

Volume II

Inspection of
Emergency
Management
at the

Argonne National Laboratory - East



May 2002

Office of Independent Oversight and Performance Assurance
Office of the Secretary of Energy

**INDEPENDENT OVERSIGHT
INSPECTION OF
EMERGENCY MANAGEMENT
AT THE
ARGONNE NATIONAL LABORATORY - EAST**

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Acronyms

AAO	Argonne Area Office
AAOM	Argonne Area Office Manager
AES	Area Emergency Supervisor
ANL	Argonne National Laboratory
ANL-E	Argonne National Laboratory – East
CAP	Corrective Action Plan
CEMP	Comprehensive Emergency Management Plan
CFR	Code of Federal Regulations
CH	DOE Chicago Operations Office
DOE	U.S. Department of Energy
EAL	Emergency Action Level
EPZ	Emergency Planning Zone
EQQ	Environmental, Safety & Health/Quality Assurance Division
ERC	Emergency Response Center
ERG	Emergency Response Guide
ERO	Emergency Response Organization
HA	Hazards Assessment
HS	Hazards Survey
IC	Incident Commander
NFPA	National Fire Protection Association
OA	Office of Independent Oversight and Performance Assurance

INDEPENDENT OVERSIGHT INSPECTION OF EMERGENCY MANAGEMENT AT THE ARGONNE NATIONAL LABORATORY - EAST

VOLUME II

1.0 INTRODUCTION

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an inspection of environment, safety, and health and emergency management programs at the Department of Energy's (DOE) Argonne National Laboratory – East (ANL-E) in April and May 2002. The OA Office of Environment, Safety and Health Evaluations and the Office of Emergency Management Oversight performed the inspection as a joint effort. This volume discusses the results of the review of the ANL-E emergency management program. The results of the review of the ANL-E environment, safety, and health programs are discussed in Volume I of this report, and the combined results are discussed in the summary report.

The DOE Office of Science is the lead program secretarial office for ANL-E. As such, it has overall Headquarters responsibility for programmatic direction and funding of activities at the site. Line management responsibility for the operation of ANL-E falls under the Argonne Area Office (AAO), which is a subordinate office of the Chicago Operations Office (CH). ANL-E is managed and operated by the University of Chicago under contract to AAO.

Throughout the evaluation of emergency management programs, OA reviews the role of DOE organizations in providing direction to contractors and monitoring the performance of contractor activities. OA is placing more emphasis on the review of contractor self-assessments and DOE line performance monitoring in ensuring effective emergency management programs. In reviewing DOE line management, OA focused on the effectiveness of CH and AAO in managing the ANL-E contractor, including such management functions as setting expectations, providing implementation guidance, monitoring and assessing contractor performance, and monitoring and evaluating contractor self-assessments. Similarly, OA focuses on the effectiveness of the contractor self-assessment programs, which DOE expects to provide comprehensive reviews of performance in all aspects of emergency management.

OA also evaluated the site-level emergency management program, which is managed and administered by the ANL Environmental, Safety & Health/Quality Assurance Oversight (EQO) Division, and elements of building emergency preparedness programs. As part of this inspection, the OA team conducted tabletop performance tests with a sample of the site's key decision-makers (incident commanders, emergency response center managers, and area office managers) to evaluate their ability to employ available tools and training in responding to postulated emergency conditions.

ANL-E is a multi-program laboratory situated about 22 miles southwest of downtown Chicago, Illinois, and is surrounded by a forest preserve. Within the site are several major facilities used by DOE and other sponsors from industry, academia, and other nations for basic research and science. In addition to work in materials science, physics, chemistry, biology, high-energy physics, mathematics, and computer science, ANL-E also supports DOE's missions in energy resources programs and environmental management. To support these activities, ANL-E operates numerous laboratories and research facilities that contain various forms of radiological and chemical hazardous materials.

In June 2001, CH/AAO conducted an emergency exercise and identified numerous programmatic weaknesses in the emergency management program. ANL-E management recognized that additional resources and management attention were required to improve performance in this program. Self-assessments conducted in January 2002 identified weaknesses in all emergency management elements that were evaluated. In February 2002, the ANL Chief Operations Officer reassigned the responsibility for the emergency management program from the Plant Facilities and Services Division to the EQO Division, a direct report to the Laboratory Director's Office. This organization change provided greater management access and visibility as well as increased resources to support program improvements. Additionally, a new individual was assigned as the Emergency Management Officer with overall responsibility for the program. With these changes came a new focus toward strengthening and integrating the sitewide capabilities for responding to operational emergencies. Until this time the role of the emergency operations center (now the emergency response center) was primarily limited to supporting the on-scene efforts of the incident commander (IC).

This OA evaluation found an emergency management program in a state of transition resulting from the recent organizational, personnel, and programmatic changes. ANL has developed hazards assessments that generally serve as a good foundation for the emergency management program for the events that were analyzed, and in most cases the ICs and the emergency response center (ERC) team appropriately considered protective actions and took actions to mitigate the postulated event. However, the hazards assessment does not always analyze the maximum potential quantities of hazardous materials allowed by authorization basis documents and does not analyze the full spectrum of accidents. Plans and procedures do not provide for consistent and preauthorized actions necessary to protect onsite personnel and to notify DOE and offsite agencies in the event of an operational emergency, such as a hazardous material release. Roles and responsibilities are not clearly established for important, time-urgent functions such as emergency categorization and classification. Additionally, there are no systematic training, drill, or exercise programs to establish and verify the integrated response capabilities of emergency response personnel and organizations. The absence of clear, consistent procedures, combined with training weaknesses, decreases the ability of the emergency response organization (ERO) to mount an effective response to the more severe events analyzed in the hazards assessment. Tabletop performance tests of the ERO demonstrated a lack of proficiency in making some critical decisions, such as event categorization and classification. Although the worst-case event analyzed for ANL-E does not result in hazardous material releases offsite, onsite consequences could involve significant risks to onsite personnel, and the emergency management program needs to be able to respond to these events effectively. Finally, an ongoing self-assessment process has not been established to ensure continuous improvement in the emergency management program. In order for the ANL-E emergency management program to meet DOE requirements, sustained management attention is warranted.

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

2.0 RESULTS

2.1 Positive Program Attributes

The emergency management program at the building level is well conceived and supports effective response to events with localized impact. Specific positive attributes of the ANL-E emergency management program were noted.

ICs demonstrated effective command and control; took appropriate actions to mitigate the event; and with few exceptions took appropriate actions to protect responders and site personnel. The front line for protection of site personnel is the first responders who control the event scene, determine initial protective actions, and obtain resources to mitigate the accident. At ANL-E, the fire department ICs fulfill this duty, and during simulated performance tests they demonstrated very effective performance. In particular, the ICs demonstrated disciplined communications, safe approach to and access control of the event scene, and effective actions to obtain additional response resources (i.e., mutual aid and activation of the ERC). Furthermore the ICs made appropriate shelter-in-place and evacuation decisions for buildings potentially impacted by the postulated events. Weaknesses were identified in event categorization and classification and in notification. Given that ANL-E does not have any analyzed hazardous material events that would require development of prompt offsite protective action recommendations, these weaknesses do not significantly detract from the ICs' effective performance in their highest priority actions to protect site workers, visitors, and emergency responders.

The building emergency plans serve as a useful resource for the IC, the area emergency supervisor, and building occupants. ANL has developed emergency plans for each occupied building. Each building emergency plan provides layouts and maps of the building, construction details, emergency response actions for the building's area emergency supervisor and occupants, and types and locations of hazardous materials.

ANL has provided emergency response personnel with the facilities and equipment needed to effectively implement emergency plans. Several systems are effectively employed and maintained at ANL-E to notify the ERC cadre, employees, and the public of an emergency. These include telephones, radios, pagers, public address systems, and an outdoor warning system. The fire department is fully equipped to respond to fires, medical emergencies, and hazardous material events. The first-response vehicle is equipped with computerized pre-fire plans developed for all buildings. The fire department also maintains a decontamination trailer that is well equipped and maintained, and that is designed for use in freezing weather.

CH and AAO are actively involved in the recent efforts to strengthen the ANL-E emergency management program. Activities have included the conduct and evaluation of an emergency exercise (usually functions performed by the contractor), tabletop performance tests, and program element reviews. These efforts have been effective in identifying performance weaknesses and ensuring that corrective actions are initiated.

2.2 Program Weaknesses and Items Requiring Attention

Although the ANL-E emergency management program provides an effective response capability for localized events, it does not provide an integrated, sitewide response to high consequence operational emergencies, such as those involving significant airborne hazardous material releases. Specific weaknesses include the following.

The ANL-E Comprehensive Emergency Management Plan (CEMP) and current procedures do not clearly establish roles and responsibilities or provide adequate direction for emergency responders and decision-makers to accomplish required actions. Response actions, such as ERC activation, emergency classification, event notification, and dissemination of emergency public information, are not clearly defined by the CEMP, and implementing procedures have yet to be developed. Division of authorities that would support effective coordination between the IC and the ERC manager is not established for such functions as emergency classification, offsite notifications, and onsite protective actions. The processes for emergency response provided in the CEMP are fragmented and, in some cases, contradictory. Additionally, memoranda of understanding referenced in the CEMP are not comprehensive in that they do not form the basis for communicating roles and responsibilities, carrying out emergency operations, or providing for treatment and care of patients. Tabletop performance tests confirmed that procedural weaknesses adversely impact event classification and notification, and coordination of response actions between the IC and ERC manager.

