

Office of Independent Oversight and Performance Assurance  
Office of Security and Safety Performance Assurance  
U.S. Department of Energy

Inspection of  
Emergency Management  
at the

# Brookhaven National Laboratory

April 2004



## Table of Contents

1.0 INTRODUCTION .....	1
2.0 RESULTS .....	2
3.0 CONCLUSIONS .....	4
4.0 RATINGS .....	5
APPENDIX A – SUPPLEMENTAL INFORMATION .....	7
APPENDIX B – SITE-SPECIFIC FINDINGS .....	9
APPENDIX C – EMERGENCY PLANNING .....	11
APPENDIX D – EMERGENCY RESPONSE .....	15
APPENDIX E – DOE LINE PROGRAM MANAGEMENT .....	20

## Abbreviations Used in This Report

BAO	Brookhaven Area Office
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
CFR	Code of Federal Regulations
CH	Chicago Operations Office
DOE	U.S. Department of Energy
EAL	Emergency Action Level
EOC	Emergency Operations Center
EPPS	Emergency Preparedness Program Specialist
ERAP	Emergency Readiness Assurance Plan
ERO	Emergency Response Organization
FY	Fiscal Year
IC	Incident Commander
NARAC	National Atmospheric Release Advisory Capability
NNSA	National Nuclear Security Administration
OA	Office of Independent Oversight and Performance Assurance
PAC	Protective Action Criteria
ppm	Parts Per Million
SC	DOE Office of Science
TPQ	Threshold Planning Quantity

# OVERSIGHT

## 1.0 Introduction

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA), within the newly created Office of Security and Safety Performance Assurance, conducted an inspection of the emergency management program at the U.S. Department of Energy (DOE) Brookhaven National Laboratory (BNL) in March 2004. The inspection was performed by the OA Office of Emergency Management Oversight.

The DOE Office of Science (SC) is the lead program secretarial office for BNL. As such, it has overall Headquarters responsibility for programmatic direction and funding of most activities, as well as emergency management at the site. Until the realignment of SC authorities, announced in March 2004, line management responsibility for most BNL operations and safety fell under the Chicago Operations Office (CH) through the Manager of the Brookhaven Area Office (BAO). In the future, BAO will report directly to SC. BNL is managed and operated by Brookhaven Science Associates (BSA), under contract to DOE.

BNL has mission responsibilities in the areas of basic and applied research. Major programs include nuclear and high-energy physics, physics and chemistry of materials, environmental and energy research, nonproliferation, neurosciences and medical imaging, and structural biology. BNL activities include operation of advanced high-energy and nuclear physics research facilities, waste management, and environmental restoration. These activities involve various forms of radiological, chemical, and biological hazardous materials that need to be effectively controlled.

Throughout the evaluation of emergency management programs, OA reviews the role of DOE organizations in providing direction to contractors and conducting line management oversight of the contractor activities. OA is placing more emphasis on DOE line management oversight in ensuring effective emergency management programs. In reviewing DOE line management oversight, OA focused on the effectiveness of

BAO in managing the BNL contractor, including such management functions as setting expectations, providing implementation guidance, allocating resources, monitoring and assessing contractor performance, and monitoring/evaluating contractor self-assessments.

This inspection focused on emergency response organization performance and DOE responsibilities, but also provided insights into the effectiveness of several key program elements, such as plans and procedures, training, and drills. The inspection at BNL did not include a detailed evaluation of all required program elements delineated in DOE Order 151.1B, *Comprehensive Emergency Management System*. DOE line management, in developing root causes and corrective actions, can further evaluate the insights identified, as warranted.

In addition to the OA review of BAO emergency management oversight and operational awareness activities, this inspection evaluated the hazards survey and hazardous material screening processes used by BSA to establish emergency management program requirements. The inspection team also conducted tabletop performance tests with a sample of the site's key decision-makers to evaluate their ability to employ available procedures, data sets, equipment, and skills when responding to postulated emergency conditions.

Section 2 of this report provides an overall discussion of the results of the review of the BNL emergency management program elements that were evaluated. Section 3 provides OA's conclusions regarding the overall effectiveness of BAO and contractor management of the emergency management program. Section 4 presents the ratings assigned as a result of this review. Appendix A provides supplemental information, including team composition. Appendix B identifies the findings that require corrective action and follow-up. Appendices C through E detail the results of the reviews of individual emergency management program elements.

## 2.0 Results

### 2.1 Positive Program Attributes

BSA is working to reduce risks and to establish the technical basis for emergency management program requirements. Positive attributes of the emergency management program are discussed below.

**BSA has reduced the risks to workers and the public through a concerted effort to minimize hazardous materials used and stored on the site.** BSA has shipped the fuel from the now shutdown reactors from the site. They also have reduced and/or eliminated chemical inventories that exceeded Code of Federal Regulations (CFR)-published threshold planning quantities (TPQs). Engineered and administrative controls are implemented to minimize the potential for release of radiological hazardous materials. Biological hazards are similarly well controlled. BSA has implemented an active pollution prevention program, which has resulted in reductions in waste stream quantities and actively minimizes the presence of hazardous waste by shipping materials as soon as there is enough for a full shipment.

**Key emergency response personnel at both the incident scene and emergency operations center (EOC) understood most of their roles and responsibilities and placed appropriate emphasis on the priority actions of protective actions, event categorization/classification, and notifications.** The roles under unified command are well understood between the BSA fire department and police incident commanders (ICs). ICs are clearly aware of their responsibilities in keeping workers and responders safe, categorizing and classifying events, making notifications, and protecting the environment. Safe approach paths for mutual aid and onsite responders were appropriately considered. Although the ICs did not always have a technical basis for the size of the isolation zones and other protective actions, they erred conservatively. The EOC teams were similarly aware of their responsibilities, such as

categorization, classification, notifications, press release reviews, verification of protective actions made by the IC, and formulation of any new protective actions required by event conditions.

**The BAO Emergency Preparedness Program Specialist (EPPS) is maintaining operational awareness of the BNL emergency management program through frequent, documented interactions and document reviews.** The EPPS and BSA emergency management staff hold biweekly meetings to discuss issues and planning activities. A fiscal year (FY) 2003 BAO assessment of the BSA training and drill program, conducted by the EPPS, was thorough and well documented. The BAO review and subsequent rejection of the annual hazards assessment revision in May 2003 was the impetus for the hazards analysis now being conducted by BSA, although progress to date in completing this key task has been limited.

### 2.2 Program Weaknesses and Items Requiring Attention

The emergency planning hazards survey and hazards assessment, which serve as the technical basis for event classification and protective action formulation, have not been completed. This weakness impacts the accuracy and usability of plans and procedures employed by key emergency response organization (ERO) initial decision-makers. Concerns in the rigor of DOE line management oversight were noted as well. Specific weaknesses are discussed below.

**The BNL emergency management program is not supported by complete analyses, and program documents are not consistent with the concepts of emergency operations that are employed.** A hazards survey has never been performed, and the site hazards assessment was abandoned in May 2003 because it was deemed inadequate and not reflective of current site hazards. Preliminary facility surveys performed since May 2003 assess the relative

facility risk and establish the priority for hazards surveys and hazards assessments, but do not yet capture all the information required in a survey. Onsite transportation activities were not considered in the preliminary hazards survey. Additionally, the only chemical hazards considered by BSA were those with a CFR TPQ or where polychlorinated biphenyls were present. Preliminary dispersion modeling performed by OA for postulated releases of various chemicals on site without published TPQ values resulted in consequences exceeding protective action criteria at significant distances from the release points, and would result in classifiable emergencies if the postulated releases were a real event.

