Independent Oversight
Inspection of
Emergency Management
at the

Sandia Site Office and Sandia National Laboratories

May 2009

Office of Emergency Management Oversight
Office of Independent Oversight
Office of Health, Safety and Security
Office of the Secretary of Energy

HSS
Office of Health, Safety and Security

Table of Contents

Abbreviations Used in This Report

ACRR	*Annular Core Research Reactor*
ARF	*Airborne Release Fraction*
CAT	*Consequence Assessment Team*
CATS	*Corrective Action Tracking System*
DOE	*U.S. Department of Energy*
EAL	*Emergency Action Level*
EMG	*DOE Emergency Management Guide (DOE Guide-151.1)*
EOC	*Emergency Operations Center*
EPHA	*Emergency Planning Hazards Assessment*
EPI	*Emergency Public Information*
EPICode	*Emergency Prediction Information Code*
EPZ	*Emergency Planning Zone*
ERDO	*Emergency Response Duty Officer*
ERO	*Emergency Response Organization*
IC	*Incident Commander*
IMaRS	*Issues Management and Resolution System*
KAFB	*Kirtland Air Force Base*
LSPT	*Limited-Scope Performance Test*
MOU	*Memorandum of Understanding*
NA-43	*NNSA Office of Emergency Management Implementation*
NARAC	*National Atmospheric Release Advisory Center*
NNSA	*National Nuclear Security Administration*
NTC	*National Training Center*
OFI	*Opportunity for Improvement*
PAR	*Protective Action Recommendation*
RF	*Respirable Fraction*
SNL	*Sandia National Laboratories*
SPAN	*Sandia Protective Actions Notification*
SSO	*Sandia Site Office*
TEDS	*Training, Education, and Development System*
TIA	*Timely Initial Assessment*

This page intentionally left blank.

1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight inspected the emergency management program at DOE's Sandia National Laboratories (SNL) in January/February 2009. The inspection was performed by Independent Oversight's Office of Emergency Management Oversight. Independent Oversight reports to the Chief, Office of Health, Safety and Security.

Within DOE, the National Nuclear Security Administration (NNSA) has line management responsibility for SNL. NNSA provides programmatic direction for and funding of most activities, including emergency management program implementation. As a multi-program laboratory, SNL receives funding for non-NNSA work primarily from the Department of Homeland Security and the Department of Defense and partners with industry and academic institutions. At the site, the Manager of the Sandia Site Office (SSO) carries out line management responsibility for SNL operations and safety. SNL is managed and operated by Lockheed Martin, which has operated SNL since 1993.[1]

The primary mission of SNL is research and development in support of national security and the NNSA stockpile stewardship program. SNL's mission areas include: nuclear weapons; nonproliferation and assessments; military technologies and applications; energy and infrastructure assurance; homeland security; and science, technology, and engineering. SNL has major facilities in Albuquerque, New Mexico, and Livermore, California. This Independent Oversight inspection focused exclusively on the SNL facilities in New Mexico. The SNL New Mexico site is located on a portion of the 118-square-mile Kirtland Air Force Base military reservation. Activities at SNL involve a variety of radiological and chemical materials that pose potential hazards to site workers and the public.

The purpose of this Independent Oversight inspection was to assess the effectiveness of the emergency management program implemented by SNL under the direction of SSO. Independent Oversight used a selective sampling approach to assess a representative sample of facilities and emergency responders at SNL. Specifically, the sampling approach was used to evaluate:

- The effectiveness of the hazards surveys and emergency planning hazards assessments (EPHAs) in serving as an appropriate foundation for the SNL emergency management program.
- The effectiveness of the SSO and SNL emergency responders in applying their skills, procedures, and training to make appropriate decisions and to properly execute actions to protect emergency responders, workers, and the public.

[1] Consistent with common practice, the term "SNL" is used to refer to both the physical facility and the onsite contractor management. The term "Lockheed Martin" is used to refer to the Lockheed Martin management that provides corporate direction to the onsite SNL management team and that performs corporate line management and evaluation functions for Lockheed Martin activities at SNL.

To evaluate response performance, Independent Oversight conducted limited-scope performance tests (LSPTs) for initial responders and decision-makers. The performance tests were designed to evaluate the ability of responders to effectively execute their assigned duties during postulated site-specific emergencies. Independent Oversight used trusted agents from the site to assist in developing and conducting the performance test scenarios and validating the results. This inspection also involved examination of selected elements of the emergency management program at SNL that included plans and procedures, and training, drills, and exercises. These activities, together with reviews of assessments and corrective actions, provided insights into the effectiveness of SSO and SNL feedback and continuous improvement systems, as well as NNSA's emergency management oversight and operational awareness activities at SNL. Although the inspection scope was expected to include a full programmatic assessment of the emergency public information element, the assessment was limited to the activities of SSO public affairs and SNL emergency public information personnel within the emergency operations center during performance tests.

Section 2 of this report provides an overall discussion of the results of this 2009 review of the SNL emergency management program elements that were evaluated. Section 3 provides Independent Oversight's conclusions regarding the overall effectiveness of SSO and SNL management of the emergency management program. Section 4 presents the ratings assigned as a result of this inspection. Appendix A provides supplemental information, including team composition. Appendix B identifies the findings that require corrective action and follow-up. Appendices C through F detail the results of the reviews of individual emergency management program elements.

2 Results

2.1 Positive Program Attributes

SSO and SNL have continued to make improvements in both the structure and implementation of the site's emergency management program. Positive attributes of the emergency management program are discussed below.

The SNL training, drill, and exercise program for the emergency response organization (ERO) is well defined and implemented. The SNL training and drill program is well established by institutional documents such as the emergency plan and emergency management training program description, which collectively convey clear requirements for training course development and proficiency maintenance. Training is being developed, delivered, and documented consistent with program requirements, and SNL has identified the need for and is developing additional training in several important areas. The drill program is extensive and provides ample opportunities for position-specific training at both the sitewide and facility level and for confirming or maintaining proficiency. In particular, the Sandia Protective Actions Notification program provides numerous opportunities for facility personnel to practice the protective measures that might be required during an emergency event. Finally, the SNL exercise program is comprehensively defined and well executed. Exercises address the relevant facilities at the appropriate frequency, are thoroughly planned and documented, and are used to verify overall program effectiveness and identify areas needing improvement.

SSO and SNL emergency management program plans and procedures form a mostly complete set of protocols for governing emergency response and program management. SSO and SNL have established emergency plans that, with few exceptions, are comprehensive, adequately describe organizational roles and responsibilities, and clearly define the various program elements and their respective concepts of emergency operations. Furthermore, the subordinate plans, processes, and procedures have continued to mature. To support these plans and processes, SSO and SNL have developed implementing procedures, guidelines, and position-specific checklists that, with the exception of some omissions related to the completion of protective measures and protective-action plans, provide adequate guidance for responders at the event scene and in the emergency operations center. Additionally, with a few exceptions, the Environment, Safety, and Health Manual establishes a comprehensive set of requirements for developing building-specific emergency plans; these plans are mostly complete, although some variations exist between facilities that have equivalent hazards, particularly with respect to the inclusion of clear procedures for completely implementing building evacuation and shelter-in-place orders.

SSO and SNL have established comprehensive mechanisms for improving the site's emergency management program, which SSO has fully implemented. SSO, with the assistance of the NNSA Office of Emergency Management Implementation (NA-43), uses a variety of effective processes to maintain awareness of and provide direction for the SNL emergency management program. NA-43 assists SSO in evaluating exercises, conducting assessments, and validating completion of SSO corrective actions. SSO meets frequently with SNL to review the status of the program, uses a comprehensive process for approving key SSO and SNL emergency documents, and utilizes contract performance measures to facilitate improvement. SSO assessments are conducted using well-defined processes, and the assessments identify improvement items. SSO has evaluated and appropriately dispositioned corrective actions from the last two Independent Oversight inspections, and SNL's corrective actions have effectively addressed all but one previous Independent Oversight findings. SNL has also recently established comprehensive processes for conducting assessments and tracking and implementing corrective actions, although, as applied to emergency management, the SNL issues management processes are relatively new and additional time will therefore be required for SNL to demonstrate their effectiveness.