The emergency management training and drill program does not adequately prepare ERO personnel to perform assigned functions. The site's ERO training and drill program is not conducted in accordance with the ANL-E CEMP and the ANL-E Emergency Management Training Plan. ERO training for both ANL and AAO does not include a formally defined and structured program element that familiarizes the trainee with position-specific tasks and equipment in the job setting, and drill/exercise participation is not required for initially establishing or maintaining position qualifications or for maintaining proficiency

ANL has not established an ongoing feedback and improvement program for emergency management that includes annual emergency management assessments. Two comprehensive assessments, conducted this year, were effective in identifying weaknesses and providing ANL a baseline for determining the breadth and scope of required program improvements. Corrective actions have been initiated to address the identified weaknesses; however, the corrective actions do not always provide assurance that all weaknesses will be adequately addressed. Additionally, annual assessments of the emergency management program have not been conducted in the past, and there are no requirements in ANL-E procedures or schedules for ensuring that they will be conducted in the future. In addition to being required by DOE Order 151.1A, *Comprehensive Emergency Management System*, an ongoing evaluation of program effectiveness is essential, considering the number and scope of identified weaknesses and broad program changes that ANL has planned.

3.0 CONCLUSIONS

The emergency management program at ANL-E is transitioning from one that focuses exclusively on mitigation actions at the event scene and protective actions to one that effectively implements and integrates sitewide capabilities in response to operational emergencies, as required by DOE. The need for this expanded focus was identified by an emergency exercise conducted by CH/AAO in June 2001 and two self-assessments conducted by ANL in January 2002. CH/AAO has provided ERO training in the form of tabletop exercises to improve performance and has conducted reviews of program elements to identify additional areas for improvement. Corrective actions to address weaknesses identified during these activities are now in progress. This OA evaluation confirmed the results of the recent CH/AAO evaluations and ANL self-assessments of the emergency management program, and identified additional program elements needing improvement.

Consistent with ANL's previous focus on event scene response actions, this OA evaluation found that, in general, the emergency management program at the building level is well conceived and supports effective but localized response activities. The ANL-E ICs demonstrated the ability to effectively mitigate postulated events and to protect emergency responders and site personnel. The training, tools (e.g., fire department emergency response procedures manual and pre-fire plans), and equipment effectively support a localized response to lower-consequence events.

However, the site's integrated response functions and capabilities to address operational emergencies, such as large airborne releases of hazardous material (i.e., Site Area Emergency or Alert) are not adequately planned and documented in procedures for use by decision-makers. Particularly, duties and responsibilities for each ERO position are not comprehensively or consistently established by the emergency plan or procedures. Emergency plan implementing procedures have not been developed to describe how to accomplish important response tasks, such as timely and accurate emergency categorization, classification, offsite notification of emergency events, field monitoring, and protective actions. Additionally, a comprehensive training and drill program for the ERO has not been implemented to develop and maintain specific response capabilities, and ANL has not established an exercise program to validate the effectiveness of all elements of the emergency management program. Consequently, during tabletop performance tests, the ERO demonstrated a lack of proficiency in making some critical decisions.

In addition to the concerns described above, the hazards assessment and the feedback and improvement program exhibited weaknesses. The hazards assessment does not always analyze the maximum potential quantities of hazardous materials allowed by authorization basis documents and does not analyze the full spectrum of accidents (i.e., onsite transportation, malevolent acts, and aircraft accidents); therefore, ANL may not have the appropriate tools and training for prompt response to the full spectrum of potential events. Finally, an effective feedback and improvement program has not been established that provides for annual emergency management program assessments and an effective process for identifying and validating corrective actions to sustain management attention and continuous improvement beyond the current program transition.

4.0 RATINGS

This review focused on a detailed assessment of seven key emergency management programmatic elements.

The ratings for the individual emergency management program elements are:

Emergency Planning

Hazards Surveys and Hazards Assessments.....NEEDS IMPROVEMENT
Program Plans and Procedures.....SIGNIFICANT WEAKNESS

Emergency Preparedness

Emergency Facilities and EquipmentEFFECTIVE PERFORMANCE
Training, Drills and Exercises.....NEEDS IMPROVEMENT

Emergency ResponseNEEDS IMPROVEMENT

Readiness Assurance

DOE Performance MonitoringEFFECTIVE PERFORMANCE
Contractor Assessments and Issues Management.....NEEDS IMPROVEMENT

APPENDIX A

Supplemental Information

A.1 Dates of Review

	Beginning	Ending
Planning Meeting	April 22, 2002	April 26, 2002
Onsite Review	April 29, 2002	May 10, 2002
Report Writing	May 13, 2002	May 17, 2002
Validation and Outbriefing	May 20, 2001	May 23, 2001

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Director, Office of Independent Oversight and Performance Assurance
Michael A. Kilpatrick, Deputy Director, Office of Independent Oversight and Performance Assurance
Charles B. Lewis, Director, Office of Emergency Management Oversight (Team Leader)
Patricia Worthington, Director, Office of Environment, Safety and Health Evaluations

A.2.2 Quality Review Board

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

A.2.3 Review Team

Charles B. Lewis, Team Leader	Jeffrey Robertson, Topic Lead
Alan Cerrone	J.R. Dillenback
James O'Brien	

A.2.4 Administrative Support

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APPENDIX B

Site-Specific Findings

Table B-1. Site-Specific Findings Requiring Corrective Action Plans

FINDING STATEMENT	REFER TO PAGES:
ANL has not fully analyzed the potential impact of the release of hazardous materials at ANL-E to support development of emergency action levels and preplanned protective actions and to ensure that the ANL-E emergency management program is commensurate with the hazards, as required by DOE Order 151.1A, Chapter IV.	12
The ANL-E emergency plan and implementing procedures do not establish the processes and requirements for emergency response functions as required by DOE Order 151.1A (Chapters I, IV, and VIII and Attachment 1), thus significantly inhibiting the capability for timely decision-making and response in an emergency.	14
AAO and ANL have not ensured that emergency response organization members are capable and proficient in fulfilling their assigned response functions and duties through a systematic training and drill program as required by DOE Order 151.1A, Chapter IV.	22
The ANL exercise program used to evaluate the emergency response program is not adequate to validate all elements of the emergency management program over a multiyear period as required by DOE Order 151.1A, Chapter IV.	23
ANL has not established an effective feedback and continuous improvement program that provides for annual emergency management program assessments and an effective process for identifying and validating corrective actions as required by DOE Order 151.1A, Chapters I and X and Attachment 1.	32

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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 that are needed to assure an effective emergency response. Key elements of emergency planning include developing hazards surveys and hazards assessments to identify and assess the impact of site- and facility-specific hazards and threats, and establishing an emergency planning zone (EPZ). Based upon the results of these hazards assessments, U.S. Department of Energy (DOE) sites and facilities must establish an emergency management program that is commensurate with the hazards identified. The purpose of the emergency management plan is to define and convey 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 must then be 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 (1) a review of the hazards survey and hazards assessment development and maintenance process and a detailed evaluation of hazards assessments for several buildings (Buildings 205, 212, 306, and 331) that were the focus of this evaluation, and (2) a review of the emergency plan and implementing procedures, with a focus on response organization, event classification, and protective action guidance.

C.2 STATUS AND RESULTS

C.2.1 Hazards Surveys and Hazards Assessments

Argonne National Laboratory – East (ANL-E) has a single document that serves as a hazards survey and hazards assessment (HS/HA). Argonne National Laboratory (ANL) has self-identified most of the weaknesses found in this area and has recently taken a number of steps to improve the HS/HA, including developing a draft procedure that guides the development of the HS/HA and involving the building management in the identification of hazardous materials. When implemented, this procedure should result in improvements in the HS/HA.

The HS/HA document includes most of the attributes recommended in DOE Guide 151.1 including the identification of the types and quantities of hazardous materials, qualitative screening to determine those materials warranting further evaluation, and qualitative evaluation of events that may cause the release of the hazardous materials and the potential consequences of the release. In addition, the HS/HA has a number of strengths. For example, the HS/HA includes a concise listing of the sources of information used to determine building inventory quantities, an analysis of accident scenarios based upon information derived from safety analysis reports, and an analysis of additional accident scenarios beyond those evaluated in the safety analysis report. Furthermore, the HS/HA includes a good description of accident scenarios and utilizes conservative assumptions on release fractions and atmospheric dispersal parameters (e.g., ground-level releases, no credit for building wake effects, and conservative morning mixing height).