**Initial emergency decision-makers are not adequately prepared and equipped with the tools necessary to ensure that all emergency response functions are adequately performed.** Although roles and responsibilities are understood, some concepts for implementing those responsibilities are not well defined or understood. Tabletop performance tests demonstrated that the frequency and scope of training, drills, and exercises have not been effective at establishing and maintaining the proficiency of responders in some key functions, such as shelter-in-place, categorization, classification, offsite notification, and consequence assessment. Decision-makers inconsistently applied emergency action levels, which are ambiguous and subject to broad interpretation. Additionally, the notification process does not ensure that offsite authorities are notified and updated in a timely manner.

**BAO, CH, and SC line management have not ensured that the BNL emergency management**

**program satisfies DOE policy and requirements.**

Although the FY 2003 assessment of the emergency management training and drill program was thorough, the scope and frequency of assessments are not sufficient to ensure that the BNL emergency management program is consistent with DOE requirements. DOE requirements for hazards surveys have been in place since 1995. BSA has been working to develop a hazards survey since May 2003. The survey has still not been completed, and BAO has not clearly conveyed expectations regarding a required completion date. There is no evidence that BAO has reviewed submittals of or has ever formally approved the BNL emergency plan. Although CH and SC receive quarterly metrics data and the annual emergency readiness assurance plan, the data and plan have not been reviewed in sufficient detail to identify problem areas and adverse trends.

**BAO has not established programs for ensuring that BAO personnel who are part of the ERO are knowledgeable of the program and their responsibilities.** There are no training, qualification, or proficiency requirements for the four primary EOC positions that are staffed by BAO. BAO does not formally track ERO member participation in drills, exercises, or actual events. Performance by the BAO Area Manager designees in tabletop performance tests paralleled that of the BSA crisis managers, in that they did not detect classification errors and did not ensure that all required notifications were made. Additionally, the primary method to recall ERO members to the EOC is by pager, but not all BAO responders have been issued a pager.

## 3.0 Conclusions

A number of positive attributes were identified during this review. Most significant is the aggressive program for reducing hazardous material inventories, minimizing hazardous waste, and evaluating chemical use to identify where less hazardous chemicals can be substituted. As a result, there are no chemicals on site that exceed CFR-published TPQs. Additionally, radiological and biological hazardous materials have effective engineered and administrative controls in place to further minimize the potential for release. Other positive attributes include initial decision-makers' awareness of their roles and responsibilities and their emphasis on both the safety of responders and protective actions for site personnel. Additionally, the BAO EPPS is actively monitoring the progress of program improvement initiatives and has targeted assessment activities at elements that are perceived to be weak.

However, the BNL emergency management program has been in transition for about 10 months. Significant program changes were initiated primarily because the annual hazards assessment update was evaluated and rejected by BAO. A hazards survey was planned to determine whether hazardous material inventories had been reduced to the point where only an Operational Emergency base program was required, or alternately to identify those facilities requiring a hazards assessment. Since a hazards survey was not previously performed, BSA implemented a preliminary hazards survey process in order to prioritize the assessment activities for the 370 facilities on site. A self-assessment performed by subject matter experts in February 2004 concluded that the BNL emergency management program is not supported by current or adequate analysis and that the program elements and documentation are not consistent with Laboratory operations. This OA evaluation confirmed those conclusions in that the hazards survey is not complete and the hazards assessment has been abandoned. Consequently, key analyses that are required for a technically sound basis upon which to construct the emergency management program, including planning documents, procedures, training, and drills,

are inadequate or unavailable. Furthermore, preliminary hazards analyses conducted by OA indicate that postulated releases of some chemicals could exceed protective action criteria at significant distances, indicating that some postulated events would result in classifiable emergencies and therefore require hazards assessments.

Additionally, some key concepts of emergency operations are not clearly understood. Tabletop performance tests found weaknesses in implementing shelter-in-place protective actions, determining event classification, notifying offsite authorities, and providing and using consequence assessment data. It was evident that BSA and BAO performance weaknesses were for the most part attributable to inadequate procedures, training, and drills. Although BAO has been actively engaged in monitoring the progress of program improvements and providing direction and feedback, they have not aggressively pursued the timely completion of the hazards survey. Furthermore, the line management oversight by BAO, CH, and SC has not ensured that DOE requirements for a comprehensive emergency management program were met for BNL.

Overall, BSA has significantly reduced the risks to site workers and the public by minimizing hazardous material inventories. Initial decision-makers are aware of their emergency response roles and responsibilities and appropriately prioritize emergency response tasks, but in some instances were not adequately prepared or equipped with the tools to perform those tasks. A hazards survey and hazards assessments, which must be completed as a prerequisite for identifying and implementing most emergency management program requirements, including emergency action levels, protective actions, procedures, and training, have not been completed by BSA. Sustained line management attention is warranted to ensure that adequate multidisciplinary resources are assigned for the timely completion of the hazards survey and hazards assessment and that once completed, those documents are used as the bases for developing or improving other program elements.

## 4.0 Ratings

This inspection focused on a detailed assessment of three key emergency management programmatic elements. No overall program rating has been assigned. The individual element ratings reflect the status of each BNL emergency management program element at the time of the inspection. The ratings for the individual program elements evaluated during this inspection are:

### **Emergency Planning**

Hazards Survey and Hazards Assessments ..... SIGNIFICANT WEAKNESS

### **Emergency Response**

BNL Emergency Response Decision-Making ..... NEEDS IMPROVEMENT

### **DOE Line Program Management**

DOE Line Program Management ..... NEEDS IMPROVEMENT

This page intentionally left blank.

# APPENDIX A

---

## SUPPLEMENTAL INFORMATION

### A.1 Dates of Review

Scoping Visit	March 2 - 4, 2004
Onsite Inspection Visit	March 15 - 22, 2004
Report Validation and Closeout	March 31 - April 2, 2004

### A.2 Review Team Composition

#### A.2.1 Management

Glenn S. Podonsky, Director, Office of Security and Safety Performance Assurance  
Michael A. Kilpatrick, Director, Office of Independent Oversight and Performance Assurance  
Charles B. Lewis, Director, Office of Emergency Management Oversight

#### A.2.2 Quality Review Board

Michael A. Kilpatrick	Dean C. Hickman
Charles B. Lewis	Robert M. Nelson

#### A.2.3 Review Team

Jeffrey Robertson (Team Leader)  
Steven Simonson  
Thomas Rogers  
David Schultz

#### A.2.4 Administrative Support

Kim Zollinger

This page intentionally left blank.