2.2 Program Weaknesses and Items Requiring Attention

Various delays in categorizing and classifying the event and in issuing protective measures to site workers and the public during LSPTs detracted from the performance of the ERO, and other related concerns were noted involving the usability of emergency action levels (EALs) by the incident commanders (ICs). Specific weaknesses are discussed below.

ERO decision-makers did not consistently demonstrate effective performance in the areas of event categorization/classification and the issuance of protective measures. During LSPTs, ICs did not issue timely event categorizations/classifications or predetermined protective actions for site workers and the public. Instead of a proactive selection and implementation of the EAL (and associated protective-action plan) appropriate for the event, ICs relied on the consequence assessment teams (CATs) to first recommend an applicable EAL. Consequently, most event categorization/classification declarations were significantly delayed. More importantly, there were corresponding delays in the issuance of a comprehensive set of protective measures for site workers and the public during these postulated events because the ICs waited for the CATs to reduce the size of the predetermined protective-action zone identified in the applicable EAL. The practice of waiting for CAT input before making protective action determinations is likely a byproduct of the complexity of the EAL set and the overly conservative nature of the predetermined protective actions (discussed further below).

EALs do not adequately support effective decision-making by the ICs. The event scenarios for most of the EPHA facilities are divided into relatively broad categories (e.g., release, fire, explosion, and building collapse) sorted by affected facility, and entry into most of the facility EALs is according to inventory rather than by specific indicators associated with barrier failure analyses. This approach to EAL construction has two negative impacts on the processes for classifying events and selecting protective actions. The first is that the absence of unique event indicators as EAL entry conditions challenges the IC's ability to rapidly identify the appropriate EAL, particularly in a time-urgent environment. For example, most release EALs for the Manzano Nuclear Facility and Radioactive and Mixed Waste Management Facility do not include specific physical indicators that would be easily observable by the IC, such as a breached drum. Instead, the IC is expected to select a release EAL based on the amount of material released, which is information that is unlikely to be readily available to the IC. In addition, for some events, the IC is required to differentiate among scenario titles that appear to have very similar impacts within the area, but the EAL does not include

any guidance to assist the IC in choosing the most appropriate EAL. The second impact of the EAL approach is that the broad scenario assumptions tend to result in overly conservative predictions of event consequences. For example, the predetermined protective actions for releases inside the Manzano bunkers are the same as for those occurring outside, even though the bunkers afford a substantial barrier to release. Additionally, the event scenarios typically represent worst-case "parking lot" releases because no credit is given for any of the normal barriers to release, some of which might be present to help mitigate the event. For example, for an Annular Core Research Reactor building collapse with no fire, the protective-action zone extends approximately 19 miles because the analysis assumes that the entire facility material-at-risk is released, even though significant barriers or filtering mechanisms could be available for the most severe accidents. Ultimately, as witnessed during the LSPTs, the SNL approach to EAL construction can encourage the ICs to delay making protective action decisions until the CAT is able to provide assistance in selecting an appropriate EAL and reducing the size of the area needing protective actions, which lessens the difficulties inherent in issuing and managing protective actions over a large geographical area.

3 Conclusions

The June 2006 Independent Oversight inspection at SNL determined that the efforts of SSO and SNL managers and staff since the previous Independent Oversight inspection, conducted approximately 11 months earlier, had been successful in addressing most of the key program weaknesses and facilitating an increased level of preparedness to respond appropriately to a significant site event involving the release of hazardous material. However, the 2006 inspection determined that SSO and SNL line management attention would be necessary to ensure that ongoing, nearer-term initiatives in several important areas were completed and to sustain efforts over the long term to complete and implement the readiness assurance activities that could promote continued program improvement. This 2009 inspection found that overall, SSO and SNL are progressing in their efforts to implement a comprehensive emergency management program, but initial emergency response decision-makers continue to have difficulty in effectively issuing appropriate protective actions for site workers and the public.

Among the areas benefitting from continued attention and improvement, the training, drill, and exercise element stands out. This area was a relative strength during the 2006 Independent Oversight inspection, and SNL has continued to strengthen both the structure of this element and its implementation through the delivery of formal training, the participation of the ERO and facility personnel in the practice and proficiency opportunities afforded by numerous drills and exercises, and the administration of recordkeeping and other program requirements.

Other strengths were noted as well. SSO and SNL have continued to refine their response plans, implementing procedures, and associated position checklists that are used to guide responder actions to an emergency event, and building-specific emergency plans include provisions for implementing protective actions for facility staff, although a few inconsistencies were noted. Furthermore, in the readiness assurance area, SSO has established and implemented a more complete set of processes for executing its line management oversight function and identifying and tracking issues; SNL has effectively closed all but one finding from previous Independent Oversight inspections; and SNL has substantially improved its assessment and issues management processes, although the issues management processes are relatively new and will require time to demonstrate effectiveness.

Ultimately, the most important program attribute is the ability of the initial decision-makers to effectively assess an emergency event and quickly determine and communicate the actions needed to protect site workers and the public, and this area continues to pose a challenge to site emergency responders. The deficiencies in training, procedures, and response processes (such as offsite notifications) and the absence of sufficient experience that were largely responsible for performance weaknesses identified during the past two Independent Oversight inspections have been corrected, yet during performance tests conducted as part of this inspection, emergency response decision-makers did not consistently demonstrate the ability

to classify events and issue needed protective actions in a timely manner. The observed delays in making these decisions were due to the reliance of the IC on the CAT for assistance in reducing the extent of the predetermined protective actions (which in many cases are overly conservative and consequently difficult to implement). The choice of the correct EAL is complicated because the EAL set is complex and EAL selection can be problematic in a time-urgent environment.

Overall, the SNL emergency management program continues to improve, and the program provides an adequate degree of protection for site workers and the public, particularly given the resources and very conservative response tools that are normally available to the initial decision-makers. However, SSO and SNL line management attention is warranted to thoroughly evaluate and address any impediments, including EAL construction, to timely and accurate emergency response decision-making. SSO and SNL line management attention is also needed to sustain SNL's efforts to fully implement the revised SNL emergency management issues management processes and to demonstrate their long-term effectiveness.

4 Ratings

This inspection focused on a detailed assessment of selected emergency management programmatic elements that fall under the standard components of planning, preparedness, response, and readiness assurance that comprise a DOE emergency management program. No overall program rating has been assigned. The individual element ratings reflect the status of each SNL emergency management program element at the time of the inspection. The ratings assigned below to the readiness assurance category are specific to those assessment, corrective action, and performance monitoring mechanisms applicable to the emergency management area.

The ratings for the emergency management elements evaluated during this inspection are:

EMERGENCY PLANNING	
Hazards Survey and EPHAs	EFFECTIVE PERFORMANCE
Emergency Action Levels	NEEDS IMPROVEMENT
Program Plans and Procedures	EFFECTIVE PERFORMANCE

EMERGENCY PREPAREDNESS	
Training, Drills, and Exercises	EFFECTIVE PERFORMANCE

EMERGENCY RESPONSE	NEEDS IMPROVEMENT

READINESS ASSURANCE	
NNSA Line Program Management	EFFECTIVE PERFORMANCE
Contractor Feedback and Improvement	NEEDS IMPROVEMENT

Ratings – Purpose

The Office of Independent Oversight uses a three-tier rating system that is intended to provide line management with a tool for determining where resources might be applied toward improving emergency management. It is not intended to provide a relative rating between specific facilities or programs at different sites because of the many differences in missions, hazards, and facility life cycles, and the fact that these reviews use a sampling technique to evaluate management systems and programs. The rating system helps to communicate performance information quickly and simply. The three ratings are:

- **Effective Performance (Green)**: An emergency management element is rated *Effective Performance* if the emergency management function is effectively implemented, all applicable standards are met, and there is reasonable assurance that the program needs are met. An element is also normally rated *Effective Performance* if, for any applicable standards that are not met, other compensatory factors exist that provide equivalent protection to the site workers and the public, or the impact is minimal and does not significantly degrade the effectiveness of the emergency responders. Line managers are expected to effectively address any specific weaknesses that are identified.

