that oversees the Laboratory. The Office of Oversight also performed two other reviews that specifically addressed DOE and BNL efforts to identify the source of the tritium leak and mitigate the tritium plume. These efforts were documented in two reports, the "Interim Evaluation of Tritium Plume Recovery Activities at BNL" and "Status of Groundwater Tritium Plume Recovery Activities at BNL," which were completed in February and October 1997, respectively (DOE, 1997a; DOE, 1997d). In July 1997, BNL submitted a detailed Implementation Plan that outlined specific actions to be taken to address the ISME findings (DOE, 1997).

- As a follow up to the ISME report, the Laboratory Director appointed a committee to review the Laboratory's decision-making process in addressing ES&H issues. The committee was headed by Robert Bari, Chair of BNL's DAT, and included a representative from the SCDHS. The committee's recommendations discussed the need for clearer management roles and responsibilities at the Laboratory, addressed how funds are allocated for ES&H projects, how these projects are ranked, how the laboratory considers community sensitivities and regulatory commitments, and the benefits of instituting a comprehensive, proactive site-wide hazards assessment and control system (Bari et al., 1997).

- In May 1997, USEPA Region II announced that they would conduct a multimedia compliance audit of the BNL site. The audit looked at air emissions, water discharges, underground storage-tanks, hazardous-waste storage, handling and disposal, spill-prevention, toxic-substance management, radiation controls, emergency planning, underground injection-wells, toxic-release inventory, and the community's right-to-know requirements. EPA cited DOE in four environmental programs areas: RCRA; TSCA, principally PCBs; Underground Injection Control (UIC); and CAA. During the EPA inspection, DOE and AUI immediately corrected RCRA deficiencies, and since then, have corrected all RCRA deficiencies identified in the EPA enforcement action through improved management of hazardous waste at points of generation in those facilities cited, including an improved procedure for labeling and storage. TSCA violations were addressed by removing improperly stored wastes. The DOE and the Laboratory are preparing an inventory of unpermitted UIC wells, including cesspools and storm drains. Clean Air Act findings are being addressed through improved operating and reporting procedures for asbestos

projects, boilers and monitoring equipment, and labeling of service-station gasoline pumps to warn against overfilling tanks.

- In response to a request from Congressional Science Committee Chairman Sensenbrenner and ranking Democrat Brown, the General Accounting Office issued a report that reviewed the circumstances that led up to the January 1997 discovery of a tritium leak from BNL's HFBR Spent-Fuel Pool, and subsequent actions taken by the DOE and BNL (GAO, 1997).
- DOE took the first step toward a formal environmental review of the HFBR by issuing a Notice of Intent to prepare an Environmental Impact Statement for public review and comment. The review, which will take approximately one year to complete, will define the environmental and public-health-impacts of various alternatives for the future of the reactor which is used for advanced research in solid-state physics, nuclear physics, materials technology, structural biology, medicine, and chemistry.
- In October 1997, DOE reviewed BNL's ES&H and Infrastructure Prioritization Program. This review was carried out by the DOE's Energy Research Department (ER-81) and focused on evaluating the process BNL established for prioritizing projects to determine if the funding plan adequately addressed critical ES&H activities. Earlier in 1997, BNL had established a new review process to prioritize work activities and to ensure that those related to environment improvements were given the appropriate recognition and support via a risk-ranked score. The review team included environmental regulators with oversight responsibilities at the site.
- In December 1997, DOE cited AUI for several significant regulatory violations of nuclear safety rules identified in June 1997, and issued a preliminary notice of violation to assure that the problems are corrected. While the actual individual consequences were not serious, DOE found that when combined they reflected a trend of noncompliance with regulatory and BNL procedural requirements. AUI was required to respond to this notice by documenting actions taken or planned to prevent recurrence of problems.

The findings from the assessments discussed above are being tracked and reported to the appropriate level(s) of management.

3.9 Site Environmental Performance Measures Program

At the start of Fiscal Year (FY) 1996, DOE implemented a new Prime Contract with Associated Universities, Inc. (AUI) which contained several performance measures on environment, safety, and health. The measures were implemented contractually by Articles 6 and 7, with Appendix B to the contract containing the actual Performance Objectives, Criteria, and Measures. DOE, AUI, and BNL developed them by reviewing past experience and operations at the Laboratory. The following summarizes the performance measures associated with BNL's environmental protection activities in CY1997:

3.9.1 Waste Generation Reports

- H**azardous Waste:** Figure 3-1 shows the hazardous waste generation (in metric tons) for CY 1993 to CY 1997. It includes routine hazardous waste, non-routine hazardous waste, and TSCA (or PCB) waste. Routine waste is defined as waste from ongoing operations. Examples of generation of non-routine waste are from construction, demolition, and environmental restoration. The routine waste-streams are those that BNL can reduce using pollution-prevention techniques.