## APPENDIX B

---

### SITE-SPECIFIC FINDINGS

FINDING STATEMENTS	REFER TO PAGES:
1. BSA has not performed a site hazards survey or facility hazards assessments, as required by DOE Order 151.1B, <i>Comprehensive Emergency Management System</i> .	13
2. During tabletop performance tests, BNL decision-makers did not always accurately classify events or provide timely notifications to authorities, as required by DOE Order 151.1B.	16
3. BSA has not developed a mechanism to ensure that the protective action of shelter-in-place is effective, as required by DOE Order 151.1B.	17
4. During tabletop performance tests, the consequence assessment plume modeler did not always develop accurate plume dispersion plots to support emergency response decision-making, as required by DOE Order 151.1B.	18
5. SC, CH, and BAO have not ensured that the BNL emergency management program has been implemented consistent with DOE policy and requirements, as required by DOE Order 151.1B.	22
6. BAO has not developed an ERO training program that ensures that BAO emergency responders are prepared to respond effectively to BNL emergencies, as required by the BAO emergency plan and DOE Order 151.1B.	23

This page intentionally left blank.

# APPENDIX C

---

## EMERGENCY PLANNING

### C.1 Introduction

Emergency planning consists of identifying hazards, threats, and hazard mitigation mechanisms; developing and preparing emergency plans and procedures; and identifying personnel and resources needed to assure an effective emergency response. Key elements of emergency planning include developing a hazards survey as part of the qualitative portion of the hazards identification process. For significant hazardous materials identified, a preliminary screening is performed to determine the need for a quantitative emergency planning hazards assessment. The hazards assessment, when required, identifies and assesses the impact of site- and facility-specific hazards and threats, and establishes an emergency planning zone. Based upon the results of these assessments, U.S. Department of Energy (DOE) and National Nuclear Security Administration (NNSA) sites and facilities must establish an emergency management program that is commensurate with the identified hazards. The emergency management plan defines and conveys the management philosophy, organizational structure, administrative controls, decision-making authorities, and resources necessary to maintain the site's comprehensive emergency management program. Specific implementing procedures are then developed that conform to the plan and provide the necessary detail, including decision-making thresholds, for effectively executing the response to an emergency, regardless of its magnitude. These plans and procedures must be closely coordinated and integrated with offsite authorities that support the response effort and receive DOE emergency response recommendations.

This evaluation included a review of the Brookhaven Science Associates (BSA) hazards survey and hazardous material screening processes used to determine the need for hazards assessment documents.

### C.2 Status and Results

#### C.2.1 Hazards Survey and Hazards Assessments

BSA has significantly reduced hazards of operations in several areas, such as reduction of hazardous material inventories in facilities, elimination of many process hazardous materials or substitution with less hazardous substances, minimization of waste streams through process modifications, and shutdown of reactors and removal of reactor fuel from the site. However, the hazards assessment document was not kept up to date with the reduction in hazards and changes to Brookhaven National Laboratory (BNL) operations. As a result, the hazards assessment was abandoned since it was deemed unusable as an emergency planning basis document. Furthermore, a site hazards survey was not performed for BNL facilities and activities, although some survey attributes were included in the hazards assessment, such as hazardous materials located in the facility.

BSA has implemented several processes and mechanisms that effectively reduce the presence of and manage hazardous materials in facilities. For example, experiment review committees in the chemistry department insist on alternatives to very hazardous chemicals where possible. BSA has implemented an active pollution prevention program that is stimulated by cash awards, which has resulted in reductions in waste stream quantities in numerous areas. For example, biology experiments utilize digital imaging, luminescent systems instead of photographic processing chemicals. Hazard controls, such as facility use agreements, identify and control the scope of activities and define organizational roles and responsibilities for safe operation. Further, emergency planning and response actions are enhanced by documents, such as facility use agreements and fire

department response cards, containing extensive computer-based links to hazardous material inventories for each facility. However, inventory inaccuracies in the site chemical management system may cause planning errors (actual inventory less than reflected in database).

In May 2003, based on Brookhaven Area Office (BAO) feedback, BSA recognized that revision of the outdated hazards assessment was not practical. Instead, a hazards survey was planned to determine whether hazardous material inventories had been reduced to the point where only an Operational Emergency base program was required, or alternately to identify those facilities requiring a hazards assessment. Consequently a preliminary hazard/vulnerability survey process, currently in progress, was developed to establish priorities for further facility evaluation based on a risk-ranking of facility attributes. Attributes considered included hazardous materials form and containment, security measures available at the facility, occupancy, and significance of the facility to the Laboratory missions. The presence of polychlorinated biphenyls, radiological materials, biological hazardous material, and chemicals listed in the Code of Federal Regulations (CFR) as threshold planning quantities (TPQs) were noted in the preliminary hazards survey.

Results of the preliminary survey indicate that hazardous material inventories are relatively low at BNL. Hazardous chemicals are less than TPQ values, and radiological hazards were reduced significantly with cessation of nuclear reactor operations and removal of reactor fuel from the site. Although the survey indicates that numerous radiological materials on site exceed the 10 CFR 30.72, Schedule C, planning quantities, many of these materials are sealed sources and are administratively controlled for safe operations. Additionally, large sources are contained in well-engineered enclosures that minimize probability of release. High-hazard toxins and biological specimens, although present, were in small quantities and similarly controlled.

However, concerns were identified with the preliminary survey process. For example, a limited set of generic emergency conditions that could affect the site was considered, but some initiators, such as an aircraft crash, were discounted because they were not considered to be probable. BSA did not document its analysis or assumptions that would justify discounting the event initiators based on event probabilities. Although integration of facility vulnerabilities from a

security perspective was an objective of the preliminary survey, two vulnerability studies did not consider the potential additive effects of malevolency on facility hazards. Facility subject matter experts did not advise the vulnerability study authors that dispersal of hazardous materials located within the facility could constitute an increased hazard outside the facility.

Another concern with the preliminary hazards survey is that it did not include intra-laboratory transportation activities. The Hazardous Material Transfer Manual provides a safety assessment methodology to “ensure containment of materials during on-site transfer.” The safety assessment methodology includes thresholds, such as material classification and hazard levels, to determine packaging requirements and evaluate the transportation system. Non-radioactive material transfers by waste management personnel are exempted from the safety assessment methodology process and rely on procedural control of the material and training of personnel to ensure containment. Emergency planning assessments are not required, even if transfers involve hazardous materials that exceed appropriate planning quantities, as was the case recently for an onsite transfer of a highly toxic biological material.

OA performed walk-downs of several facilities that contain hazardous materials to determine whether significant quantities were present to the extent that if released due to emergency conditions, protective action criteria (PAC) could be exceeded at critical receptors (> 30 meters) from the facility release point. Exceeding a PAC at critical receptors differentiates between base program requirements and the more extensive Operational Emergency Hazardous Material Program requirements. Facility walk-downs included the hazardous waste facilities; biology, medical, isotope research, and chemistry laboratories; warehousing facilities; and the central steam plant. Facilities were generally free of typical industrial hazards, such as unsecured gas cylinders and excessive combustible loading. However, one biology laboratory contained numerous flammable/toxic chemicals sitting on top of a rolling flammable storage cabinet because the materials would not fit inside the cabinet. Corrective action to obtain additional storage was reported to be in progress at the time of the observed condition.

The waste management facility includes three relatively new waste-handling structures. Engineered attributes, such as secure enclosures, fire suppression systems, and effluent monitoring, mitigate potential events, and adherence to procedural requirements minimizes the potential for abnormal events. Although

the facility radiological loading exceeds 10 CFR 30.72, Schedule C, TPQs, the loading is a relatively small percentage of permissible inventories due to aggressive efforts to ship materials to long-term storage facilities as soon as an economical load is accumulated. Radiological materials in the isotope research and medical laboratories were also small percentages of permissible inventories and less than TPQs; chemical inventories were similarly small. Warehouse areas contained minimal amounts of stock supplies of typical acids, bases, and flammable chemicals in appropriate cabinets. No toxic gases were present in the gas cylinder storage area.