In general, the HS/HA document serves as a good technical basis for the ANL-E program for the hazardous materials and accidents analyzed. The HS/HA concludes that the potential releases of hazards materials from the ANL-E site could not result in significant offsite consequences, and therefore, detailed planning to support prompt offsite protective action recommendations is not necessary. The analysis of site hazards does indicate that there is a potential for significant onsite consequences, and the ANL-E program has been developed commensurate with the hazards and accidents analyzed. The HS/HA also serves as an appropriate technical basis for a majority of the emergency action levels and provides information on the distance where protective action guidelines are exceeded, which can support event response. The HS/HA also provides the technical basis for the site EPZ. Although no postulated events would cause the release of hazardous materials exceeding protective action guide lines beyond the site boundary, ANL has established an EPZ that includes the Forest Preserve District (an area that extends approximately 1000 meters beyond the site boundary).

Notwithstanding the above positive attributes, the HS/HA document has not fully analyzed all potential hazards and accident scenarios. For example, the HS/HA did not identify, for all buildings, the maximum amount of hazardous materials that may be at risk. For a number of facilities, the hazardous material inventory used in the HS/HA was a snapshot of current hazardous material inventories rather than a physical or administratively controlled maximum consistent with the authorization basis. Compounding this concern is the fact that the inventories used in the HS/HA are out of date. Data on chemical inventories were taken from an annual report to the Environmental Protection Agency developed in February 1999. In addition, the process used to identify chemical hazards does not capture all potential hazards. For example, the chemical management system is relied on to identify hazardous material quantities and locations; however, two hazardous materials in relatively large quantities (e.g., 20 pounds of chlorine gas in Building 205 and about 100 pounds of mercury in Building 212) were found in facilities that had not been identified in the chemical management system. In addition, 150 pounds of chlorine gas located in an unoccupied building (Building 128) is currently identified in the chemical management system as having been on the site since 1999 and was inventoried as recently as December 2001, but has not been evaluated in the HS/HA. Based on a walkdown by ANL personnel during this evaluation, the site believes that the material was not actually in the building; the fact that the chemical had not been addressed in the HS/HA raises concerns about the process used to identify hazardous materials onsite.

Another concern with the HS/HA is that it did not quantitatively evaluate a full spectrum of accidents. Specifically, the HS/HA did not evaluate aircraft crashes (although emergency action levels have been developed for this event), malevolent acts (considered by ANL to be very unlikely based upon security threat analyses), and onsite transportation events. The impact of these low-probability events not being quantitatively evaluated is that ANL is less prepared to quickly evaluate the event and initiate appropriate protective actions.

Finding: ANL has not fully analyzed the potential impact of the release of hazardous materials at ANL-E to support development of emergency action levels and preplanned protective actions and to ensure that the ANL-E emergency management program is commensurate with the hazards, as required by DOE Order 151.1A, Chapter IV.

Finally, ANL has not established a process to ensure that the HA is revised when significant changes in plant operations or quantities of hazardous materials occur. For example, neither the unreviewed safety question process nor the safety analysis report revision process includes provisions for notifying emergency management when significant changes occur. In addition, the chemical management system does not have a mechanism for automatically identifying when chemical inventories exceed appropriate

thresholds, nor is there a provision for notifying emergency management when these thresholds are exceeded.

ANL has recently completed preliminary HSs for all occupied buildings. These preliminary HSs are intended to serve as a starting point for developing a new stand-alone summary HS for the site and revision to the current HA. However, some concerns were identified in the process used to develop the preliminary HSs and the rigor with which they were developed. For example, the process used to develop the preliminary HSs did not identify maximum and typical quantities, and some identified only radioactive source material and not radioactive waste. In addition, although extremely hazardous chemicals listed in 40 CFR 355 were identified, chemicals listed in 40 CFR 302 were not consistently evaluated. As discussed previously, some preliminary HSs did not identify some of the more hazardous chemicals located in Buildings 205 and 212.

In conclusion, ANL has developed an HS/HA document that provides information useful in supporting emergency planning and response for those hazards and accidents analyzed. However, concerns that the hazardous material inventory may not bound the maximum that may be involved in an accident and the incomplete spectrum of accidents analyzed prevent it from being fully effective. In addition, sufficient processes and tools are not in place to ensure that ANL maintains the HS/HA current with significant changes in building operations or quantities of hazardous materials.

C.2.2 Program Plans and Procedures

The Chicago Operations Office (CH) emergency plan and a CH/Argonne Area Office (AAO) standard operating procedure adequately describe the roles and responsibilities of each organization and provide guidance and checklists to ensure their consistent involvement during emergency response activities. In the event of an emergency at ANL-E, CH has overall responsibility for oversight of the emergency response. The AAO oversees the ANL response, provides assistance and guidance to ANL management, and serves as the primary DOE point of contact for ANL during emergencies. Additionally, the AAO reviews and approves news releases, serves as the DOE spokesperson in the emergency press center, and ensures that the Laboratory appropriately responds to events at ANL-E or New Brunswick Laboratory.

The ANL-E emergency management program is described in the ANL-E Comprehensive Emergency Management Plan (CEMP). Supporting the CEMP and providing details for various aspects of the ANL-E emergency response is a set of fire department procedures, building emergency plans, and a public affairs plan. In addition, ANL has established memoranda of understanding for obtaining support from offsite resources and has recently drafted job aids to support the emergency response in the emergency response center (ERC). This set of documents provides some useful information on the emergency response organization and various response activities, but, as described below, the documents have a number of weaknesses, many of which were self-identified, that adversely affect ANL's ability to respond to emergencies.

The CEMP describes ANL-E's overall concept of emergency operations, which is commensurate with the level of hazards identified in the HS/HA. The CEMP addresses many of the requirements set forth in DOE Order 151.1A, as well as the expectations provided in associated DOE guidance. In addition, the CEMP includes a number of operational procedures that provide detail to support emergency response at the ERC. However, the information contained in the CEMP is fragmented, and different sections of the document provide inconsistent direction. For example, site evacuation is described in different sections of the CEMP, and these sections contradict each other in regard to the responsibility for that action. CEMP Section 3.9.4 states that the chief operations officer is responsible for decisions to evacuate the laboratory. Section 3.9.5.2 states that the decision to evacuate the site is made by the incident commander (IC), ERC manager, or chief operations officer. Another example is that two sections provide conflicting

requirements regarding responsibilities for making initial notifications to the area emergency supervisor (AES). Section 1.5 assigns notification of the AES to the Com Center, while Section 3.1.5 and the notification manual state that the Fire Alarm Office makes initial notifications to the first responders, one of whom is the AES. Interviews indicated that the Com Center contacts the AES during normal work hours, and the Fire Alarm Office contacts the AES during off-normal hours. Without clearly established assignment of responsibilities, important actions, such as those required for personnel protection, may be delayed.

Another weakness is that the CEMP does not adequately describe the processes for performing emergency response actions (such as ERC activation, emergency classification, event notification, and dissemination of emergency public information) and does not clearly reflect the division of authorities between the IC and the ERC manager to support effective coordination during an event. In addition, there is no documented methodology for establishing an orderly transfer of command and control; there are no plans or criteria for building reentry; and the only discussion of the emergency public information process is a reference to the emergency public affairs plan. As a result, there is no preplanning for these activities that would aid decision-making by the ERC staff. Finally, there is no protocol for maintaining and approving the CEMP; this may have contributed to the fact that annual CEMP updates have not been approved by AAO (as required by DOE Order 151.1A) since 1993, a weakness also identified by a CH/AAO program review.

The CEMP identifies the offsite agencies that may be called upon to support an emergency response. Memoranda of understanding with those agencies have been established. However, the memoranda of understanding are not comprehensive in that they do not form a basis for communicating roles and responsibilities, carrying out emergency operations, and providing for treatment and care of patients. In addition, ANL and AAO have not established a process designating accountability for the routine review and update of agreements.

A significant element missing in the ANL-E emergency management program is emergency plan implementing procedures. Although the bulk of the information in the CEMP is contained in Chapters entitled *Operational Procedures*, the information typically consists of general descriptions that do not serve the purpose or function of emergency plan implementing procedures. This weakness was identified by two emergency management self-assessments conducted in January 2002. Corrective actions addressing procedural weaknesses include a determination of required emergency plan implementing procedure subjects, and the development of an approval process and review schedule. Currently, 13 subject areas for implementing procedures have been identified; they are scheduled to be developed and approved over the next few months.

Finding: The ANL-E emergency plan and implementing procedures do not establish the processes and requirements for emergency response functions as required by DOE Order 151.1A (Chapters I, IV, and VIII and Attachment 1), thus significantly inhibiting the capability for timely decision-making and response in an emergency.

Fire department emergency response procedures, used by the IC, serve as the primary tool for directing the on-scene emergency response activities. These procedures detail the fire department's actions for initial incident notifications, mutual aid activation, and incident command for a variety of potential emergencies, including chemical and radioactive material releases. However, while the fire department procedures address the IC's response to a variety of events, they do not include all the response actions delineated in the CEMP. For example, the IC procedure (within the fire department's emergency response procedures manual) does not identify the IC's responsibility to classify the emergency, determine and implement protective actions for all site occupants, and direct offsite emergency

notifications during off-hours. In addition, the IC procedure does not include categorization/classification tools, so the IC must rely on the activation of ERC staff. These procedural weaknesses adversely impacted the ICs' ability to classify events and to direct notifications during tabletop performance tests, as discussed in Appendix E.