- **Needs Improvement (Yellow)**: An emergency management element is rated *Needs Improvement* when the system being inspected only partially meets identified program needs or is not sufficiently mature to provide assurance that the program needs are fully met. The element is normally rated *Needs Improvement* if one or more of the applicable standards are not met and are only partially compensated for by other measures, and the resulting deficiencies in the emergency management function degrade the ability of the emergency responders to protect site workers and the public. Line managers are expected to provide sufficient attention to ensure that identified areas of weakness are effectively addressed through corrective actions and/or ongoing initiatives.

- **Significant Weakness (Red)**: An emergency management element is rated *Significant Weakness* when the element does not provide adequate assurance that the identified programs needs are met. The element is normally rated *Significant Weakness* if one or more applicable standards are not met, there are no compensating factors to reduce the impact on effectiveness, and the resulting deficiencies in the emergency management function seriously degrade the ability of the emergency responders to protect site workers and the public. Line managers are expected to apply immediate attention, focus, and resources to the deficient program areas.

APPENDIX A
Supplemental Information

A.1 Dates of Review

Scoping Visit	December 9 – 10, 2008
Planning Visit	January 6 – 8, 2009
Onsite Inspection Visit	January 26 – February 4, 2009
Report Validation and Closeout	February 24 – 25, 2009

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Chief, Office of Health, Safety and Security
William A. Eckroade, Deputy Chief for Operations, Office of Health, Safety and Security
John S. Boulden, Acting Director, Office of Independent Oversight
Steven C. Simonson, Director, Office of Emergency Management Oversight

A.2.2 Quality Review Board

Michael A. Kilpatrick
William A. Eckroade
Dean C. Hickman
William T. Sanders
Robert M. Nelson
Peter M. Turcic

A.2.3 Review Team

Steven Simonson (Team Leader)
Jeffrey Robertson
John Bolling
Deborah Johnson
Teri Lachman
David Odland
Tom Rogers

APPENDIX B
Site-Specific Findings

FINDING STATEMENTS	REFER TO PAGES:
1. The SNL Emergency Plan and response procedures do not adequately support timely identification and implementation of some sitewide protective actions, including accountability and shelter-in-place, as required by DOE Order 151.1C, *Comprehensive Emergency Management System*.	19
2. During limited-scope performance tests, SNL incident commanders did not categorize and classify events in a timely manner, as required by DOE Order 151.1C and the SNL Emergency Plan.	30
3. During limited-scope performance tests, SNL incident commanders did not promptly implement appropriate protective actions to minimize the consequences of emergencies to site workers and the public, as required by DOE Order 151.1C and the SNL Emergency Plan.	32
4. During limited-scope performance tests, consequence assessment teams did not consistently provide timely and accurate estimates of event consequences, as required by DOE Order 151.1C and the SNL Emergency Plan.	34
5. The SSO emergency response organization training requirements do not ensure that emergency response duty officers are fully trained to perform the duties of emergency manager and that SSO emergency operations center cadre members demonstrate proficiency in their assigned emergency operations center positions, as required by DOE Order 151.1C.	38
6. SNL does not prepare final reports on actual emergency responses requiring activation of the site's emergency management team, as required by DOE Order 151.1C.	40

APPENDIX C
Emergency Planning

C.1 Introduction

Two key elements of emergency planning are the hazards survey and emergency planning hazards assessments (EPHAs), which identify and assess the impact of site- and facility-specific hazards and threats and establish an emergency planning zone (EPZ). The hazards survey and EPHAs serve as the foundation of the emergency management program; consequently, their rigor and accuracy are keys to developing effective emergency response procedures and other elements of the program. The degree to which the EPHAs effectively serve this function is primarily dependent upon the completeness of the institutional processes for developing the hazards surveys and EPHAs, the effectiveness of the screening process by which hazardous materials are initially considered, and the rigor and accuracy of the analyses contained within the EPHAs.

U.S. Department of Energy (DOE) and National Nuclear Security Administration sites and facilities use the results of these hazards assessments to establish emergency management programs that are commensurate with the identified hazards. The site emergency plan defines and conveys the management philosophy, organizational structure, administrative controls, decision-making authorities, and resources necessary to maintain the site's comprehensive emergency management program. Specific implementing procedures are then developed that conform to the plan and provide the necessary detail, including decision-making thresholds, for effectively executing the response to an emergency, irrespective of its magnitude. These plans and procedures must be closely coordinated and integrated with offsite authorities that support the response effort and receive DOE emergency response recommendations.

This evaluation included a review of the Sandia National Laboratories (SNL) hazards survey and EPHAs and their treatment of hazards associated with the SNL site. Also reviewed were sitewide and facility-specific emergency plans and associated implementing procedures.

C.2 Status and Results

C.2.1 Hazards Survey and Emergency Planning Hazards Assessments

The 2006 Independent Oversight inspection found that SNL had improved the technical content of the EPHAs and their associated protective-action plans, and had established a formal mechanism to control and limit the quantities of hazardous material in facilities. Accordingly, most of the weaknesses identified during the 2005 inspection had been effectively addressed. However, the complexity of the EPHA methodology documents, EPHAs, and related output documents combined with the absence of a formalized SNL process for reviewing EPHA changes, represented significant challenges to maintaining an accurate and usable set of EPHAs. Additionally, consequence assessment team (CAT) personnel did not yet have the tools needed to generate timely initial and ongoing assessments of projected hazardous material releases. This 2009 inspection found that SNL has continued to improve the hazards survey and EPHA processes and ensured that consequence assessment personnel have the tools necessary to generate timely initial and ongoing assessments.

In response to the 2006 Independent Oversight inspection, SNL implemented processes and tools for the CAT to perform timely initial assessments (TIAs) and ongoing, real-time assessments of hazardous material

release consequences. SNL also completed implementation of an upgrade to the TIA tool. Although the TIA tool is still limited to assessing the consequences from chemical or radiological releases for worst-case and typical weather conditions, all chemical and radiological mixture files used for the consequence analyses in the EPHAs have been incorporated into the TIA tool for ease of use by the CAT. Additionally, the emergency management department hired and trained three full-time personnel as leads for the CAT, and CAT personnel conduct weekly training drills to maintain proficiency in applying EPHAs and associated documents, and their set of modeling tools – TIA tool, HOTSPOT health physics code, Emergency Prediction Information Code, National Atmospheric Release Advisory Center dispersion modeling programs – and work aids.

Since the last inspection, SNL developed revisions to the hazards survey and EPHA methodology documents to incorporate the provisions of DOE Order 151.1C and the associated DOE Emergency Management Guide (EMG). The *SNL Emergency Planning Hazards Survey Methodology Overview* document was approved during this inspection. The *SNL Emergency Planning Hazards Assessment Methodology* document is currently being revised and will include the methodology for the development of emergency action levels (EALs) and protective-action plans.

Although the hazards survey methodology document was only recently approved, SNL emergency planners used guidance contained in the draft document to revise the hazards survey to incorporate the new provisions of DOE Order 151.1C and the EMG. The hazards survey includes appropriate elements, such as contractor and Sandia Site Office (SSO) roles and responsibilities, descriptions of emergency incidents and conditions, and applicable planning and preparedness requirements. The survey also identifies onsite non-facility operations, such as storage tanks, pipelines, and onsite transportation of hazardous materials, and offsite non-facility operations with hazardous materials of concern. The hazardous material screening process properly applies the new screening criteria contained in the order.