In contrast, the other facilities that were evaluated contained significant quantities of hazardous chemicals with high toxicity that under emergency conditions could potentially affect the environs and workers outside the facility. For example, the central steam plant utilized two industrial chemicals in large quantities with relatively high toxicity. Boiler feedwater is treated with a solution containing diethylaminoethanol from a 2000-gallon tank outside the plant. A PAC calculated from information on the material safety data sheet, provided by steam plant personnel, could be as low as 10 parts per million (ppm). Dispersion analysis performed by OA using National Atmospheric Release Advisory Capability (NARAC) determined that PACs were exceeded well beyond 100 meters for worst-case meteorological conditions, the criteria for a Site Area Emergency. As much as 3800 gallons of the material could be present during vendor deliveries to the steam plant. The postulated release of another treatment chemical containing sodium sulfite similarly exceeded PACs well beyond 100 meters. In addition, the biology and chemistry buildings contain very large numbers of different chemicals. Many chemicals have significant toxicity, including ammonium persulfate, for example, with a PAC of 1 ppm. NARAC dispersion analysis for the material located in one area calculated that PACs were exceeded for the material well beyond 100 meters from the biology building. Dispersion analysis of several chemistry building materials listed in the chemical management system with similar or higher toxicity produced similar results.

The above dispersion analyses were performed for only a small sample of chemicals for selected buildings. However, the results indicate PACs will be exceeded beyond 30 meters from the release point, the definition of an Operational Emergency requiring further classification. As a result, an Operational Emergency Hazardous Material Program based on a hazards

survey and hazards assessment is required. Until event consequences are computed, an emergency planning zone for BNL cannot be determined.

Consistent with the results of this OA evaluation, a self-assessment conducted in February 2004 by subject matter experts concluded that the BNL emergency management program is not supported by current or adequate analysis and that the program elements and documentation are not consistent with Laboratory operations. The self-assessment also identified weaknesses in the preliminary hazards survey process, such as not considering transportation activities. Although these weaknesses were self-identified, detailed corrective actions have not been developed and progressed to a point that allows an evaluation of their effectiveness.

**Finding #1: BSA has not performed a site hazards survey or facility hazards assessments, as required by DOE Order 151.1B, *Comprehensive Emergency Management System*.**

### C.3 Conclusions

BSA has implemented an aggressive program to reduce hazards. Inventories of hazardous materials are at minimums for continued operations; process modifications are readily made to utilize less hazardous materials; and hazardous waste presence is minimized with an active shipping campaign. Engineered and administrative controls effectively minimize the hazards with appropriate material confinement and limitations on the scope of activities, and institutional mechanisms track and maintain hazardous material inventories. However, the site has not completed a hazards survey to identify all hazardous materials that exceed planning quantities in facilities and transportation activities and that, if released under emergency conditions, could result in time-urgent response requirements to protect workers, the public, and the environment. Consequently, several key elements that are required for a technically sound basis upon which to construct the emergency management program are inadequate or unavailable. Furthermore, the full spectrum of emergency events has not been identified and assessed, and assessment conclusions are not available for use in other elements of the emergency management system. While plans, procedures, training, and drills were not subject to a comprehensive review, the tabletop performance tests (discussed in Appendix D) indicated that these key

elements were negatively impacted by incomplete analysis. As a result, the accuracy and usability of predetermined protective actions and event classification tools, and the determination of an emergency planning zone, were also negatively impacted.

## C.4 Rating

A rating of SIGNIFICANT WEAKNESS is assigned to the area of hazards survey and hazards assessments.

## C.5 Opportunities for Improvement

This Independent Oversight inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible DOE and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic emergency management objectives.

### Brookhaven Science Associates

- Strengthen the processes that support development of the hazards survey and hazards assessment. Specific actions to consider include:
  - Ensure multidisciplinary membership on the hazards survey/hazards assessment development team, and ensure facility manager approval and involvement in the document development process.
  - Include references to hazardous material database inventories in the hazards survey.
  - Develop a site-specific procedure, based on DOE Guide 151.1-1, *Emergency Management Guide*, to specify the process for developing the hazards assessment document. Ensure that

additive and synergistic effects of laboratory amounts of hazardous chemicals are assessed.

- In coordination with BAO, develop a protocol for reviewing the hazards assessment to ensure that BSA facility managers, BAO Facility Representatives, and the appropriate technical disciplines, such as safety and security analysis experts, support the review.
  - Enhance the site vulnerability documents by including the effects of malevolent acts that involve hazardous materials that are contained in facilities or transported on site.
  - Develop and include administrative limits on hazardous material inventories in facility use agreements to ensure that bounding inventories analyzed in the hazards assessment are not exceeded.
- Improve the utility of the site chemical management system in emergency planning and response activities. Specific actions to consider include:
    - Increase the accuracy of the chemical inventory database through increased verification activities.
    - Develop a list of specific chemicals and associated BNL-specific screening quantities, and implement a mechanism for notifying the emergency management program manager when these chemicals are ordered in quantities that exceed these predetermined thresholds.
  - Strengthen facility safety inspections to ensure that emergency event initiators are minimized. Implement, and develop where appropriate, inspection checklists that specifically verify the adequacy of facility conditions involving combustible loading; gas bottle storage; toxic chemical storage; and flammable storage cabinet locations and conditions of usage.

# APPENDIX D

---

## EMERGENCY RESPONSE

### D.1 Introduction

The ultimate objective of emergency planning and preparedness is to prepare emergency responders so that they can apply their skills, procedures, and training to make appropriate decisions and to properly execute actions to protect emergency responders, workers, and the public. Critical elements of the initial response include the categorization and classification of the emergency, formulation of protective actions, and notifications to onsite personnel and offsite authorities. Concurrent response actions include reentry and rescue, provision of medical care, and ongoing assessment of event consequences using additional data and/or field monitoring results.

Most of the information provided in this section is based on observations from tabletop performance tests conducted by the Office of Independent Oversight and Performance Assurance (OA) with two Brookhaven Science Associates (BSA) incident commander (IC) teams operating under unified command conditions (BSA fire department and BSA police), and two emergency operations center (EOC) teams consisting of two BSA crisis managers (which is standard EOC staffing for BSA) and a U.S. Department of Energy (DOE) Brookhaven Area Office (BAO) Area Manager designee. In addition, interviews and BSA demonstrations of dispersion modeling capabilities were conducted with two individuals with consequence assessment responsibilities.

Collectively, three Operational Emergency scenarios were presented to the participants: a propane delivery vehicle fire involving an injured person and a propane fire that threatens nearby hazardous chemicals; a vehicular accident with an injured person involving a fire that produces a release of radiological materials; and a malevolent act with a potential bomb explosion and potential release of radiological materials. The scenarios, which were developed by OA in conjunction with three BSA trusted agents, were presented to the participants by the BSA trusted agents, who also acted as the balance-of-plant personnel, to ensure scenario validity and delivery of accurate event cues.