In addition to the CEMP, ANL has developed additional plans to support the site's emergency management program. Building emergency plans for each occupied building provide layouts and maps of the building, construction details, emergency response actions for the building's AES and occupants, and types and locations of hazardous material. These plans serve as a useful source of information for the building occupants and the IC and are also used in the development of pre-fire plans.

ANL has also developed a comprehensive emergency public affairs plan that contains considerable detail for activating and operating the emergency press center. This plan defines the emergency public information program and the process for providing timely and accurate emergency information. The ANL-E public affairs plan contains useful procedural guidance for activating the onsite emergency press center and a public and media inquiry telephone bank. However, it does not include clear guidance on the approval of news releases or activation of an offsite joint information center.

ANL has recently undertaken a number of initiatives to improve its emergency response program, including the development of ERC job aids for a number of emergency response organization positions and a new notification form. However, these new additions have not significantly improved the tools for emergency responders. The job aids are checklists of response actions for the emergency responder. They do not, however, address all critical emergency response organization positions, do not include all response actions to be taken, are not sufficiently integrated with other responders' procedures, and are not effectively sequenced. For example, there is no job aid checklist for the IC or for the ERC emergency public information representative; notifications and information sharing are not included on all affected checklists; and areas requiring immediate response actions are not always tasked early in the sequence. In addition, these job aids are not approved documents, and responders have not been trained in their content and use or validated their effectiveness. Finally, there are no instructions for completing the notification form, and the form itself contains several problems, including incorrect definitions of emergency classification levels and undefined terms. These weaknesses, as well as weaknesses in the CEMP, adversely impacted ERC performance during tabletop tests.

In summary, the building emergency planning program is well conceived and supports effective localized response activities. Fire Department emergency response procedures, used by the IC, are effective for directing on-scene emergency response activities. However, fundamental weaknesses in the CEMP and operational procedures, particularly in the areas of protective action identification and event categorization/classification, significantly inhibit the capability for timely decision-making and response to an operational emergency. Additionally, the CEMP and operational procedures do not provide adequate direction regarding roles and responsibilities and response functions.

C.3 CONCLUSIONS

The ANL-E HS/HA serves as a good technical basis for the ANL-E emergency management program for those hazardous materials and accidents that were analyzed, and the HS/HA was appropriately used to develop emergency response tools, such as emergency action levels, to support prompt emergency response. However, because not all hazardous materials and accidents were analyzed, the technical basis is not complete. Therefore, ANL may not be prepared to respond promptly to the full spectrum of potential events. ANL has developed a set of plans and procedures that establishes the emergency management program. However, these plans and procedures do not clearly establish roles and

responsibilities or provide adequate direction for emergency responders and decision-makers to accomplish required actions, such as timely and accurate emergency categorization, classification, offsite notification of emergency events, and protective actions. These procedural weaknesses adversely impacted emergency response performance during tabletop performance tests.

C.4 RATING

Not all hazardous materials and accident scenarios have been analyzed, and therefore there is questionable assurance that the ANL-E emergency management program is adequately prepared to respond promptly and efficiently to all potential accidents. A rating of NEEDS IMPROVEMENT is therefore assigned to the area of hazards surveys and hazards assessments.

The ANL-E emergency management program plans and procedures do not adequately support timely and effective initial decision-making, protective action determination, and event categorization and classification. The absence of comprehensive implementing procedures, in support of the plan, seriously degrades the effectiveness of the overall concept of emergency operations. A rating of SIGNIFICANT WEAKNESS is therefore assigned to the area of program plans and procedures.

C.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.

Argonne National Laboratory

- While many opportunities for improvement have been self-identified by ANL and are included in a draft HS/HA emergency plan implementing procedure, some additional improvements to the draft procedure should be considered:
 - Revise criteria specified for including malevolent events in emergency action levels (EALs). Current criteria exclude development of EALs if analysis of other events (e.g., fire) bounds the accident. However, including EALs for malevolent acts has the benefit of classifying this type of event based upon the potential for a release of hazardous materials (rather than waiting for the release to occur) in order to maximize the time available to take protective actions.
 - Consider whether the use of a default facility boundary of 200 meters provides the best protection for site workers or whether a smaller distance may be more appropriate for some facilities. (For example, use of a smaller distance may support development of preplanned protective actions for buildings within 100 to 200 meters of the affected facilities.)
 - Consider whether a central organization should be designated to perform the screening of hazardous materials once the facility has identified them, rather than relying on individual divisions to perform this function.
 - Consider whether proposed criteria for screening hazardous materials based upon “vapor pressure < .5 mm Hg and ERPG-2 or equivalent of ~ 1 ppm” is appropriate. Coordinate with the Office of Emergency Management on this issue.

- Improve the chemical management system's tracking of toxic gases so that it serves as a more accurate source of information for the HA and for actual emergency responses. Consider improving the chemical management system by including a provision for notifying the emergency management officer when chemicals are ordered in quantities that exceed site-specific thresholds (e.g., 40 CFR 355 threshold quantities).
- Consider incorporating emergency management into the review of safety analysis report revisions and unreviewed safety question documentation to ensure that any significant changes in the types, quantities, or uses of hazardous materials are promptly identified.
- Ensure that the HS/HA, safety analysis reports, and building emergency plan hazardous material inventories are consistent, or that inconsistencies are justified and documented.
- Develop a document or tables derived from the HA that provide an easy cross reference from building EALs to the HS/HA scenario assumptions and resulting consequences for use in the ERC.
- Consider whether the current definition of the site EPZ is warranted based upon existing site hazards, and if it is, ensure that appropriate preplanning has been performed within the EPZ. Consider whether a building-specific EPZ should be defined for the Alpha-Gamma Hot Cell Facility and whether, therefore, preplanned protective actions should be developed for surrounding buildings in case of an emergency at this facility.
- Develop a comprehensive checklist for use by the IC to facilitate timely initial decision making. Include procedural steps for categorizing and classifying an emergency, determining and implementing protective actions for onsite personnel, and performing required offsite notifications. Incorporate this checklist into the Fire Department Emergency Response Procedures Manual.
- Review and update memoranda of understanding with support organizations and other jurisdictions to include all expectations for support actions. Establish mechanisms to assure that such agreements are kept current.
- Consider using approved and effective guidelines implemented by other DOE/National Nuclear Security Administration sites when developing the emergency plan implementing procedures. ANL would then have the advantage of starting with set of integrated and effective procedures that could be tailored to site-specific needs.
- As part of the process of improving procedures and response tools, consider requiring individuals with responsibility for procedure implementation to conduct procedure verification (for accuracy) and validation (for usability). Walk-through and rigorously validate procedures with users to determine whether there is an established method for implementing each step and the time needed to fully implement those steps based on existing systems. Determine whether the timing is prompt enough for protective actions to be effective in protecting people.
- Develop the approval protocol for the distribution of information to the media and the public. Document that process in the CEMP and the public affairs plan, including a flowchart reflecting organizational approval responsibilities by title for all information. Include classifier review and approval as required.

- Review and document news release formats in the public affairs plan. Consider developing a pre-approved initial news release to ensure timely and accurate initial information flow during normal hours and for an off-hours incident.

Chicago Operations Office/Argonne Area Office

- Develop a protocol for review of the HA to ensure that the appropriate disciplines (e.g. safety analysis experts and Facility Representatives) support the review. Obtain the assistance of the Office of Emergency Operations (SO-40) in the conduct of the reviews.
- CH/AAO plans and procedures are currently in place to effectively support ANL. However planned changes in the ANL-E emergency management program need to be considered and coordinated to ensure the continued integration of DOE line management actions.
- Establish a procedure to ensure that the annual review and revision of memoranda of understanding are coordinated.
- CH/AAO should work with other Federal, state, and local agencies to develop a plan for the activation of an offsite joint information center. Implementation of this plan should be coordinated with ANL to ensure integration with the CEMP and ERO training.

APPENDIX D

Emergency Preparedness

D.1 INTRODUCTION

Based on the outcome of the hazards surveys and assessments, sites and facilities are required to procure, install, and maintain sufficient facilities and equipment to support emergency response. A coordinated program of training, drills, and exercises is necessary to ensure that emergency response personnel and organizations are capable of responding effectively to emergencies impacting the site or facilities. Effective response includes the ability to make time-urgent decisions and take action to minimize the consequences of the emergency and to protect the health and safety of responders, workers, and the public. To be effective improvement tools, exercises should be used to validate all elements of an emergency management program over a multi-year period using realistic, simulated emergency events and conditions.

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance team evaluated the facilities, equipment, and training, drill, and exercise programs used to support the emergency response organizations at both the site and building levels at Argonne National Laboratory – East (ANL-E). This review encompassed facilities and equipment used at the emergency response center (ERC), response vehicles, and the building-level equipment needed to support the building emergency plans. Training and drill plans, training materials, and records for emergency responders were evaluated. Also evaluated were records and reports of the emergency management exercise program.