A noteworthy feature of the process is the use of two-step screening for chemicals. Initially, consequence-based thresholds, which are based on the potential for a chemical release to result in a hazardous materials operational emergency (i.e., Alert, Site Area Emergency, or General Emergency), are used as primary quantitative screening criteria. This step ensures that hazardous materials that could cause classifiable emergencies in very small quantities, as well as multiple small quantities stored in one location, are addressed in emergency planning. Subsequently, chemicals that screen in are further screened using laboratory-scale quantity as a threshold criterion, including the one-pound threshold for extremely hazardous gases. Through the screening process, SNL has appropriately removed several facilities from the list of those requiring an EPHA. Additionally, chemicals that were previously included and analyzed in the EPHAs (e.g., silane, potassium hydroxide, sodium hydroxide) are scheduled to be removed from remaining EPHAs because they do not pose a threat to the workers or the public if released.

SNL has nine approved EPHAs for identified hazardous material facilities, including facilities with radiological and chemical hazards. The EPHAs are well organized, consistently formatted, accurately describe facility operations and specific facility systems (i.e., ventilation, fire detection and protection, safety, and alarm indicators), and, with the exception of some inconsistencies in the selection of release fractions, use an accurate method to develop source terms. These EPHAs have not been updated to reflect new DOE Order 151.1C requirements, but will be updated within the required three-year review and revision cycle. Additionally, SNL recently developed an abbreviated EPHA for the Explosives Research Laboratory and is in the process of developing an EPHA for a new facility (Auxiliary Hot Cell), both of which incorporate the provisions of DOE Order 151.1C and the EMG. Important consequence analysis outputs, such as distances to protective action criteria and thresholds for early lethality, are correctly used for EAL and EPZ development. EALs are issued for each analyzed scenario that results in a classifiable emergency, and EPHA results are correctly used as the basis for protective action distances and the minimum size of the site EPZ.

Inconsistencies were identified in the selected release fractions chosen for development of the estimated source terms for the radiological facility EPHAs. The airborne release fraction (ARF) and respirable fraction (RF) values used for release and fire scenarios were obtained from the guidance found in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, but the ARF and RF values for explosive scenarios were determined using the guidance from DOE-HDBK-3010-94, *Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*. Although the ARF and RF values obtained from DOE-STD-1027-92 are technically adequate and conservative, the use of this standard is not consistent with the recommendations of the EMG. SNL emergency management personnel previously identified these inconsistencies and developed an adequate temporary work aid for the CAT to use until the EPHAs are revised during their three-year update cycle.

To summarize, since the 2006 inspection, SNL has provided CAT personnel with the tools necessary to generate timely initial and ongoing assessments and has initiated revisions to both the hazards survey and EPHA methodology documents. SNL has also revised the site hazards survey to incorporate the provisions of the order. The hazards survey includes the expected elements and correctly screens identified hazardous materials. Notably, the screening process in the hazards survey appropriately identified several facilities that no longer require an EPHA and several chemicals that no longer require analysis in the remaining EPHAs. The EPHAs are well organized, comprehensively describe facility operations and systems, and are used to establish a technically based site EPZ and protective action distances. In their continuing effort to improve the EPHAs, SNL personnel identified inconsistencies associated with the release fractions used in source-term development for the radiological facilities. These inconsistencies will be corrected during the scheduled EPHA revision cycle and an adequate temporary CAT work aid is in place until all revisions are complete. Overall, the EPHAs establish an adequate basis for the site's emergency management program, although, as discussed in the next section, the overly conservative nature of the analyses that serve as the EAL bases diminish EAL usability by incident commanders (ICs) in a time-urgent environment.

C.2.2 Emergency Action Levels

EALs are essentially response procedures to aid decision-makers in rapidly classifying events and identifying needed protective actions, but they are a direct output of the EPHA analyses. Consequently, Independent Oversight inspection reports typically include discussions of the analytical and "usability" (as procedures) aspects of the EALs in the "EPHA" and "Response Plans and Procedures" sections, respectively. Given the difficulties in timely event classification and protective action issuance observed during the limited-scope performance tests (LSPTs), which are discussed in Appendix E, and the critical role of EALs in those tasks, Independent Oversight decided to perform an in-depth review of selected aspects of the SNL EAL set and to discuss the results of that review in a single report section that combined the analytical and usability elements.

As part of the review of progress made in improving the technical content and maintainability of the EPHAs, the 2006 Independent Oversight inspection identified that SNL had made improvements in the structure and usability of the EALs, particularly for the Sandia Pulsed Reactor, and that the gaps in EAL and, especially, protective-action plan coverage identified during the 2005 Independent Oversight inspection had been addressed. This 2009 inspection found that SNL emergency response continues to be supported by a complete set of EALs that represent the bounding consequences across a range of events at the hazardous material facilities. The EAL set appropriately addresses event classification, includes discretionary and transportation EALs, and provides a link to protective actions for the responders, workers, and the public. The inspection also revealed that SNL revised the EAL structure for the nuclear facilities at Technical Area-V in 2008 and replaced EALs based on observables within the facility (e.g., fuel cladding, loss of coolant) with event-based EALs (e.g., spills, fire, or explosion) having inventory-based entry conditions. Although the event-based

EALs developed for all of the SNL facilities include events having a wide range of possible consequences, the EALs do not incorporate observable facility parameters that would promote timely selection by the ICs and over-emphasize worst-case analyses at the expense of more likely, lower consequence events. Further, the complexity of the EALs causes difficulty in their timely use by the ICs, and their conservatism complicates the identification and implementation of appropriate protective actions.

To support event classification and the determination of protective actions during emergencies, SNL developed a series of event-based EAL tables for each of the hazardous material facilities. Each analyzed scenario in the EPHA may be represented in the facility EAL set in up to five EAL categories (e.g., release, small fire, large fire, explosion, and building collapse) that represent a spectrum of initiating events ranging from releases of small individual gas bottles within individual zones (e.g., for Building 858EF) to mid-range events (e.g., fire/explosion affecting part of the facility) to events at the low frequency, high consequence end of the spectrum (e.g., aircraft crash, building collapse). The EALs provide links to the protective actions through the identified isolation zone distance, protective-action zone distance, and protective-action plan. The EAL tables are extensive, permit entry for leaks/spills of single containers (through "Inventory-specific EALs") as well as for estimated inventory by pounds or curies (through "General EALs"), and contain a significant amount of information potentially useful to consequence assessment personnel regarding the apparent sensitivity of consequences to the amount of material-at-risk present.

However, the inspection team identified several important weaknesses in the EALs involving the degree to which they support accurate event classification and protective action identification by decision-makers in a time-urgent environment. There are two principal categories of concerns: those related to the ease of use of the EAL set by the ICs in choosing the applicable EAL (particularly for an EAL set that is extensive and complex) and those related to the appropriateness of the associated predetermined protective actions (and hence, as demonstrated during the LSPTs, the willingness of the IC to implement the listed protective actions without clarification by the CAT). Examples of the first set of concerns, ease of use by the IC, fall into three groups:

- Absence of specific event indicators. Although EPHAs describe facility operations and systems in detail, the EPHA analyses (and therefore the EALs) do not consider available facility barriers and instrumentation. For example, most "release" EALs for the Manzano Nuclear Facility and Radioactive and Mixed Waste Management Facility do not include specific indicators that would be easily observable by the IC, such as a breached drum (whether from being dropped or punctured from a handling incident). Instead, the IC is expected to select a release EAL based on the amount of material released (expressed as a percentage of the allowable facility limit or number of curies), which is information that is very unlikely to be readily available.

  As another example, although diagnosis of a fuel element failure at the Annular Core Research Reactor (ACRR) facility requires (by local response procedure) building evacuation and emergency notification of the operations center, there is no readily apparent EAL for this event. Numerous EALs for a release are available for the IC to classify this event (e.g., fire, explosion, etc.), none of which specifically applies. Additionally, all of the EALs require identification of the hazardous material involved (reactor fuel) and the quantity of material, but the entry values in the table do not represent observable amounts of material; rather, they are examples of inventory for various reactor configurations, which is information that is not available to the IC. By procedure, there are numerous alarms and indications of this event, including an elevated demineralizer radiation area monitor indication and/or elevated continuous air monitor indication following a reactor power transient (i.e., indications of fission product release to the water and the building after a transient).