### D.2 Status and Results

In the event of an emergency, the IC provides initial direction and control of the Brookhaven National Laboratory (BNL) emergency response organization (ERO) from a field location. The incident command staff, consisting of BSA fire department and police department ICs, has responsibility for emergency categorization/classification decisions using emergency action levels (EALs), formulation of protective actions, and notification of offsite authorities until relieved of these duties by a BSA crisis manager as part of the EOC activation process. Depending on the type of emergency, the appropriate IC (fire or police) leads the on-scene response and directs tactical operations. For security-related events, the BSA police IC consults with the on-scene fire department representative for categorization/classification determinations and formulation of protective action under unified command conditions. The BSA fire and police organizations are relatively small, so site response capabilities are significantly limited but are promptly augmented by offsite fire and police organizations through mutual aid agreements. EOC activation decisions are made based on consultations between the incident command staff and a crisis manager. If the EOC is activated, a crisis manager assumes overall strategic response and may relieve the IC of some duties, including notification, classification, and protective action responsibilities. Normal BNL staffing includes two crisis managers when the EOC is activated. Consequence assessment personnel, located in the EOC, support event response by identifying areas that could be affected by a radiological release and by providing associated recommendations to the EOC command staff.

#### D.2.1 Incident Commanders

The BSA fire and police ICs understood the BNL unified command system, and the duties are assigned to positions held by personnel who have the appropriate experience. While overall tactical operations are led by the appropriate commander based on event type, the fire department IC always has the lead on formulating protective actions, event classification, and

notifications under unified command. The command teams worked well together, and all members were proactive in assuming their roles under varying scenarios.

During tabletop performance tests, BSA fire department ICs demonstrated safe and sound approaches in keeping site workers and responders protected. Appropriate consideration was made for the hazards, meteorological conditions, and protective barriers when protecting or relocating site personnel. These actions were implemented using appropriate references, such as the 2000 Emergency Response Guidebook, the Bureau of Alcohol, Tobacco, Firearms and Explosives-prepared blast zone tables, and to some extent, site maps, checklists and building run cards. Other decisional information was obtained from an industrial hygienist (played by a trusted agent), who was called to the scene. Additionally, the ICs promptly increased tactical capability by requesting offsite aid that is available through mutual aid agreements.

The ICs had some difficulties in using EALs, and were inconsistent in determining event categorization, classification, and protective actions. For example, one IC categorized an event as an Operational Emergency with no further classification, while another IC classified the same event as an Alert. With no hazardous material release the event would properly be categorized as an Operational Emergency, not further classified. If the event classification decision was based on the potential for a hazardous material release (i.e., propane release without fire), then a Site Area Emergency would be the appropriate classification due to the one-mile evacuation zone established by the IC. For another scenario, one IC ordered evacuation of personnel in the affected zone, while the other ordered shelter-in-place. Following the tabletop performance tests, the ICs were asked how they used the EAL criteria to determine that the more severe event classifications were not applicable. Although they were unable to explain using the EAL criteria, they indicated that they had the option to use a more severe classification based on their evaluation of event significance and expertise or as agreed upon through consultation with a crisis manager. Weaknesses in classification are attributable for the most part to EALs that are ambiguous, in that they do not contain specific criteria for classification.

The process used for event notifications creates unnecessary delays. The on-scene command staff is responsible for categorization and classification decisions, completing the notification transmittal forms, and having the forms sent to a facsimile machine by a runner or by reading the information over a cell phone

to the central alarm station operator (to develop and distribute a transcribed notification form). The ICs understood and executed their priorities appropriately by first assessing the event, protecting people and property, and obtaining any mutual aid to support mitigating event consequences before attending to the duties of categorization, classification, and notification. To execute these latter duties, the IC analyzes event conditions against EALs, completes a notification form, and then normally sends it to a designated facsimile machine by runner, to ensure appropriate distribution. The time to complete the notification, once categorized, becomes a function of runner availability and the distance from the incident command post to a facsimile machine. If conditions allow for transmitting the notification form information by cell phone (some security events preclude the use of cell phones and radios), completion of notifications waits until the ICs attention can be drawn from the tactical response. Thus, notifications are unnecessarily delayed because of the staff position assigned to complete the task and the process of execution. Additionally, procedures and training have not emphasized the importance of providing notifications as soon as possible, and the common understanding by BSA staff is that notifications are to be made within two hours of event recognition.

**Finding #2: During tabletop performance tests, BNL decision-makers did not always accurately classify events or provide timely notifications to authorities, as required by DOE Order 151.1B.**

## D.2.2 EOC Teams

EOC teams were familiar with most of their key roles and responsibilities, including classification, notification, protective action verification and formulation, press release approval, and knowledge of available mutual aid assets. Most of these functions were executed through available checklists and procedures. The EOC teams also demonstrated effective methods to investigate event conditions, particularly during the security scenario, in order to formulate strategic management decisions.

Although the EOC teams were knowledgeable of their responsibilities, they encountered difficulties in executing some tasks due to weaknesses in available tools, and some tasks were not effectively implemented because BSA emergency management operational concepts were not fully understood. The following examples illustrate observed performance weaknesses, which are incorporated in Finding #2:

- Similar to the ICs, the EOC team members encountered difficulties in applying the EALs using event conditions in determining event classifications. Weaknesses in the EALs were the primary cause of the difficulties, since they do not contain objective criteria for determining event classification. When difficulties were encountered, the EOC teams did not apply standard generic assessment criteria to determine event severity by considering distances from the event scene in which protective action criteria were met.
- In one case, when consequence assessment data was made available it was not used to reevaluate the event classification or the adequacy of protective actions.
- In one case, a decision was made to make follow-up notifications only to DOE Chicago Operations Office and Headquarters when a change in event conditions was identified. Thus, follow-up notification to other offsite authorities was not provided.

An additional weakness was noted in the implementation of protective actions for site workers. When instructed to shelter-in-place, no instructions were provided to personnel in shelters to close doors and windows and shut down ventilation systems. The EOC teams assumed that local emergency coordinators, who are assigned emergency tasks within their building, ensure that these actions are taken whenever their buildings are used for shelter. Follow-up interviews with five local emergency coordinators determined that they do not close doors and windows and shut down ventilation systems when instructed to shelter-in-place, as assumed by the EOC teams.

**Finding # 3: BSA has not developed a mechanism to ensure that the protective action of shelter-in-place is effective, as required by DOE Order 151.1B.**

Difficulties encountered by the EOC teams can be attributed to weaknesses in the documents used in implementing the BSA program, and to the absence of a formal process to train people on their emergency tasks and to do so at a frequency that maintains a proficient staff. Follow-up discussions to tabletop observations indicated that staff visits to the EOC and the alternate EOC have not been assured or are

infrequent. Additionally, drills are not performed at a frequency that ensures proficiency, or on a rotational basis to allow all ERO members to practice their skills.

### D.2.3 Consequence Assessment

The ability of dispersion modelers to predict consequences from postulated radiological releases varied significantly, as did their understanding of the BSA emergency management operational concepts. One modeler was proficient at using the Hotspot program for dispersion modeling, provided protective action recommendations based on the appropriate criteria, and was knowledgeable of his role in interfacing with other ERO members. A second modeler was not made aware of a software update to the Hotspot program that was installed to support the EOC, and was therefore unable to generate appropriate dispersion models without prompting. When models were generated, recommendations to the EOC were inappropriately based on predicted contamination levels as well as the total effective dose equivalent. Only total effective dose equivalent is an appropriate protective action criterion; contamination level is more of a consideration for recovery actions. Additionally, because changes to the emergency management program had not been communicated, the modeler was not familiar with the EOC staff positions that would interface with the modeler position and did not know the current location of the alternate EOC.