  The chart shows that BNL reduced the generation of hazardous waste by 54% from 1993 through 1997. The Pollution Prevention program aggressively targeted hazardous wastes that are particular problems for the site. An example is the targeting of the solvent TCA,

a common groundwater pollutant on Long Island. Since 1990, BNL has reduced generation of TCA by 99% (Figure 3-2).

- **Low Level Radioactive Waste:** Figure 3-3 shows the generation of low-level radioactive waste (LLW) (in cubic feet) for CY 1993 through 1997. LLW is tracked as four waste streams; routine liquid and solid, and non-routine liquid and solid. The routine waste is from ongoing operations, while the non-routine waste is as defined above. Routine generation of LLW fluctuates considerably. The variability can often be traced to specific research activities or projects. The generation of non-routine LLW rose sharply in 1996 and the increase is expected to continue as the environmental restoration of BNL proceeds from the investigation phase to the cleanup phase. The routine LLW stream (both liquid and solid) has been targeted for reduction by the BNL Pollution Prevention program since 1995. Major investments were made in 1997 that should help BNL reduce the volume of routine LLW requiring disposal. These include the use of disposable resins and procurement of a metal waste compactor. It is anticipated that this waste stream will continue to rank high for future pollution prevention funding.
- **Mixed Waste:** Figure 3-4 shows the production of mixed waste (hazardous waste mixed with low-level radioactive waste), in cubic feet, for calendar year 1993 through 1997. Mixed waste is tracked as routine and non-routine waste. BNL reduced generation of routine mixed waste by approximately 67% from 1993 through 1997. The BNL Pollution Prevention program continues to target mixed waste for opportunities due to the difficulty and cost of its disposal. The rates of non-routine generation are related to environmental restoration projects, specifically, the removal of storage tanks and disposal of mixed-waste sludge held therein.
- **Industrial Waste:** Figure 3-5 shows the metric tons of industrial waste (principally photographic wastes) generation (measured in pounds) for calendar year 1993 through 1997; it represents over 60% in reduction of photographic wastes.

3.9.2 SPDES Compliance

Another Performance Measure initially established in 1996 was compliance with SPDES parameters as an indicator of satisfactory performance. A ranking scheme was developed associating a numerical score with a SPDES permit excursion; the sum of individual scores for the year is used to determine overall performance. For example, the score for a specific SPDES excursion is determined as follows: 1) the specific inorganic or volatile organic pollutant is first evaluated for toxicity, with toxic elements being assigned a higher score than nontoxic elements; 2) the ratio of the concentration relative to the SPDES limit is evaluated, with discharges of high concentration being assigned a higher score; and 3) repeat offenses are penalized heavier (i.e., given more points). Considering the permit excursions detailed in Chapter 2, the total score for 1997 was 65, which placed the SPDES performance measure in the “Marginal” category. However, the 1997 performance is biased low due to persistent iron exceedances that occurred during the summer. As described in Chapter 2, the iron excursions were attributed to construction activities. Excluding these iron excursions, the score for 1997 could be recalculated to be 19, which would categorize this performance indicator as “Excellent”.

3.9.3 Solid Waste Sent to Landfill

The amount of solid waste sent to the off-site landfill is a general indicator of the effectiveness of waste-minimization and material-recycling efforts. For 1997, BNL sent 866 tons of solid waste to the landfill which is considered a “Marginal” level of performance. This measure is flawed because it does not take into account the amount of programmatic or operational activity that occurs on-site. That is, the measure is not adjusted if on-site activity is higher or lower. Additional programs, such as a new mixed-paper recycling program and reminders to employees to recycle, have improved BNL’s recycling program. BNL will continue its recycling efforts, as well as look for additional opportunities to reduce solid waste.