- Absence of amplifying information to assist the IC in choosing from a set of apparently similar EAL event descriptions. For example, for a zone-wide event occurring in an "unknown" zone in Building 858EF, there are four possible EALs: a multi-substance fire, zone-wide explosion, zone-wide vehicle crash, and zone-wide flying debris. Each of these events could combine elements of the others, yet there are substantially different, unexplained protective action distances for these events. The EALs provide no indication that the "zone-wide flying debris" event encompasses tornados or high-wind scenarios, which result in rapid material dispersal and a substantially reduced protective-action zone.

- Absence of general application information and the presence of unnecessary information. For example, the EPHA methodology document provides detailed information for a planner regarding the construction and use of the EAL tables, but much of this information (for example, use of the general EAL table) is not included for responders in the applicable implementing procedure and supporting work aids. Further, the EAL tables contain numerous entries for hazardous materials that do not cause a classifiable event.

The second concern regarding the approach used at SNL for EAL construction is the appropriateness of most of the predetermined protective actions. Although the EALs include a wide range of accident scenarios, as discussed in Section C.2.1, the results of the EPHA consequence analyses that form the basis of the EALs typically bound all possibilities of incident initiators and contributing factors by assuming that the entire amount of potential source material is released. For example, the consequence analysis for the release scenario at the Manzano Nuclear Facilities uses the following assumptions:

- A combined ARF and RF of 1.0E-3 (taken from DOE-STD-1027-92)

- A damage ratio and leak path factor of 1.0, whether the release occurs inside or outside the bunker (even though the bunkers afford a substantial barrier to release and have only a small, natural ventilation shaft)

- 100% of the radiological material is powder

- 100% of the total quantity of material allowed in the bunker (i.e., upper limit of DOE-STD-1027-92 Hazard Category 3 quantity) is released regardless of which container is breached.

As a result, the associated EAL indicates that a General Emergency must be declared and a protective-action zone of 4,750 feet and an isolation zone of 572 feet must be implemented. To compensate for the over-conservatism of the above analysis and provide emergency responders with a range of inventory-based "events," additional consequence analyses have been performed using increments (i.e., 75%, 50%, 25%, and 10%) of the upper Hazard Category 3 limit. However, these analyses also result in overly conservative, unrealistic EALs and protective action distances and, as discussed previously, cannot be used directly by the ICs, who must instead rely on CAT personnel to obtain the nuclide composition and material form using the SNL radiological tracking system. Use of a more realistic, yet still conservative, approach to calculating the source term by crediting available barriers and using ARF and RF values taken from EMG-recommended references would result in a substantial reduction in the scope of the needed protective actions and enhanced EAL credibility.

Additionally, the scenarios typically represent worst-case "parking lot" releases because no credit is given for any of the normal barriers to release, some of which might be present to help mitigate the event. For example, the classification and protective actions for releases at Manzano are identical regardless of whether the spill occurs inside or outside the bunker, even though the bunker affords a very dissimilar leak path.

Further, for an ACRR building collapse with no fire, the protective-action zone extends approximately 19 miles and the isolation zone extends approximately one mile because the analysis assumes that the entire facility material-at-risk is released, even though (with a large portion of the facility's inventory contained in ceramic metal form or otherwise substantial primary containment and releases from the primary containments subject to significant filtering from the building rubble) there are no postulated events that could produce such a release.

Finally, some facility abnormal and emergency procedures are not well integrated with the EALs, which represents a potential source of confusion for the IC when attempting to select an applicable EAL. For the most part, facility-specific response procedures appropriately utilize available, observable indicators to drive local response actions. For example, operators at the ACRR would use indicators of a fuel element failure to diagnose its occurrence and initiate protective actions for facility personnel and, at some point, would contact the IC with this information. However, because (as mentioned previously) this event does not appear as a specific EAL entry condition, the IC would likely be confused as to EAL applicability. Similarly, in response to toxic gas alarms, Building 858EF facility response procedures direct personnel to attempt to diagnose and mitigate leaks based on available indicators and subsequently to contact the IC. Without other available facility indicators to identify the presence of fire, specific toxic gas involved, remaining confinement barriers, or status of the release, the IC is presented with significant difficulty in choosing the correct EAL from among the numerous available zone-wide, unknown event, or release EALs. In these examples, the lack of facility indicators in the EALs and the indication-specific response approach that is appropriately used in the facility-response procedures may combine to cause confusion regarding the nature of the event, ultimately delaying the site's emergency response.

To summarize, SNL has established a comprehensive set of event- and inventory-based EALs to guide the ICs in determining the categorization and classification of events. Nonetheless, the EALs are difficult to implement as constructed due to the lack of inventory information available to the IC and the general nature of the inventory descriptions. EALs do not incorporate available facility information to assist the ICs in achieving timely, accurate categorization and classification, and facility abnormal and emergency procedures are not fully integrated with emergency procedures and processes to provide smooth entry into the EALs. Further, the assumptions used in the consequence analyses result in unrealistically conservative protective actions, which becomes problematic for the ICs to quickly implement. Bounding the consequence analyses to worst-case, "parking lot" releases detracts from their usability, and, due to the relatively large number and complexity of the EALs, the ICs have become highly reliant on the CAT for support in classifying events and issuing protective actions. Consequently, classification of an operational emergency involving the actual or potential airborne release of (or loss of control over) hazardous material becomes much more difficult to consistently accomplish in a prompt, accurate manner using the current set of inventory-based EALs. The EAL weaknesses likely contributed to the difficulties observed during the LSPTs, and the associated findings identified in Appendix E are intended to encompass the EAL weaknesses identified in this section. Although the current set of EALs provide for conservative protective actions for the workers and the public, particularly given the ready availability of consequence assessment staff to provide advice to the IC, improvements are needed to ensure that decision-makers can quickly determine the appropriate event classification and protective measures.

C.2.3 Program Plans and Procedures

The 2006 Independent Oversight inspection identified that SNL had made numerous improvements in emergency management program plans, procedures, work aids, and notification processes and forms to ensure that critical, time-urgent tasks for determining and communicating protective actions and protective action recommendations were completed rapidly following a significant event. This 2009 inspection found

that SNL plans and procedures have continued to evolve and mature, and a mostly comprehensive, effective set of plans and procedures support emergency response. Nevertheless, some important weaknesses in the plan and procedures for choosing and implementing protective actions were identified.

The emergency plan provides a comprehensive description of the site's overall emergency response strategy, including the organizational assignments and responsibilities. The plan completely describes the site emergency response organization (ERO) and its functions, and addresses each response element in a separate, stand-alone section. The emergency plan also adequately describes the program's administrative elements, including program administration, training and drills, exercises, readiness assurance, and emergency public information. Although the plan is comprehensive, some responsibilities and response strategies, such as implementing accountability and sheltering on the site but away from the scene, are not clearly described.

A mostly complete set of procedures, guides, checklists, and supporting forms implement the emergency plan and govern emergency response at the scene and in the emergency operations center (EOC). At the scene of the incident, an emergency plan implementing procedure contains adequate instructions for categorization, classification, protective action determination, and notifications. Standard operating procedures and guides provide further instructions for the response to most events, including those involving fire, hazardous materials, suspicious packages, and mass casualties. In addition, a detailed operating procedure provides guidance and direction for the incident command organization. Checklists governing position responsibilities and actions support most incident command organization positions, and a detailed form with instructions for a number of events is available to guide the IC. Further, both the Kirtland Air Force Base (KAFB) fire department and the SNL protective force have appropriate procedures governing their responses to emergencies, such as fire, hazardous material releases, and security incidents. Although implementing documents are in place for most response functions, a number of weaknesses were identified. For example:

- Procedures direct the use of the protective-action plans, but instructions for formulating protective actions using the plans are limited, and one work aid for determining the downwind protective-action zone does not include an instruction for formulating the width of the downwind sector.