The BSA predictive consequence assessment program is expert-based. Modelers evaluate source term information and select protective action criteria and contamination limits for program input data based on their experience. Likewise, they provide their expert advice to the EOC staff using the Hotspot output data. Modeler recommendations are critical to EOC decision-making because radiological protective action criteria are not incorporated into EALs, and the EOC staffs observed were unfamiliar with Hotspot output data. Therefore, it is important that modelers be familiar with the BSA emergency operational concepts and proficient in using available tools in order to provide technically sound and timely advice for supporting decisions made in the EOC. The current process for doing this, based on discussion with modelers, is a self-study program at the initiative of the individual. It is also noted that it has been two to three years since the modelers participated in a drill or exercise. Although personnel assigned to these positions have relevant expertise, their day-to-day activities do not keep them proficient in all their

emergency management tasks or keep them current with program changes.

**Finding #4: During tabletop performance tests, the consequence assessment plume modeler did not always develop accurate plume dispersion plots to support emergency response decision-making, as required by DOE Order 151.1B.**

### D.3 Conclusions

During the tabletop performance tests, BNL emergency responders serving in key positions demonstrated the ability to formulate protective actions for site workers and responders and implemented event mitigating tactics through the use of site and offsite assets. Sound strategies were ordered for the protection of personnel, property, and the environment. These decisions and the implementing orders were performed using conservatively safe tactics and were appropriately prioritized. However, several key mechanisms are not in place to ensure a consistent and appropriate response. Shelter-in-place protective actions are not effective for protecting personnel from airborne hazardous material releases. The ICs and crisis managers had difficulty in applying the EALs, resulting in inaccurate and inconsistent event classifications using the same information. The BSA implementing process for notifications to offsite authorities does not support the timely completion of this task, and notifications were not always properly completed. Finally, consequence assessment personnel could not consistently develop predictive plume plot information for use by decision-makers. Additional modeler weaknesses were noted in understanding operational concepts used in implementing the BNL emergency program.

### D.4 Rating

A rating of NEEDS IMPROVEMENT is assigned to the area of BNL emergency response decision-making.

### D.5 Opportunities for Improvement

This Independent Oversight review identified the following opportunities for improvement. These potential enhancements are not intended to be

prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible DOE and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic emergency management objectives.

#### Brookhaven Science Associates

- Strengthen the EALs by improving their usability in a high-stress environment, and improve the ability of key emergency response decision-makers to accurately and consistently classify event severity. Specific actions to consider include:
  - Incorporate measurable, objective criteria into the EALs whenever possible.
  - Develop a set of generic EALs that correlates event severity with the predicted or actual distance from the event location in which the protective action criterion is met. These EALs should be used when decision-makers cannot apply any event-specific EALs.
  - Revise EALs to align BNL classifiable emergencies to the definitions used in DOE Order 151.1B and associated guidance documents.
  - Validate EALs through drills and exercises. Revise the EALs whenever users have different interpretations in their application or obtain different results, or when the EALs cannot be used as written.
  - Ensure that emergency response decision-makers have a common understanding of the definition of a hazardous material release and the appropriate event classification when using the EALs. Include in the clarification the concept of protective action criteria and their use.
  - Establish a hierarchy of assessment tools, such as standard blast zone limits, to address cases where allowable references may contain similar but different information.
- Implement program improvements to improve the timeliness of offsite notifications. Specific actions to consider include:

- Revise program documents to emphasize the completion of notifications on an “as soon as possible” basis, and train accordingly.
- Consider reassigning the initial classification and notification responsibilities to a different 24-hour duty person, or equip the on-scene command vehicle with a facsimile machine.
- Strengthen the use of predictive consequence assessment results. Specific actions to consider include:
  - Establish written criteria for selecting protective action criteria used in developing plume plots.
  - Establish written policies governing the use of predictive assessments while awaiting field monitoring data. Include protective action criteria concepts and event classification and offsite notification requirements in the policy/ implementing instructions.
  - Incorporate radiological protective action criteria into EALs.
  - Clarify the meaning of “protective actions” and “protective action recommendations” to ERO members.
  - Using National Atmospheric Release Advisory Capability (NARAC), establish a predictive chemical dispersion modeling capability in close proximity to the EOC.
- Strengthen ERO response. Specific actions to consider include:
  - Establish EOC activation criteria, such as staffing and equipment, and provisions for formally declaring EOC activation.
  - Document and train all ERO members on the emergency management concept of operations. Include functions performed at each venue and emphasize venue interfaces when performing training.
- Delineate in procedures all ERO members’ roles and responsibilities for implementing the emergency management program.
- Establish refresher training mechanisms to ensure that ERO members are trained on significant changes to the emergency management program and their procedures.
- Establish periodic drill requirements and mechanisms to ensure that all ERO members will practice their skills. Provide drill participation opportunities in a team setting whenever possible.
- Manage ERO member participation through a duty roster and/or a training coordinator. Assign only personnel who are current in training and drill participation requirements and are on the roster. Establish mechanisms to identify and notify members of training and proficiency deficiencies.
- Improve the effectiveness of shelter-in-place protective actions. Specific actions to consider include:
  - Direct personnel seeking shelter to close doors and windows and shut down ventilation systems as part of the announcement made from the central alarm station.
  - Positively identify local emergency coordinators and alternates. Do not assign them to multiple buildings in cases where they must break shelter to perform all responsibilities.
  - Clearly establish the local emergency coordinators’ duties through written plans and procedures.
  - If securing of ventilation systems is difficult or undesirable, consider assembling personnel in an area that can be sealed, and stage the necessary equipment needed to isolate the area.

# APPENDIX E

---

## DOE LINE PROGRAM MANAGEMENT

### E.1 Introduction

Emergency management program management includes elements of readiness assurance as well as performance of some planning and response functions. Readiness assurance activities ensure that Brookhaven Area Office (BAO) and Brookhaven National Laboratory (BNL) emergency management program plans, procedures, and resources will facilitate an effective response to an emergency at BNL. Key elements of the readiness assurance program for U.S. Department of Energy (DOE) field elements include active involvement in monitoring program effectiveness for both contractor and DOE responsibilities; timely implementation of corrective actions for identified weaknesses; and the incorporation of lessons learned from training, drills, exercises, or actual events. DOE field elements also have direct responsibility for performing some emergency planning activities, primarily oversight of the Brookhaven Science Associates (BSA) emergency response, and activities related to the release of emergency public information to site workers and the public.

This inspection examined the processes by which the DOE Office of Science (SC), the Chicago Operations Office (CH), and BAO provide guidance and direction to and maintain operational awareness of the BNL emergency management program. Also evaluated were those functions of emergency management planning and response for which BAO is responsible.