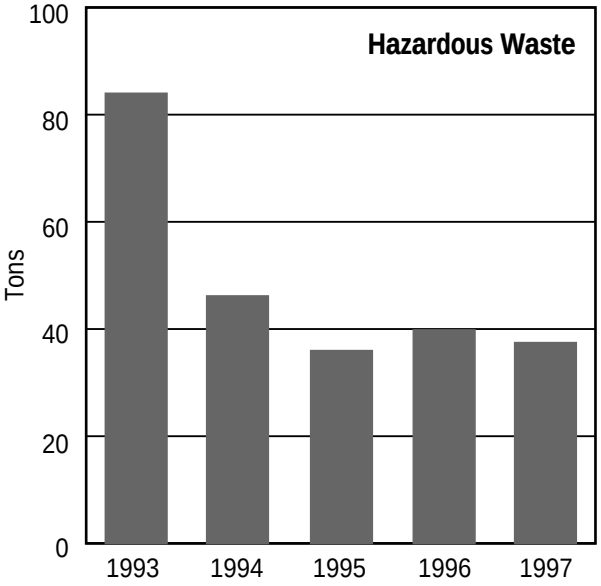

Figure 3-1.
Annual Hazardous Waste Generation

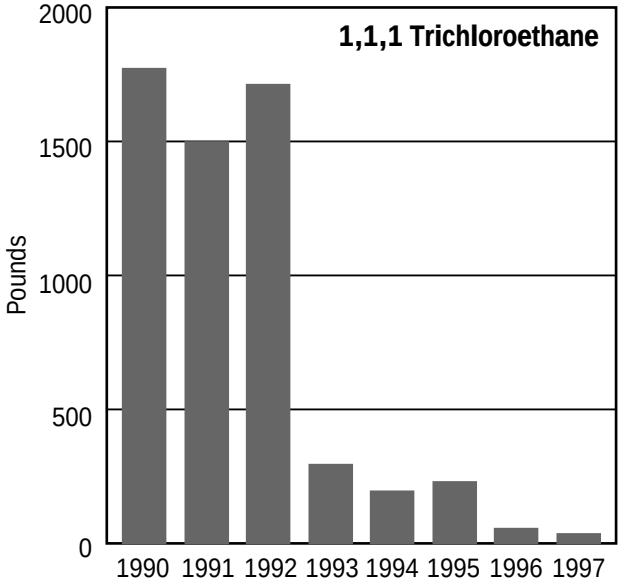

Figure 3-2.
Annual TCA Use

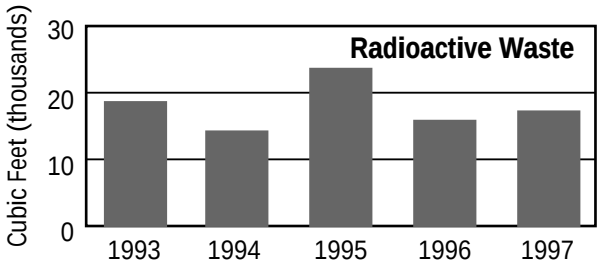

Figure 3-3.
Annual Radioactive Waste Generation

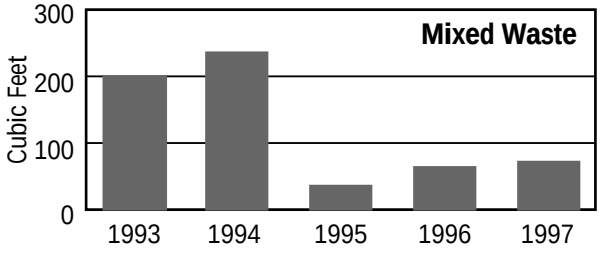

Figure 3-4.
Annual Mixed Waste Generation

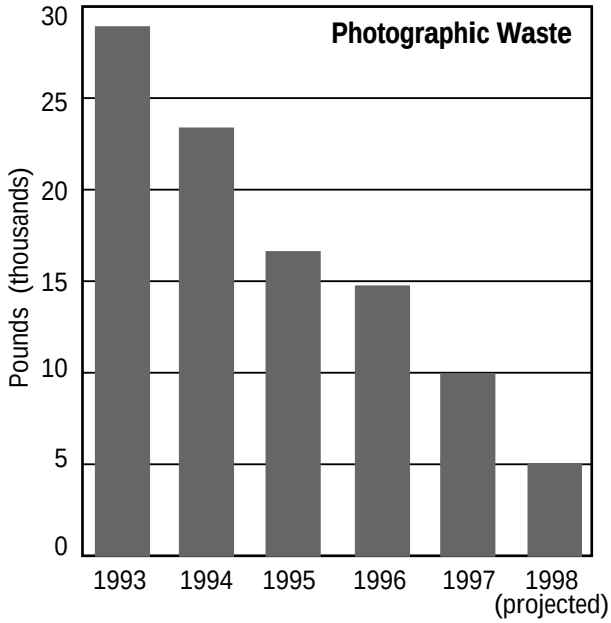

Figure 3-5.
Annual Photographic Waste Generation