- A computerized tool is available to assist in developing protective actions using the isolation and protective-action zones on an electronic map; however, instructions for using the tool are not included in procedures.

- Accountability for personnel at the building or facility directly affected by the event is completed through a building sweep by the evacuation team and reported to the IC (or other emergency response personnel at the scene), but follow-up tasks to verify that accountability for personnel in other nearby evacuated facilities are not clearly addressed in procedures, checklists, or forms.

- The descriptions of the roles and responsibilities of the various ICs present during unified command for fire and security events do not always clearly address the expectations for the commanders within the unified command organization.

In the EOC, a thorough set of implementing documents deal with the response actions of each position. A procedure adequately governs EOC operation during an emergency and addresses the roles, responsibilities, and duties of EOC members, including SSO personnel. Further, standard operating procedures and checklists contain directions for the emergency director, EOC manager, EOC coordinator, operations and planning manager, and CAT members. These supporting documents adequately address the SNL concept of operating with a reduced staff for most classified emergencies (situation analysis team) and a more complete EOC activation either to support the IC or for General Emergencies. Procedures and checklists clearly implement the roles and responsibilities established in the emergency plan, which primarily involve supporting the IC.

Although EOC implementing procedures are generally complete and correctly implement the site's overall response strategy, some weaknesses were identified. While the emergency plan and procedures indicate that the emergency director has overall responsibility for the response, most critical actions are either assigned to the IC or not discussed in the plans and procedures. For example, responsibility for follow-up on implementation of ordered protective actions on site but away from the scene of the incident is not included in the emergency plan. Further, actions to validate completion of accountability or implementation of shelter in place for buildings adjacent to the scene are not clearly established in the implementing documents. Finally, notification forms and instructions address initial and update notifications, but the plan and procedures do not provide clear direction for upgrading an event, and the update notification form allows changes to be made in the protective action recommendations with emergency director approval but without involving the IC (who is given that responsibility in the plan).

The Environment, Safety, and Health Manual (Chapter 15) establishes a sound set of requirements for the preparation and implementation of building or facility emergency plans. The chapter includes planning and implementation roles and responsibilities for managers, evacuation teams, and workforce personnel, and delineates requirements for preparing emergency action plans (non-hazardous material facilities) or building emergency response plans (hazardous material facility), including expected contents. Further, an appropriate set of procedures supports implementation of these requirements through the Sandia Protective Action Notification program. Nevertheless, some specifics regarding actions for shelter in place are missing. For example, although building evacuation team members are given responsibility for implementing shelter in place, no guidance is given regarding closing windows and doors or securing ventilation. In addition, emergency action plans must include shelter-in-place instructions, but no similar requirement has been established for the building emergency response plans.

Each hazardous material facility reviewed during this inspection has an emergency response plan in place, but the plans differ in scope and some plans do not address all the required elements. Extensive plans and implementing procedures are available for Technical Area V (which includes several hazardous material facilities) and Building 858EF, including fully developed facility emergency response organizations. The radioactive waste management facilities have procedures for responding to occurrences and emergencies, including instructions for both evacuation and shelter in place, though they do not have large-scale response organizations. The contingency plan for the hazardous waste management facility addresses the identification of emergencies, evacuation, and accountability (by roll call), but not shelter in place.

Most of the buildings without hazardous material programs reviewed during the inspection also have appropriate procedures governing emergencies, though some of the procedures lack detailed steps for implementing several actions. Most procedures and processes adequately address evacuation of the buildings. Additionally, most buildings have procedures to implement shelter in place and address accountability through completion of sweeps and a rollup process that culminates with team captain reports to the IC. When addressed, shelter-in-place processes include blocking doors, bringing personnel indoors, and calls to the operations center for information and reporting; however, there are no instructions regarding operation of the ventilation systems (other than to follow directions).

Finding #1: The SNL Emergency Plan and response procedures do not adequately support timely identification and implementation of some sitewide protective actions, including accountability and shelter in place, as required by DOE Order 151.1C.

SSO has developed a mostly comprehensive emergency plan and implementing procedures to address its role in emergency response. The concept of operations for the site office and resulting roles and responsibilities

are well described in the emergency plan, which addresses all the sites under SSO cognizance. The SSO response role is primarily to monitor the SNL response, implement communications with DOE Headquarters (watch office, EOC, and managers), and provide guidance or direction for public information, including the required interfaces with Headquarters. Further, the SSO plan is supported by a detailed implementing procedure and checklists for each of the three SSO EOC positions. Nonetheless, the plan does not address DOE tenants of the KAFB, such as the National Training Center (NTC) and Office of Secure Transportation Western Command. Consequently, although the emergency response duty officer checklist includes a step to notify NTC of events that may affect it, the checklist is organized such that timely notification is not ensured.

SSO has an adequate set of memoranda of understanding (MOUs), letters of agreement, and a service agreement in place to govern mutual aid, assistance, and response from offsite organizations. For example, MOUs are in place with local hospitals to provide emergency care for contaminated, injured personnel and to participate in necessary training and drills. An interagency service agreement, which is currently undergoing review, governs the basic services provided to SNL by the U. S. Air Force Air Wing at KAFB, and a separate, more detailed MOU governs emergency response by the KAFB fire department to fires and hazardous material releases. Although the MOUs are mostly complete, two organizations that may be affected by emergency events do not have agreements addressing emergency response. The MOU with the Department of Agriculture (Forest Service) is outdated and does not mention emergency response, though Forest Service land abuts the eastern boundary of the site. Also, there is no letter of agreement or MOU governing the relationship with the NTC, although the center may be impacted by nearby emergencies.

To summarize, SNL has continued to refine its emergency management program. An emergency plan and generally comprehensive set of implementing documents govern both the administrative program and site emergency response. Roles and responsibilities are mostly well established in the plan, and implementing procedures, checklists, and guides address most critical response functions, including categorization, classification, notification, and protective actions. SSO has established a set of agreement documents with offsite organizations that adequately support nearly all emergency response activities and has developed and implemented a comprehensive emergency plan and implementing procedure. Nonetheless, SNL roles and responsibilities for implementing some protective actions, primarily affecting accountability and shelter in place for onsite populations away from the scene of the event, are not well documented. Further, instructions for using the processes and tools for developing protective-action plans need strengthening. Although improvements to plans and procedures for these areas are needed, the existing set of plans and procedures generally support effective site emergency response.

C.3 Ratings

A rating of EFFECTIVE PERFORMANCE is assigned to the area of hazards survey and EPHAs.

A rating of NEEDS IMPROVEMENT is assigned to the area of EALs.

A rating of EFFECTIVE PERFORMANCE is assigned to the area of program plans and procedures.

C.4 Opportunities for Improvement

This Independent Oversight inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are offered to the site to be reviewed

and evaluated by the responsible line management and accepted, rejected, or modified, as appropriate, in accordance with site-specific emergency management program objectives and priorities.

Sandia Site Office

- To enhance the process for implementing protective actions at offsite (off SNL), potentially impacted facilities located on KAFB (e.g., NTC), consider establishing MOUs that detail the process for notifying these facilities of the need to take protective actions in a timely manner.