D.2 STATUS AND RESULTS

D.2.1 Emergency Facilities and Equipment

The ERC is a centralized, controlled-access facility for carrying out emergency response organization (ERO) activities. It consists of one room where the ERC manager directs the emergency response, and it provides space for the Argonne Area Office (AAO) manager and the entire administrative and technical support staff. Argonne National Laboratory (ANL) and Chicago Operations Office (CH)/AAO assessments identified a potential concern in that once the ERC is fully equipped, it may not be large enough to support an expanded ERO activation. As discussed in Appendix F, this concern has not been adequately addressed. The technical support area within the ERC is fully equipped to support emergency management decision-making, with such tools as plume modeling programs, area maps, weather monitoring instruments, building-specific emergency plans, and appropriate communications equipment. ANL continues to improve the ERC equipment to keep current with technology advances, such as the recently acquired Nextel radios that will enhance communications between the various response organizations, and the new transportable status boards that will provide continuity of event information whenever the ERC manager is relocated. The ERC equipment was observed to be adequately maintained, and its operability is demonstrated through a periodic testing program required by the emergency plan. One exception is that periodic testing of communications of ERC facsimile equipment with the Chicago and DuPage County Emergency Operation Centers is not performed.

ANL-E uses several systems to notify the ERC cadre, employees, and visitors of an emergency, including telephones, radios, pagers, public address systems, and an outdoor warning system. These systems provide diverse methods to make notifications, and thus provide a high level of reliability. A notable practice for making timely notifications and activating an emergency response is the site's 911 telephone

emergency notification system, which is the primary means for notifying ERO of an emergency. The fire department answers all 911 calls, which are monitored by the various ERO support groups during normal working hours in order to expedite a response by the appropriate support organizations, such as industrial hygiene and safety. However, outside of normal working hours, each member supporting the emergency response must be called individually.

ANL-E has a fully equipped industrial fire department that provides emergency response for the entire site and mutual aid to the surrounding communities. Specific functions of the fire department include incident command and control; fire suppression; emergency medical services and ambulance support; technical rescue; and hazardous material identification, containment, and stabilization. The fire department responds to requests from fire departments in surrounding communities under a mutual aid agreement (Mutual Aid Box Alarm system) for firefighting, as well as hazardous material and emergency medical support. Their equipment was observed to be well maintained and in an appropriate state of preparedness.

To establish the equipment and staffing needs of the Argonne fire department, a baseline needs assessment was performed in August 1998 as required by DOE Order 420.1, *Facility Safety*. This assessment was intended to identify the type and quantity of emergency equipment required to be maintained at the fire station and the minimum number of personnel required to be on duty at all times. In May 2000, an ANL-E audit was performed to determine whether the baseline assessment was accurate in its assumptions and conclusions. The audit confirmed the baseline needs assessment conclusion that a staffing level of seven people per shift is required, not including the dispatcher and Fire Chief. Presently there are six people per shift, including the dispatcher. This equates to five people available to respond to an ANL-E onsite emergency.

It is recognized that the fire department belongs to the Mutual Aid Box Alarm system, which provides additional assistance to the fire department within about 15 minutes. An ANL-E fire department response to requests from fire departments in surrounding communities could reduce the onsite staffing to three (including the dispatcher), depending on the type of offsite response. As a result, the onsite staffing level, in the 15 minutes prior to the arrival of offsite mutual aid, would not allow building entry in compliance with Occupational Safety and Health Administration and National Fire Protection Association (NFPA) standards for backup rescue capabilities. Correspondence between AAO and ANL reflects that they have accepted the risk associated with this likelihood of delayed building entry. Finally, the results of the baseline needs assessment, such as response capabilities and equipment, have not been incorporated into the ANL-E emergency plan as required by DOE Order 420.1.

A noteworthy practice is that the fire department first response vehicle is equipped with computerized pre-fire plans for all laboratory buildings. These plans are easily accessed using a computer touch screen and contain critical information needed in a response, such as building occupancy, construction features, hazardous material inventories by class, building floor plans, type of installed fire protection equipment, and building emergency contact numbers. These features support a safe and effective emergency response by the fire department.

Hazardous material response apparatus is maintained in a state of readiness for emergency response to onsite and offsite events. Equipment includes self-contained breathing apparatus, radiation detection instruments, combustible gas indicators, and oxygen meters. Large equipment items include generators, pumps, and overpacks for containing leaking drums. The response vehicle is equipped with a hazardous material reference database to assist in field identification of hazards and appropriate response actions. The Argonne fire department also maintains a decontamination trailer, which is well equipped with showers, sinks, and liquid holding tanks; adequately stocked with protective clothing and supplies needed to perform decontamination activities; and designed for use in freezing weather.

The Argonne Occupational Medical Group can provide medical support during an emergency. Their facility is designed to receive contaminated (radiological and/or chemical) and injured patients through specially equipped rooms that support decontamination, medical treatment, and collection of all liquid and solid wastes generated from these operations. The medical staff works closely with ANL-E's ERO to plan for treating health effects from exposure to identified hazards, thereby providing some assurance that appropriate equipment and supplies, such as chelating agents, are stocked.

At the building level, Buildings 205 and 306 have installed and staged response equipment consistent with the building emergency plans in support of the site emergency plan. Placement of equipment is appropriately based on considerations of likely locations of equipment use, as well as local (room and wing) and building evacuation paths. A positive feature of the program is that equipment locations are shown on building emergency maps. Inspections and the use of tamper indicating devices on storage cabinets assure that equipment is available and operable. Systems for warning and instructing personnel are tested periodically. It was evident through building walkdowns and equipment inspections that Buildings 205 and 306 have an effective program for keeping building emergency equipment available and operable.

In conclusion, the Argonne emergency response program is effectively supported by facilities and equipment for responding to such events as fires, medical emergencies, and hazardous material releases. All equipment that was observed was maintained in an appropriate state of readiness.

D.2.2 Training, Drills, and Exercises

Training And Drills

The ERO training and drill program is described in the Argonne Comprehensive Emergency Management Plan and ANL Emergency Management Training Plan. However, the Comprehensive Emergency Management Plan is a high-level document that establishes general program requirements, such as the requirement to "train the technical support staff in their roles and responsibilities and applicable procedures," and the training plan is out of date and is not currently used. The details of the training requirements are established through job task analysis and are incorporated into the training plan for each ERO position. However, the job task analysis was not used to develop ERO task- or position-specific training requirements and materials for all positions. For example, the ERC manager does not receive any training for incident command or plume modeling capabilities, which are related to his/her ERO job tasks. Other weaknesses identified in the ERO training program include:

- ERC personnel, area emergency supervisors, field response teams, and AAO positions do not have separate, detailed training plans and processes to ensure that they are capable of performing assigned ERO functions.
- Criteria for successful completion of training courses have not been established to ensure that all individuals have acquired the necessary knowledge, skills, and abilities to perform their assigned duties.
- There is no documented requirement for ERO members to participate in drills or exercises to initially establish or maintain position qualifications or to maintain their proficiency.

The emergency management training program was designed around the needs of existing experienced personnel, rather than designing it to train a less experienced individual to fill an ERO position. For example, no training requirements are identified for a dispersion modeler in the ERC. Personnel who are currently responsible for performing this task are known to be proficient. However, a new person can complete all the training requirements for a dispersion modeler without receiving specific training on or demonstrating knowledge of the modeling program. Under the current design, the only programmatic

elements that provide task-specific training for any of the ERC positions are position orientation training, and tabletop participation. Under a systematic approach to training, required skills would be a part of an entry-level requirement, or the task training would be included as a training requirement for position qualification. The new individuals who already have the required skills could be excused from unnecessary training through an exception/exemption process.

The AAO emergency management training program also appears to have been designed around the needs of existing personnel with site experience. The only programmatic elements that provide training for any of the DOE ERO positions are annual overview training and tabletop participation. The AAO ERO training and drill program is not documented. Like ANL, AAO has not established detailed training requirements to ensure that ERO members are trained and capable of performing their assigned ERO tasks.

The drill program, as defined by the ANL-E emergency management plan, is an integral part of the ERO training program. The ERO is involved in building-level drills, but these do not sufficiently test the combined proficiency and integration of the ERC and field responders and do not allow for full ERO member participation, as would be required for a large hazardous material release. Two drills (i.e., tornado and fire) are conducted at each building annually. Program requirements and records indicate that all comments provided by the participants at post-drill “hot washes” (critiques conducted immediately following the exercise to provide an opportunity for the responders to discuss their own perspectives on the activities and events) are recorded, collected, and reviewed to ensure appropriate management of all ANL drill objectives that were met, not met, or not observed.

Finding: AAO and ANL have not ensured that ERO members are capable and proficient in fulfilling their assigned response functions and duties through a systematic training and drill program as required by DOE Order 151.1A, Chapter IV.