### E.2 Status and Results

#### E.2.1 DOE Monitoring of Contractor Performance

DOE Order 151.1B assigns line management oversight as well as various emergency response roles to cognizant DOE field and Headquarters elements. For BNL, until the SC realignment that occurred coincident with this inspection, the Department's emergency management responsibilities were divided among the BNL site contractor, BAO, CH, and SC. Line responsibility for the operation of BNL fell under

BAO, one of five area offices managed and supported by CH. Within CH, the Safeguards and Security Services group, via the CH emergency management program manager, was responsible for providing emergency management guidance and oversight for CH sites. The role of the CH emergency management program manager in the future is not clearly specified in the SC realignment. Authority for managing the BNL emergency management program, including reviewing and approving such key program documents as the BNL emergency plan and the emergency planning zone was delegated from CH to BAO through the CH functions, responsibilities, and authorities manual. Commencing April 1, 2004, BAO reports directly to SC, which is the cognizant secretarial office for BNL. SC's Environment, Safety, and Health Division, through the SC emergency management coordinator, is responsible for monitoring the status of emergency management programs at all SC sites.

The BAO emergency preparedness program specialist (EPPS) is actively engaged in maintaining operational awareness of the BNL emergency management program. The EPPS conducts biweekly meetings with BSA emergency management staff, and documents the discussions in a biweekly report so that the information can be shared with other BAO staff, as necessary. Since being assigned 18 months ago, the EPPS has conducted an assessment of one BNL emergency management program element—the BSA emergency management training and drills program. This assessment was both detailed and thoroughly documented, and the results were promptly communicated to Laboratory line management via formal correspondence from the BAO manager. Additionally, in recognition of potential weaknesses in the site's emergency public information program, as indicated by the out-of-date emergency public information plan, the BAO EPPS has scheduled (for the 3rd quarter of 2004) an assessment of this area. The EPPS has also begun to ensure that BAO expectations are being formally communicated to BSA, as in the case of BAO's response to BSA's request to take credit for the August 2003 blackout as the annual 2003 exercise. This response included specific deadlines for submitting future exercise packages for BAO review. Of particular note is the fact that the

EPPS's thorough and critical review of the BSA hazards assessment submittal resulted in BSA redirecting their attention toward developing an emergency planning hazards survey that would comprehensively identify the site hazards and thereby meet the requirements of DOE Order 151.1B, an activity that had never been undertaken. Finally, the EPPS has begun to use BAO's quarterly feedback reports to communicate emergency management issues and concerns to BSA management.

The Independent Oversight team identified several weaknesses in the program oversight being supplied by BAO. The first is that emergency management assessments are being scheduled at the rate of only one program element annually. BAO has not developed a mechanism to ensure that all applicable elements of the program are being assessed at least every three years, as required by the CH emergency plan and DOE Order 151.1B. The second weakness is that there is no evidence that BAO has reviewed submittals of the BNL emergency plan or has ever formally approved the BNL emergency plan. Additionally, the current BAO emergency plan is outdated. Although it includes information redundant to the CH emergency plan, it lacks details regarding BAO-specific emergency planning and response expectations. Finally, although BSA has been working to develop a hazards survey since May 2003, the hazards survey process is still in its initial stages, and BAO has been slow to formally convey to BSA a clear expectation for a completion date. BAO also has not ensured that CH and SC have a clear understanding of the status of the hazards characterization process at BNL.

These weaknesses exist partly because the individual serving as the BAO EPPS is relatively new in this position, had no significant prior experience in the Department's emergency management system, and has retained four other previously assigned collateral duties. The situation is compounded by weaknesses in the rigor of line management oversight being supplied by CH and SC. The CH emergency plan requires CH to oversee the BNL emergency management program and ensure the preparation and maintenance of plans and procedures necessary for facilities to carry out their responsibilities during an emergency. However, CH has not provided any significant level of emergency management assistance or assessment for the past several years. The CH emergency management program manager primarily interfaces with the BAO EPPS to gather quarterly metrics data and annual emergency readiness assurance plan (ERAP) submittals. CH does not conduct programmatic

assessments or provide insight/guidance unless specifically requested by BAO. This approach relies on the EPPS to understand issues that need to be raised to CH's attention and to recognize when such assistance would be appropriate. Additionally, although DOE Order 151.1B requires Program Secretarial Officers to ensure implementation of DOE emergency management policy and requirements, the SC emergency management coordinator has not visited BNL in several years, and he obtains program status information almost exclusively through quarterly metrics submittals and the CH consolidated ERAP.

Furthermore, in the absence of site assessment activities, neither CH nor SC review the emergency management quarterly metrics information or the annual BNL ERAP submittal to the level of detail required to identify adverse trends or potential issues. For example, the fiscal year 2003 third-quarter emergency management metrics indicated that BSA was having significant difficulty in getting BAO approval for its hazards assessment, as evidenced by a hazards assessment status of "overdue" and "requiring review and completion" for seven consecutive quarters, in combination with the hazards assessment status changing from "incomplete" to "complete," and then back to "incomplete" over three consecutive quarters. Additionally, the BNL ERAP contains statements, such as the following, that should at a minimum have elicited requests by CH and/or SC for additional information:

- "Based upon the assessment, only an Operational Emergency (not otherwise classified) can occur at BNL. The Emergency Action Levels in the site emergency plan include Alerts and Site Area Emergencies, but only for completeness."
- "The BNL Hazards Assessment was rewritten twice in FY03 and remains in draft as of September 30, 2003. The scope of the hazards assessment is changing and this indicates a need for an individualized focus on Hazard Surveys, specifically in the environmental restoration activities."
- "Although all individuals listed on the ERO [emergency response organization] have had some initial training, many have not had any refresher training or drills in up to four years."

The first statement is internally inconsistent because classification emergency action levels are not applicable to an emergency management program that only

requires Operational Emergencies (not further classified). The second statement seems to indicate the presence of significant challenges in producing the hazards assessment. The third statement speaks to a situation that is contrary to DOE Order 151.1B requirements regarding refresher training for ERO personnel.

As a consequence of weaknesses in line management oversight, neither CH nor SC was aware that BNL does not have a completed hazards survey, or that the program exhibits the effects of significantly reduced emphasis by BSA, as indicated by recent reductions in staffing levels and funding. A contributing factor to SC's erroneous impression of the status of the BNL program is that the CH ERAP contains several inaccurate statements that could have misled SC regarding the status of the BNL emergency management program. For example, the CH ERAP states that, "All CH facilities have approved emergency plans in place"; however, the current BNL emergency plan, which was approved by BSA in September 2001, does not reflect the current status of the emergency management program, and based on the expected completion date of the hazards survey, will not be updated until at least December 2004. The CH ERAP also does not accurately convey information taken from the BNL ERAP regarding anticipated projected budget requirements or the availability of an individual to fill the Federal full-time equivalent position. A more thorough review of these submittals may have caused CH and SC to question the status of the hazards survey and hazards assessment, and consequently could have resulted in more progress in completing these key activities as a result of increased line management attention.