Sandia National Laboratories

- Enhance the quality and completeness of EPHAs by adding additional details and ensuring that accurate and conservative mechanisms are used during the EPHA development process. Specific actions to consider include:
  - Incorporate facility operations in the development and selection of the range of accident scenarios, and establish appropriate source terms utilizing release fractions (i.e., damage ratios, ARFs, RFs, and leak path factors) that take into account facility barriers and instrumentation to attain realistic consequence analyses.
  - Incorporate accident analyses conducted in documented safety analysis and facility safety analysis documents into the consequence assessments to ensure consistency between the emergency technical planning basis and the facility authorization basis, including use of terminology in place at the facilities.
  - Establish worst-case container quantities with radiological material facility managers and perform consequence assessment analyses for these quantities rather than the upper limit of DOE-STD-1027-92 Hazard Category 3 quantities.
- Consider implementing a timelier EPHA revision schedule to attain earlier compliance with DOE Order 151.1C and correction of identified release fraction inconsistencies.
- To improve the timeliness and accuracy of event categorization and classification and formulation of corrective actions, consider revising the EAL set to make them more user friendly. Specific actions to consider include:
  - Expand the spectrum of initiating events included in the EPHAs to address specific facility operations and system and equipment configurations.
  - Include critical receptors of interest that correlate with the protective-action zone and isolation zone distances obtained from the EPHA consequence analyses.
  - Include accident event terminology consistent with that used by the facilities (e.g., fuel cladding failure, loss of coolant accident, dropped/ruptured cylinder, etc.).
  - Provide facility-specific emergency recognition indicators for EALs, including facility monitoring instruments and alarms that would be utilized in the detection and recognition of a hazardous material release.
  - Provide building- and facility-specific identification criteria, as necessary, to aid in decision making (recognition and categorization) of Operational Emergencies not requiring further classification.

  - Review and revise, as necessary, the facility emergency procedures to ensure that there is a smooth transition from facility response to abnormal and emergency events into the EALs and activation of the site ERO.

- To improve the ability of the response personnel to quickly develop protective-action plans, consider the following actions:

  - Incorporate more fully the guidance on the construction of the EALs contained in the EPHA methodology document into the procedures and work aids for developing protective-action plans.

  - Use available "key-hole" software that provides an overlay on site maps to determine areas and specific facilities that require protective actions.

  - Provide instructions and work aids for the use of these computer-aided tools in developing the protective-action plans.

  - Incorporate the revised processes in the ERO training program.

- Consider the following to enhance the processes for verifying the implementation accountability at the site:

  - Considering work load and task priority, determine the ERO position(s) that should be responsible for tracking the completion of accountability away from the event scene.

  - Incorporate the additional roles, responsibilities, and methods in the description of the site's emergency response in the emergency plan.

  - Develop additional procedures, instructions, and tools (e.g., a list of the affected buildings with checks to mark the completion of accountability and/or record follow-up actions required).

- To improve the overall understanding of unified command at the site, expand the discussion of unified command (e.g., for fire and security events) in the emergency plan and verify that the underlying procedures reflect the unified command philosophy and MOUs.

- Evaluate the following actions to improve the implementation of shelter in place:

  - Revise the Environment, Safety, and Health Manual to include instructions regarding doors, windows, and ventilations in shelter-in-place actions in both emergency action plans and emergency response plans.

  - Identify the processes necessary to secure ventilation in the buildings, particularly those near hazardous material facilities, and include the actions in appropriate site and facility procedures.

  - Identify those facilities that cannot secure ventilation and ensure that applicable procedures and work aids, particularly for the IC, include this information.

  - Develop a process for an EOC member to verify that shelter-in-place orders have been implemented in facilities required to do so.

- Consider revising the emergency plan and implementing procedures to clarify roles, responsibilities, and processes for upgrading emergency events.

APPENDIX D
Emergency Preparedness

D.1 Introduction

A coordinated program of training, drills, and exercises is necessary to ensure that emergency response personnel and organizations can effectively respond to emergencies impacting a specific facility or the site as a whole. This 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, and to provide emergency response organization (ERO) members an opportunity to practice their skills.

The Office of Independent Oversight team evaluated the training, drill, and exercise program used to support the Sandia National Laboratories (SNL) ERO. As part of the programmatic review of the training, drill, and exercise elements, the Independent Oversight team evaluated the plans and procedures that support these elements and reviewed training and proficiency records for key site emergency responders. Drill documentation and exercise reports were also reviewed for indications that they are being used effectively to enhance responder proficiency and evaluate the level of the site's response preparedness.

D.2 Status and Results

D.2.1 Training, Drill, and Exercise Program

Training and Drills

During the 2006 inspection, the Independent Oversight team concluded that SNL had fundamentally corrected the previous training and drill program weaknesses. Training requirements for each SNL ERO position had been implemented to establish initial qualifications and to maintain proficiency through annual refresher training, drills, and exercises. Additionally, an active program of drills was being used to promote improvements in performance and procedures. However, the limited-scope performance tests in 2006 demonstrated that those emergency operations center (EOC) team members who had not yet attended the practice drills were not able to use the response procedures effectively to formulate protective actions. This 2009 inspection found that SNL has continued to improve the training and drill program, numerous practice opportunities are available through drills and exercises, and SNL is progressing in its efforts to address the few elements of the training program that are referenced in the 2009 Training Plan but are not yet developed.

The SNL training and drill program is well defined by the SNL Emergency Plan, the emergency management Training and Drill Program Document, and implementing procedures. This set of program documents also incorporates germane sections of the SNL corporate Environment, Safety, and Health Manual, such as general employee training, the instructional system design process, and the Training, Education, and Development System (TEDS) database as part of the emergency management training program. Collectively, these documents establish the framework for an effective program. Specifically, to support the qualification of all personnel assigned to the ERO, the documents establish the requirements to:

- Develop the training using a systematic approach.
- Provide training that is performance based, customized to program-specific ERO positions, and based on learning objectives.
- Include a test as a final validation of satisfactory course completion.
- Assign training requirements for qualification to all ERO positions.
- Include each ERO member as a player in an annual drill, exercise, or actual event.

Training and drill program courseware and processes used to ensure that only qualified personnel are on the ERO roster are developed and implemented as described in the program requirements documents and are effectively used by assigned SNL personnel. SNL is currently improving the content of initial and refresher training courses as a result of a recently completed functional analysis of ERO positions. Lesson plans, instructor guides, and drill packages are developed and approved as required, and the contents of lesson plans are appropriate in depth and scope for the described use. Training schedules are posted, completion of training is managed using the TEDS corporate database, and training course attendance sheets and drill records are on file to support TEDS data. ERO training completion status is periodically reviewed to ensure that only qualified SNL ERO personnel are listed on the ERO roster. Finally, drill packages for monthly drills are available and contain the essential elements, such as scenario narratives, objectives, criteria, simulations, injects, and security and safety plans, to serve as a record of drill and planning activities.

SNL recently self-identified training program shortfalls and added numerous training activities to the 2009 Training Plan. SNL is developing needed training, such as consequent assessment team training, and has plans to develop other training materials to provide needed details not covered in existing courses. Other elements of the program not currently in place, but described in program documents, include the job performance requirements books and accompanying evaluator books, which are expected to facilitate a more critical evaluation of an individual's performance than the current practice of drill participation. Corrective actions for a few of these self-identified items are in the early stages of implementation, and the implementation schedule for the remaining items is not yet fully defined within the 2009 Training Plan.

Following initial qualification, SNL uses a variety of methods to provide periodic training to ERO members during the year. Periodic training comes in the form of written lesson plans and/or required reading, depending on the position, in addition to drills and exercises. In 2008, ERO refresher training appropriately focused on new EOC configuration changes and used the revised initial qualification training lesson plans. Refresher training topics for 2009 are identified in the standard operating procedure for refresher training and are primarily based on the results of the instructional system design review that are now contained in the 2009 Training Plan, soon to be scheduled for development. SNL uses a required reading process to distribute reading assignments to ERO members whenever significant procedure changes occur. This process uses an e-mail based system that requires the students to submit a reply upon completion of the assignment, and emergency management personnel monitor the status of completion.

The SNL process for providing training opportunities for offsite responders is maturing. During the past year, SNL provided many opportunities for offsite personnel to receive training on the SNL emergency response capabilities, concepts of operations, and interface issues. These opportunities came in the form of formal presentations, a tour of the EOC, exercise participation, and SNL offsite interface liaison meetings. Although records are not contained in a centralized file, as described in the offsite liaison procedure, attendance sheets and slide presentations are available at workstations of various emergency management

personnel such as instructors, the exercise director, and the offsite liaison. Additionally, an offsite interface procedure was issued in 2008 that includes requirements for SNL personnel to develop and retain training materials for training offsite responders. An associated action for this is included in the 2009 Training Plan, and completion is expected later this year.