The ERO training program is managed via the sitewide training management system database. A job hazard questionnaire is used to identify personnel assigned to an emergency management program position. This system allows for quick retrieval of an individual’s training status and is used to notify personnel when training is due or incomplete. However, the system is not used to track all required training or drill and exercise participation for ERO members. Also, the questionnaire does not distinguish between the various positions within the ERO and therefore does not record task-specific training. AAO informally tracks (manually) the training provided to DOE personnel assigned to the ERO but does not use the sitewide training management system.

The Argonne fire department has established specific training requirements. All ANL-E fire department emergency response personnel are certified by the State of Illinois and are trained to meet the requirements of NFPA 1001, “Standard for Fire Fighter Professional Qualifications;” NFPA 471, Recommended Practice for Responding to Hazardous Materials Incidents;” and NFPA 472, “Standard for Professional Competence of Responders to Hazardous Materials Incidents.” The paramedic medical program is conducted under the authority of the Loyola University Medical Center, operating under the Hospital Medical Director to administrate medication. ANL doctors have received training from the Radiation Emergency Assistance Center/Training Site.

General employee training and visitor orientation training are comprehensive with respect to target audience roles and responsibilities within the site emergency management program. These courses adequately cover actions that may be required of all workers and visitors, such as reporting emergencies, response to various alarms, and sheltering and evacuation.

At the building level, area emergency supervisors receive emergency management training annually via computer-based training, which includes an examination. However, the computer-based training has not been updated to reflect the latest changes in the ERO and does not provide the level of training on ERC response activities prescribed by the emergency management training plan that was developed for this position.

Exercises

CH has been proactive in using emergency exercises and tabletops to improve both DOE and ANL performance in the emergency management program. CH developed, conducted, and evaluated the June 2001 annual emergency exercise for the site and is planning to administer the exercise for calendar year 2002. The 2001 exercise package was formally developed and includes clear objectives with measurable performance criteria. Appropriate records, including evaluator, controller observations, and post-exercise “hot wash” and critique notes, were developed and maintained. The exercise results are documented in detail in an exercise evaluation report. Items requiring corrective action are entered into the sitewide corrective action system for processing.

ANL has not maintained exercise records for prior years. Comments provided by controllers, evaluators, and exercise participants at post-exercise “hot washes” and formal critiques are unavailable for review to determine whether ANL exercise objectives were met. In addition, past exercise scenarios have not involved hazardous material releases and therefore did not require an integrated response by the full ERC cadre.

Finding: The ANL exercise program used to evaluate the emergency response program is not adequate to validate all elements of the emergency management program over a multiyear period as required by DOE Order 151.1A, Chapter IV.

ANL has self-identified that the area of training, drills, and exercises needs improvement. The corresponding corrective action plan states that an emergency plan implementing procedure will be developed to correct these deficiencies and retrain personnel. However, as discussed further in Appendix F, the corrective action plan does not provide the detail and appropriate sequencing of corrective actions to ensure that the program will be robust and incorporate the requirements of DOE Order 151.1A.

In conclusion, the ANL and AAO site training and drill program is not sufficiently rigorous to provide the training and practice necessary to ensure effective responder performance. Formal, performance-based training and drills that test decision-making skills have not been conducted, and opportunities to demonstrate and maintain proficiency in responding to large-scale emergencies are limited.

D.3 CONCLUSIONS

ANL provides emergency response personnel with the facilities and equipment needed to effectively implement emergency plans. ANL effectively employs and maintains several systems to notify the ERC cadre, employees, and the public of an emergency, including telephones, radios, pagers, public address systems, and an outdoor warning system. The fire department is fully equipped to respond to fires, medical emergencies, technical rescue, and hazardous material identification, containment, and stabilization. The first-response vehicle is equipped with computerized pre-fire plans for all buildings. The fire department also maintains a decontamination trailer that is well equipped and maintained and that is designed for use in freezing weather. However, significant weaknesses were noted in the area of training and drills. Important elements of a comprehensive training program for the ERO personnel have not been developed or implemented, including training keyed to critical job tasks, an evaluation of the skills and

knowledge attained to ensure that individuals are qualified for their job positions, and practice in an environment that simulates actual job performance conditions. Consequently, ERO members did not demonstrate proficiency in making some critical decisions during tabletop performance tests, as discussed in detail in the Appendix E.

D.4 RATING

The facilities and equipment available at ANL-E provide assurance that emergency response personnel can adequately respond to emergency events. A rating of EFFECTIVE PERFORMANCE is therefore assigned to the area of emergency facilities and equipment.

The emergency management training, drill, and exercise programs do not ensure that upon assignment to the ERO, personnel are trained and proficient in tasks that they need to perform in order to provide adequate protection under time-urgent conditions. This condition is partially compensated for by the training and experience of the fire department initial responders. A rating of NEEDS IMPROVEMENT is therefore assigned to training, drills, and exercises.

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.

Argonne National Laboratory

- Evaluate the ERC to ensure that the space is sufficient to support the expanded ERO and equipment. A self-assessment identified that the ERC might be too small for the number of personnel and planned equipment upgrades. This issue was not adequately addressed by the corrective action, as discussed in Appendix F. The ability of the ERO to function effectively in the space provided could be included as an objective in the next emergency exercise.
- Examine existing mechanisms used to notify onsite and offsite personnel of emergency conditions in order to establish a more timely process (e.g., pagers for all ERC personnel) for activating the ERC during off-hours. Consider performance testing the ERO notification system under varying conditions (e.g., day, night, peak vacation periods) to assure that notifications can be performed promptly.
- Use benchmarking and peer reviews from other DOE sites to enhance the effectiveness of the training, drill, and exercise program.
- Consider performing a systematic analysis of the tasks to be performed by each ERO position using a simplified approach, such as a tabletop job analysis. Use the results of this analysis to develop position- and function-specific training and qualification requirements and course material.

APPENDIX E

Emergency Response

E.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 decision-making 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. Termination of an operational emergency is accomplished by meeting a predetermined set of criteria and coordinating the termination with offsite authorities.

In the event of an emergency, initial direction and control of the Argonne National Laboratory – East (ANL-E) emergency response organization is provided by the fire department battalion chief (or his/her lieutenant), who ultimately proceeds to the event scene and assumes incident command. After activation of the emergency response center (ERC), the ERC manager assumes overall command and control authority, including emergency classification and notification responsibilities (while the incident commander maintains on scene command and control authority). The ERC manager is assisted by a cadre of support personnel who perform such activities as notifications and consequence assessment. The Argonne Area Office Manager (AAOM) ensures that the Laboratory appropriately responds to the event.

The majority of the information provided in this section results from tabletop performance tests that were conducted with three incident commanders (ICs) and three ERC emergency managers (teamed in most cases with an operations officer and a safety officer). The scenarios were presented to these individuals by an Argonne National Laboratory (ANL) trusted agent to ensure scenario validity and delivery of accurate event cues. In addition, performance-based interviews were conducted with three individuals assigned to serve as the AAOM when the ERC is activated.

E.2 STATUS AND RESULTS

E.2.1 Incident Commanders

In accordance with the ANL-E Comprehensive Emergency Management Plan (CEMP), when the IC assumes incident command he/she has the authority and responsibility for all actions at the event scene, making appropriate emergency notifications, and recommending activation of the ERC. The objective of the tabletop performance tests was to verify that the IC has the appropriate training, tools (e.g., procedures), and skills to effectively assess postulated emergency event conditions; determine protective actions for responders and collocated workers; categorize and classify operational emergency events; and perform notifications. Three different accident scenarios (a transportation event, a security event at a hazardous waste building, and a severe weather event) were presented to each of three ICs by an ANL trusted agent.

The ICs who were evaluated all demonstrated effective command and control and took appropriate actions to mitigate the event. Simulated communications with support staff were disciplined (including repeat-backs and acknowledgement of messages received), and such actions as event scene isolation, requests for mutual aid, and requests for support from the ERC were quickly and effectively performed.

Furthermore, the ICs, with few exceptions, took effective actions to protect responders and site personnel. For example, following a simulated 911 report of each of the events, the ICs quickly determined wind direction and a safe path of approach to the event scene. The command post was established at an appropriate upwind location, and event scene isolation was established at the appropriate roadway intersections. For the simulated transportation event, the IC directed appropriate precautions to be taken when emergency responders approached the event scene to determine whether the driver could be rescued. The IC determined and directed protective actions, such as building evacuation and sheltering in place, to protect co-located workers who could be affected by each of the events. In a few isolated cases, inappropriate response actions were directed. For example, in one instance the approach to the event scene was not from the upwind direction, and in another, an IC did not clearly communicate precautions for staying clear of a vapor cloud and did not establish provisions for backup rescue personnel. Finally, in one instance an IC did not take prudent actions to relocate evacuated personnel from areas that could be impacted by the security-related event. A weakness was also identified concerning the use of the Department of Transportation 2000 Emergency Response Guide (ERG) as a tool for assisting in emergency response to the simulated transportation event, which included a hazardous material spill. Although the ICs were generally familiar with the ERG, none utilized it to verify that the scene isolation was appropriate. However, the isolation points established during the performance test were beyond those recommended in the ERG, so safety was not compromised during the scenarios.