**Finding #5: SC, CH, and BAO have not ensured that the BNL emergency management program has been implemented consistent with DOE policy and requirements, as required by DOE Order 151.1B.**

In conclusion, BAO is actively involved in maintaining operational awareness of the BNL emergency management program. The BAO EPPS is in frequent contact with BSA emergency management staff and has provided detailed feedback to BSA on the emergency planning drill and exercise program and the hazards assessment. As a direct result of the EPPS's attention to the hazards assessment, BSA is in the process of developing its first hazards survey

intended to fully meet DOE expectations. The EPPS is also formally conveying BAO expectations to BSA through such mechanisms as quarterly feedback reports. However, several weaknesses characterize BAO oversight, including not conducting programmatic assessments at the required frequency; not ensuring that BSA has been provided with clear expectations regarding completion of the hazards survey; and not ensuring that CH and SC are adequately apprised as to the BNL program status. Furthermore, CH and SC line management oversight has been limited almost exclusively to collecting quarterly metrics data and developing and reviewing the annual CH ERAP, but these documents are not being reviewed in sufficient detail to be able to identify areas of potential programmatic concern. Consequently, CH and SC are not aware of significant weaknesses in the BNL hazards characterization and hazards assessment processes or that the frequency of BAO programmatic assessments does not meet DOE expectations.

## E.2.2 DOE Emergency Response

The BAO concept of emergency operations calls for BAO to provide several key responders to oversee decisions made by BSA emergency response decision-makers and to assist in such response activities as developing, approving, and disseminating emergency press releases. The response actions of the designated Area Manager, who is the senior BAO emergency responder, are addressed by a response procedure that adequately describes the roles and responsibilities of the four primary BAO positions within the BNL emergency operations center (EOC). Another positive aspect of BAO emergency planning efforts is that BAO has provided the designated BAO public information officer with appropriate training that broadly covers public affairs activities in preparation for and following an emergency.

However, BAO does not have an ERO training program that provides training specific to the implementation of the BNL concept of emergency operations and that ensures that key decision-makers and support personnel are adequately trained to effectively fulfill their response roles. BAO has not developed any formal training, qualification, or proficiency requirements for the four primary EOC positions, and BAO does not require (or formally track) any ERO member participation in drills, exercises, or actual events. Additionally, BAO has not verified, through a drill or exercise, that its decision to remove

paggers from selected ERO personnel, such as the public information officer, would not adversely affect the timeliness or effectiveness of their response. During tabletop performance tests, there was a substantially different level of involvement of the individuals serving as the senior BAO emergency responder in their interaction with the BSA crisis managers during protective action decision-making, event classification, and notification. One Area Manager designee was actively involved in the discussions and decisions; the other was focused almost exclusively on the communications-related aspect of the position. In both cases, classification errors by the crisis managers went undetected, primarily as a result of weaknesses in the emergency action levels that are discussed in Appendix D.

**Finding #6: BAO has not developed an ERO training program that ensures that BAO emergency responders are prepared to respond effectively to BNL emergencies, as required by the BAO emergency plan and DOE Order 151.1B.**

To summarize, BAO emergency responder roles and responsibilities are adequately documented in BAO response procedures, and BAO has ensured that the BAO public information officer has been provided with emergency response training generally suited for the public affairs arena. However, BAO has not provided BNL-specific training for any BAO emergency responders, and does not require these individuals to maintain proficiency through participation in drills or exercises.

### E.3 Conclusions

BAO oversight of the BNL emergency management program has been effective in identifying several key program aspects that do not meet DOE expectations as articulated in DOE Order 151.1B and the accompanying emergency management guide, as well as the CH emergency plan. However, BAO has not consistently ensured that these issues have been clearly identified for timely resolution, and has not ensured that CH and SC have been kept aware of program status. As part of the DOE chain of line management responsible for BNL operations, CH and SC have not been proactively involved in ensuring that DOE expectations or delegated authorities have been satisfied. Consequently, fundamental weaknesses in the BSA hazards identification and hazards assessment

processes have not been resolved in a timely manner, and as observed during tabletop performance tests conducted during this inspection, BSA and BAO key emergency response decision-makers do not have all the tools necessary to ensure an effective response to a severe event at BNL.

### E.4 Rating

A rating of NEEDS IMPROVEMENT is assigned to the area of DOE line program management.

### E.5 Opportunities for Improvement

This Independent Oversight review identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible DOE and contractor line management and prioritized and modified as appropriate, in accordance with site-specific programmatic emergency management objectives.

#### DOE Office of Science

- Further clarify the continuing role of CH in supporting BAO's responsibilities for conducting line management oversight of the emergency management program.
- Consider developing an emergency management program oversight policy statement or program management aid that formally conveys SC expectations regarding the approach to be used by both SC and CH in fulfilling line management oversight responsibilities assigned by DOE Order 151.1B.
- Consider developing a systematic, sampling-based process for reviewing site-specific ERAP submittals to verify that consolidated (i.e., rollup) ERAPs accurately present the status of individual site programs.
- In coordination with CH, consider developing a systematic approach and schedule for conducting site visits or teleconferences so that field element emergency management program managers, including the BAO EPPS, can periodically update SC and CH regarding program status.

## Chicago Operations Office

- As appropriate to the continuing role in emergency management, consider the following actions:
  - Revise the CH emergency plan to document and convey CH expectations regarding the type of program information that the CH emergency management program manager requires on an ongoing basis to ensure that CH is kept current on the status of site programs for which it is responsible.
  - Develop and present training for site emergency management coordinators that is designed to ensure that program assessments by DOE field elements are both effective and efficient. This training should discuss use of the elements and evaluation criteria contained in Volume VI (draft) of the emergency management guide (DOE Guide 151.1).

## Brookhaven Area Office

- Proactively engage CH as necessary to provide outside expertise and guidance for the BNL emergency management program.
- Ensure that BAO oversight of the BNL emergency management program, described in the applicable BAO administrative procedure, is effectively implemented by developing a detailed program review implementation plan or program management plan as an aid. Specific actions to consider include:
  - In coordination with CH, develop a formal, structured assessment plan and schedule to ensure that all elements of the BNL emergency management program are reviewed at least every three years. Identify the areas and source of expertise needed to support the assessment plan. Consider using technical support from other national laboratories, CH sites, and such DOE organizations as the Office of Emergency Operations (NA-40).
  - Identify the tasks needed to implement individual requirements, such as developing assessment schedules, assessment plans, evaluation criteria, and reporting mechanisms.

- Identify the resources needed to complete each action, and for activities that may require additional expertise, identify how that expertise will be obtained.
- Coordinate with BSA to establish a schedule and process for conducting a technical review of such program documentation as emergency plans, implementing procedures, and emergency planning hazards assessments.
- In coordination with BSA, devise challenging tabletop scenarios to evaluate BAO emergency responder qualification and proficiency. These activities should emphasize designated Area Manager responsibilities related to oversight of BSA emergency response actions in the areas of conservative decision-making, protective actions, emergency categorization/classification, and notifications.
- Consider developing an assessment protocol document that describes the approach to be used for conducting comprehensive programmatic assessments. Consider developing BAO assessment and self-assessment checklists that use the programmatic and performance criteria from Volume VI (draft) of the emergency management guide, as appropriate.
- Strengthen BAO preparedness and planning by re-evaluating and clarifying planning and response expectations. Specific actions to consider include the following:
  - Compare the CH emergency plan to the BAO emergency plan and delete areas of redundancy from the BAO emergency plan that do not directly contribute to an understanding of the BAO response protocols. Further revise the BAO emergency plan to include details of BAO response.
  - As the BNL emergency plan evolves, re-examine the role of BAO responders. Analyze the jobs and tasks that must be performed by BAO responders, and then design and provide BNL-specific training and proficiency-related activities that address the identified needs so that BAO responders can effectively fulfill designated roles and responsibilities.