A significant weakness was identified in the ability of the ICs to categorize and classify the postulated events. None of the ICs attempted to categorize or classify the event, instead focusing solely on the event scene command and control. The simulated events were postulated to occur during the day, and ERC activation would be expected to occur promptly. Therefore, categorization and classification by the IC were less critical. However, following the presentation of the events, none of the ICs could utilize categorization and classification criteria in the CEMP effectively. Furthermore, one of the three ICs could not find the form used to notify offsite agencies. These problems in event categorization, classification, and notification can be attributed to the weaknesses identified in the emergency plan and training discussed in Appendix C and Appendix D.

E.2.2 Emergency Response Center Managers

Tabletop performance tests were performed with three ERC managers, accompanied in most cases by two support managers (a safety officer and an operations officer). The same three event scenarios provided to the IC were utilized for the ERC managers, although the start time and event cues were modified to reflect the expected activation time for the ERC and the type of information that the ERC would have available. Generally, all three ERC teams appropriately supported the event control and mitigation by evaluating potential actions to protect site workers and by obtaining support resources. For example, the ERC identified potential areas impacted by the events and considered the appropriateness of both shelter-in-place and evacuation options for protecting site workers. In addition, the ERC considered additional technical support that would assist in mitigating the event, such as obtaining assistance from waste management, environmental compliance, and industrial hygiene personnel.

Three weaknesses were identified in the ERC managers' performance. The first weakness was that the ERC managers were not proficient in categorizing and classifying the postulated events and in completing the forms for notifying offsite officials and the U.S. Department of Energy (DOE). For example, ERC managers approved a notification form presented to them that inappropriately designated the event categorization as both an "operational emergency not further defined" and an Alert. When questioned on the definitions of the event categorization and classification, none of the ERC managers demonstrated a clear understanding of the definition of an operational emergency (as defined in DOE Order 151.1A), nor were they proficient in evaluating CEMP guidance on event categorization and classification. This

weakness can be attributed, in large part, to problems with the tools available to support these actions, as discussed in Appendix C of this report.

The second weakness identified was that the ERC manager did not clearly communicate with the IC. In a number of cases the ERC manager did not identify that the ERC had assumed control of the event and, therefore, had assumed the responsibility for categorizing and classifying the event and for determining and issuing site protective actions. These actions are specifically called out in an ERC manager checklist. However, in most cases the checklist was not effectively utilized to ensure that these actions were properly performed, and the ERC manager was uncertain as to when it was appropriate to take over control of the incident response effort.

The final weakness was that the ERC staff was not aware of the process for obtaining health physics support. This resulted in some confusion and several different approaches being utilized to obtain the support, including relying on the radiological assistance program team instead of ANL health physics resources.

Although the weaknesses identified in the ERC response are significant, the staffs generally demonstrated good teamwork, were technically capable, and provide a good technical resource for the IC. None of the currently designated ERC managers have served in this position for more than a month, and the lack of training and practice contributed to performance problems.

E.2.3 Argonne Area Office Manager Position

Performance-based interviews were conducted with the three individuals assigned to serve as the AAOM in accordance with the Chicago Operations Office (CH)/Argonne Area Office (AAO) standard operating procedure to determine whether they understood their emergency response roles and responsibilities defined by the CH emergency management order and AAO standard operating procedure, and could take appropriate actions when faced with postulated emergency conditions. The primary responsibilities of the AAOM include ensuring that the Laboratory appropriately responds to the event and that appropriate event classification and notifications are made. The interview included a discussion of actions the AAOM would take during critical activities, using the same three event scenarios used for performance testing of the ICs and ERC managers.

The AAOMs demonstrated a good understanding of their roles and responsibilities during an emergency response. In particular, they recognized their role in ERC oversight and as a communicator with the CH emergency operation center, and they understood that the primary goal was the protection of personnel. Furthermore, they understood the importance of timely and accurate notifications and communications. When presented with simulated emergency situations, the AAOMs demonstrated the ability to effectively oversee such ERC activities as protective action determination and event categorization and classification. In addition, the AAOMs effectively reviewed a press release to ensure that it was accurate and conveyed an appropriate message to the public.

Some minor concerns were identified in the level of understanding of the categorization and classification tools used in the ERC. For example, the AAOMs were unfamiliar with information on categorization and classification located in the CEMP and did not fully understand how this information was to be identified on the notification form.

E.3 CONCLUSIONS

The ICs demonstrated the ability to effectively mitigate postulated events and to protect emergency responders and site personnel. In addition, ERC staff demonstrated that they understood their roles and

responsibilities for emergency response and were technically competent to support the on-scene response. Similarly, the AAOMs understood their roles and responsibilities and demonstrated that they could effectively oversee the ANL-E response. However, neither the ICs nor the ERC managers demonstrated the ability to promptly categorize and classify emergency events or to effectively notify offsite agencies and DOE management of the event. The failure to classify emergency events promptly and accurately may cause uncertainty about the significance of an event when communicating with offsite agencies and DOE Headquarters. In addition, concerns were identified in the ability of the ERC managers to clearly communicate with the IC regarding the responsibilities that the ERC assumes upon activation of the ERC, and in the capability of the ERC to promptly obtain health physics support for events in which radioactive material may be released.

E.4 RATING

Although the ICs demonstrated appropriate response to mitigate the event and protect site personnel, neither the IC nor the ERC could effectively categorize and classify the event and make all required notifications. In addition, concerns were identified in the ability of the ERC managers to clearly communicate with the IC and to muster health physics support. These concerns are directly related to weaknesses in plans, procedures, and training identified previously. A rating of NEEDS IMPROVEMENT is therefore assigned to the area of emergency response.

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.

Argonne National Laboratory

- Conduct performance-based training with the IC on using the 2000 ERG as a tool for establishing event scene isolation distances and formulating protective actions.
- Conduct drills involving the IC and ERC staff to ensure that turnover of emergency responsibilities is well coordinated.
- Consider whether the use of the IC to perform event categorization and classification and event notification provides the best system for performing both on-scene response and prompt categorization, classification, and notification. Consider normal working hours and after-hours response.
- Conduct a drill with health physics support to ensure that onsite field monitoring will be effective if needed during an actual event involving the release of radioactive material.

Argonne Area Office

Conduct drills with the ERC staff so that each AAOM can practice interfacing with the ERC staff on event categorization and classification and the development and issuance of event notifications and press releases.

APPENDIX F

Readiness Assurance

F.1 INTRODUCTION

The readiness assurance program provides the U.S. Department of Energy (DOE)-wide framework and multi-year planning mechanism for assuring that program plans, procedures, and resources are adequate and sufficiently maintained to mount an effective response to an emergency. Readiness assurance activities include the annual development of an Emergency Readiness Assurance Plan and implementation of a coordinated schedule of program evaluations, appraisals, and assessments. Key elements of the readiness assurance program include the active involvement of DOE line organizations in monitoring program effectiveness, contractor self-assessment programs, timely implementation of corrective actions for identified weaknesses, and lessons learned from training, drills, exercises, or actual events. For exercise evaluations, readiness assurance includes assessment of the effectiveness of the exercise as a means of demonstrating and continuously improving a site's integrated emergency response capability.

The Office of Independent Oversight and Performance Assurance (OA) team assessed Chicago Operations Office (CH), Argonne Area Office (AAO), and Argonne National Laboratory (ANL) feedback and improvement elements that were directly related to the emergency management program, including line management oversight, assessment programs, and issues management.

F.2 STATUS AND RESULTS

F.2.1 DOE Performance Monitoring

CH has clearly documented expectations for DOE line management monitoring of the Argonne National Laboratory – East (ANL-E) emergency management program. In response to an OA finding resulting from a focused review conducted at ANL-West in May 2001 (also under the purview of CH and AAO), an October 2001 revision was issued to the CH emergency plan, and a CH emergency management order was issued in December 2001 to define roles, responsibilities, and requirements for emergency management program assessments. AAO is responsible for emergency management oversight at ANL-E. The CH role is to support AAO as requested. CH support has included participating in assessments, providing emergency management training for AAO and CH managers with a role in response activities, and obtaining contractor and DOE support for emergency exercise planning and evaluation.

The area office emergency management coordinator is responsible for assessing all elements of the site's emergency management program at least once every three years. AAO does not have the staff or resources to meet this requirement. Past evaluations have used consultants and experts from other CH sites to support the AAO evaluations of emergency management. To obtain the necessary resources, AAO must submit an assessment schedule or plan to CH. CH then identifies and ensures the availability of outside personnel resources with the necessary expertise to support the assessments. AAO has documented the program elements that were reviewed during the June 2001 emergency exercise and is factoring this into the planning for the evaluation of the exercise for calendar year 2002. However, no schedule has been submitted to CH to identify future resource needs.

CH and AAO assessment activities in the last year have integrated various types of oversight activities, including the conduct and evaluation of an emergency exercise and tabletop performance tests, and evaluation of program documents. Formal reports of AAO and CH oversight activities are prepared to

document program monitoring results and issues. Within the last few months, the ANL emergency management officer has communicated almost daily with the AAO emergency management coordinator and the CH emergency management program manager regarding the numerous changes being proposed and/or implemented. CH and AAO maintain operational awareness of the program and communicate expectations regarding specific program element changes through these informal discussions and email. However, discussions of the overall strategic planning, including the long term goals and objectives of the broad programmatic changes planned, have been limited.

CH and AAO have demonstrated a proactive approach in addressing weaknesses identified in *Review of the Adequacy of Emergency Response to the February 2000 Criticality False Alarm in New Brunswick Laboratory*. Because the New Brunswick Laboratory is physically within the ANL-E site boundary, the ANL-E emergency management program must include provisions for responding to events there. One of the corrective actions was to conduct an emergency exercise that would require a coordinated response by New Brunswick Laboratory, AAO/CH, and ANL. AAO/CH conducted and evaluated the joint sitewide emergency exercise held June 5, 2001. The exercise, designed to test the integrated response of the emergency response organization, was challenging and identified performance weaknesses that required improvement.

CH and AAO also conducted a program review of the Comprehensive Emergency Management Plan (CEMP) in September 2001. The results of this program review and the exercise evaluation were well documented, and findings are being tracked in the ANL corrective action tracking database. Most corrective actions to address the findings are considered complete and awaiting AAO verification for closure. However, a weaknesses was identified in the verification of corrective actions by AAO.

By procedure, AAO is required to formally verify the status of corrective action implementation developed in response to any weaknesses every six months. This formal verification has not been accomplished for 18 months, and several of ANL's responses to the findings in the above reports are not considered adequate by AAO. However, AAO has not been timely in communicating their concerns. As a result, the ANL corrective action tracking database indicates that the actions are complete, and no one is assigned further action. For example, the program review of the CEMP identified that the annual updates to the emergency plan have not been submitted to AAO for approval. The ANL response to this finding was that the ANL policies and procedures management system notifies subscribers of all changes to the CEMP and that this mechanism provides the opportunity to review and provide comments. Since November 2001, ANL has shown the status of this action as complete, even though the original finding regarding AAO approval of the CEMP was not addressed by the ANL response. Although AAO has recently discussed this concern with ANL, nothing was provided in writing and the action status is shown as complete, awaiting AAO verification. This weakness is addressed more broadly in Volume I of this report.

Overall, DOE line management oversight activities conducted within the last year have been proactive and effective in identifying performance weaknesses and ensuring that corrective actions are initiated. However, the oversight activities by CH and AAO and the effectiveness of ANL corrective actions are limited by the absence of timely verification and feedback.

F.2.2 Contractor Assessments and Issues Management

Two assessments of the ANL-E emergency management program were conducted during January 2002. The first was conducted by the emergency management officer from ANL-West to apply lessons learned from an OA assessment conducted at that site in May 2001. The second assessment, to determine compliance with DOE Order 151.1, was performed by two members of the Emergency Preparedness organization within the Decision and Information Sciences Division at ANL. The thoroughness of these

two self-assessments is notable. Both were rigorous and identified numerous significant programmatic deficiencies in almost all areas evaluated. For example, the assessments identified inconsistencies between the CEMP and the hazards assessment (HA), weaknesses in emergency action levels, out-of-date memoranda of understanding with offsite response organizations, unclear definition of roles and responsibilities, and the need for emergency plan implementing procedures for each of the emergency response organization positions.

A corrective action plan (CAP) was developed that consolidated the 77 concerns in the two assessment reports into 17 findings that were then placed in the ANL Environmental, Health & Safety/Quality Assurance Oversight Division (EQO) corrective action tracking database. This approach appropriately sought to address the causes of the numerous weaknesses from a generic process or programmatic perspective. The stated intent was to establish requirements and programs that, when implemented, would correct the identified weaknesses and then reevaluate the effectiveness of the program. However, the corrective action plan does not provide assurance that all identified deficiencies will be corrected. Weaknesses in the CAP include:

- **The CAP identifies in general terms the actions to be completed, without identifying the specific problems or direct cause to be addressed or milestones for achieving and validating the effectiveness of corrective actions.** For example, one concern identified the potential to incorrectly classify an event due to inconsistent application of protective action guidelines in the HA. The corrective action to address this issue was to develop an emergency plan implementing procedure on preparing, approving, and reviewing hazards surveys and HAs. This specific issue was in fact informally resolved; the protective action guideline used in the HA was determined to be technically correct following discussions between the evaluator and the engineer responsible for updating that section of the HA. However, there is no record of this resolution in the assessment file or EQO corrective action tracking database, so it will be difficult to validate the effectiveness of this broader corrective action.
- **Some corrective actions are not effectively sequenced or do not include timely feedback mechanisms.** For example, training was scheduled and completed prior to the development of an emergency plan implementing procedure that defines and describes training requirements for response personnel. Additionally, there is no timely retraining to address program changes resulting from new emergency plan implementing procedures on such subjects as emergency action levels, consequence assessment, and notifications.
- **Some corrective actions do not adequately address the root cause of the concern.** One concern related to the size of the emergency response center (ERC) and the ability to accommodate the ERC team and equipment necessary to support the team, such as status boards and communications equipment. The related corrective action was to evaluate and post occupancy limits for the facility once it was properly equipped. Another concern identified that stack monitors used to determine emergency action level thresholds (in the CEMP) were no longer installed. The related corrective action is to revise the CEMP to describe emergency preparedness policy and concept of operations, including responsibilities and functions. In these cases the corrective actions do not adequately address the identified concern.

As stated above, it is the intent of EQO to perform a programmatic assessment to verify the effectiveness of corrective actions, but there is no established schedule or requirement in ANL-E procedures to conduct an annual emergency management program assessment in accordance with DOE Order 151.1A. Rigorous assessments of the emergency management program were conducted in calendar year 2002, but they were not performed previously, and there is no programmatic mechanism in place at ANL-E that provides assurance that self-assessments will be conducted in the future.

Finding: ANL has not established an effective feedback and continuous improvement program that provides for annual emergency management program assessments and an effective process for identifying and validating corrective actions as required by DOE Order 151.1A, Chapters I and X and Attachment 1.

Overall, the two self-assessments conducted in January 2002 were thorough and self-critical evaluations that provided ANL with an excellent baseline for determining the breadth and scope of required program improvements. Appropriately, corrective actions were designed to address the broad process weaknesses. However, the CAP does not provide enough detail to determine whether it is likely to be effective. Additionally, DOE Order 151.1A requirements for annual emergency management assessments have not been incorporated into ANL-E procedures; thus there is little assurance that the effectiveness of that program will be reevaluated in the future.

F.3 CONCLUSIONS

Recent efforts by CH and AAO to strengthen the ANL-E emergency management program are proactive and include the development, conduct, and evaluation of emergency exercises (usually functions performed by the contractor). Additionally, tabletop performance tests and program element reviews have been conducted. The level of effort spent by CH and AAO over the last year is noteworthy; however, the full value of these oversight activities has not been realized due to the absence of timely verification and feedback on corrective actions.

The two self-assessments conducted by ANL in January 2002 are also noteworthy in that they were conducted by subject matter experts and identified numerous program weaknesses. Corrective actions have been initiated to establish processes to ensure that these weaknesses are addressed programmatically. However, the corrective actions, taken as a whole, do not provide assurance that all the identified weaknesses will be adequately addressed, and ANL has not established a program of annual emergency management assessments to validate the effectiveness of corrective actions.

F.4 RATING

The extent of DOE line management involvement in and oversight of the ANL-E emergency management program provides reasonable assurance that DOE will fulfill its responsibilities for monitoring performance and effecting program improvements. The absence of timely feedback on and verification of corrective actions is partially compensated for by frequent but informal communication between DOE line management and the contractor. A rating of EFFECTIVE PERFORMANCE is therefore assigned to the area of DOE performance monitoring.

The frequency of continuous improvement activities conducted by ANL is not adequate to systematically identify and effectively address weaknesses in the site's emergency management program. A rating of NEEDS IMPROVEMENT is therefore assigned to the area of contractor assessments and issues management.

F.5 OPPORTUNITIES FOR IMPROVEMENT

This OA 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.

Argonne National Laboratory

- Consider developing an implementation plan or project management plan to properly sequence corrective actions and ensure that an integrated approach is used. In addition to corrective actions, also include routine and annual activities that will require significant resources or outside expertise, such as the annual updates to the emergency readiness assurance plan, emergency management plan, hazards assessment, procedures, program assessments, and refresher training.
- Enhance the CAP for the January 2002 self-assessments to identify the specific issues to be addressed by the process changes to ensure that all weaknesses are addressed, and also to aid in the validation of completed actions. Update the corrective action tracking system to reflect changes in the CAP.

Argonne Area Office/Chicago Operations Office

- Obtain an overall understanding, including the long-term goals and objectives, of the strategic approach and planning for the integrated implementation of the various program changes that are planned or in progress.
- In coordination with CH, AAO should develop a plan and schedule for assessing all elements of the site's emergency management program at least once every three years. Identify the areas and sources of expertise needed to support the assessment plan. Consider technical support from other national laboratories and CH sites.

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