The SNL drill program provides ample opportunities for training and maintaining the proficiency of ERO and facility personnel, and drill results are used to promote program improvements. SNL drills are provided in a number of forums, including monthly ERO drills as well as other functional, small scope, and tabletop drills. The monthly ERO drills are implemented using detailed drill packages and are used to provide periodic opportunities, scheduled through the TEDS database, for ERO member to meet annual drill participation requirements. Other drills also provide opportunities to practice or demonstrate proficiency in assigned ERO tasks. During 2008, there were 38 ERO drill opportunities, seven actual responses, and four exercises that provided practice and procedure validation opportunities. At the conclusion of drills, SNL emergency management personnel prepare written reports that describe the scenarios, responses, and opportunities for improvement identified during the drill. SNL emergency management personnel enter opportunities for improvement into the recently implemented Issues Management and Resolution System database for disposition and assignment of corrective actions.

Likewise, many drill opportunities, in the form of Sandia Protective Actions Notification (SPAN) drills, are provided at the facilities for evacuation teams and employees to practice their expected emergency response actions. In 2008, approximately 540 SPAN drills were performed. Each facility assigned to the SPAN program receives an announced and an unannounced shelter-in-place drill and an evacuation drill annually. The drills practice evacuation plans, employee assembly, facility communications with the ERO, equipment functionality, accountability procedures, and processes for closing doors and windows; however, except for trailers, shutting down facility ventilation systems is not a part of these shelter-in-place drills.

To summarize, the SNL Emergency Plan, emergency management Training and Drill Program Document, corporate Environment, Safety, and Health Manual, and subordinate procedures establish an appropriate framework for the training and drill program. Training is based on a functional analysis of the ERO positions and is comprehensive, and initial and refresher training requirements are established and include annual drill participation. Successful completion of course material is based on test scores or a performance demonstration. Drill opportunities are frequent and make use of well-developed drill packages, and reports identify opportunities for program improvements. Systems used to schedule and track the status of training completion are used and monitored to ensure that only qualified personnel are listed on the SNL ERO duty roster. Periodic training is also provided, through e-mail based training, when significant changes are made to procedures. The SNL emergency management organization also provides training to employees and evacuation teams at the facilities and offsite response organizations to help prepare them for their response tasks. SNL continues to improve the training and drill program by using the results of self-assessments, and corrective actions for these self-identified items are in the early stages of implementation or should soon be scheduled.

Exercises

The 2006 Independent Oversight inspection determined that previously identified weaknesses in the SNL exercise guide had been effectively addressed, and improvements were noted in the quality of exercise reports, evaluation of performance, and identification of improvement items. Additionally, an active program of exercises was being used to promote improvements in performance and procedures. This 2009 inspection found that the exercise program has sustained its high quality products, continues to be actively used to improve performance and procedures, and is undergoing continued improvement in a number of areas.

The SNL Exercise Program Manual establishes site requirements for the exercise program and is consistent with DOE order requirements and guidelines. Specifically, the Exercise Program Manual adequately describes the management of the exercise planning process; defines the contents of the exercise planning package; and establishes expectations for the conduct, evaluation, and follow-up of exercises. The manual also requires testing the emergency management program elements over a five-year period and includes offsite participation at least once every three years. Furthermore, the manual requires the evaluation process to include hotwashes and a critique and the evaluation results to be documented in an after-action report. Opportunities for improvement contained in the after-action report are further required to be dispositioned to promote program improvements using the Issues Management and Resolution System database.

SNL has implemented or is developing a number of program tools to meet the Exercise Program Manual requirements. To help plan exercises and ensure evaluation of all program elements and appropriate participation, SNL has developed a six-year planning schedule. The six-year schedule is used to track planned and completed exercises by facilities or transportation, hazard type, and offsite participation. SNL also is developing an exercise objective bank that enables planners to track completed objectives in order to plan future exercises and ensure appropriate scope. Participation of offsite authorities in SNL exercises is frequent because they are invited every year and are interested in being involved. Representatives from offsite authorities have participated in some form in each of the last three years.

SNL conducts many exercises during the year, thus providing more frequent program element evaluations. In preparation for the annual exercise, SNL conducts three exercises leading up to the site-level exercise. These exercises are in the form of tabletops and field exercises and use different scenarios but a similar theme. For example, two years ago the theme was hazardous materials, and last year's theme was security. In all cases, exercise packages contain the essential elements of a safe and effective exercise, such as scenario narratives, objectives, evaluation criteria, simulations, timelines, injects, and security and safety plans. SNL satisfies annual facility-level exercise requirements at all hazardous material facilities through the numerous evaluated SPAN drills, the annual exercise, and periodic drills at the 858 complex. Collectively, these drills and exercises adequately test the ERO and all facility emergency capabilities.

Exercise results are adequately collected, documented, and used to promote program improvements at SNL. Evaluator checklists, hotwashes, and critiques are used to identify program strengths and weaknesses, and results are documented in after-action reports. SNL enters opportunities for improvement into appropriate site tracking systems for evaluation and assignment of corrective actions. Furthermore, corrective actions ready for validation are added to the exercise objectives and are identified in the exercise package by their tracking number.

To summarize, through the emergency plan and Exercise Program Manual, SNL has established and implemented an effective program of exercises that meets applicable DOE order requirements and is consistent with the DOE Emergency Management Guide. Planning of exercises is effective in ensuring all program elements are evaluated over a five-year period and offering offsite participation at least once every three years. Exercise packages and after-action reports are developed as described in program documents and are used to identify program strengths and weaknesses or to validate completed corrective actions. SNL conducts frequent exercises, which are well complemented by evaluated drills at the facilities. Collectively, the exercises and evaluated drills annually test the site- and facility-level response capabilities at all hazardous material facilities. SNL continues to improve the effectiveness of the exercise program through ongoing development of an objective bank, which is used to track tested objectives, and the adoption of the recently improved issues management process.

D.3 Rating

A rating of EFFECTIVE PERFORMANCE is assigned to the area of training, drills, and exercises.

D.4 Opportunities for Improvement

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

Sandia National Laboratories

- To enhance the drill program, consider revising the drill objectives and evaluation criteria to include practice in shutting down building ventilation systems (where desirable for shelter-in-place protective actions) and expanding drill participation to include personnel responsible for operating the ventilation systems.
- To ensure that training for offsite responders is comprehensive, consider conducting a consolidated review of existing training against agreement letters with all offsite entities, updating training materials as necessary, and maintaining a central file of training materials developed for offsite responders.
- Consider developing a master, integrated schedule that captures the development of training materials identified in the 2009 Training Plan so that ERO members are afforded sufficient opportunities to complete refresher training and other training assignments during the calendar year.
- To ensure that the Building 858 complex annual exercise evaluations and corrective action processes are consistent with evaluations conducted by the emergency management department, consider adding an emergency management signatory to drill packages and reports conducted at the Building 858 complex.

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 formulating protective actions, categorizing and classifying the emergency, and notifying onsite personnel and offsite authorities. Concurrent response actions include reentry and rescue, provision of medical care, and ongoing assessment of event consequences using additional data and/or field monitoring results.

The information provided in this section is based on observations from two sets of limited-scope performance tests (LSPTs) evaluated by the Office of Independent Oversight. Each set of LSPTs involved a combined assessment of response activities by the Sandia National Laboratories (SNL) incident commander (IC) with field support staff and emergency response organization (ERO) members in the emergency operations center (EOC), security command center, and operations center (communications center located in the EOC facility). The field teams included the SNL IC, the deputy IC, hazardous materials group supervisor, and a security field lieutenant. The EOC teams included a U.S. Department of Energy (DOE) Sandia Site Office (SSO) EOC emergency manager, SSO emergency response duty officer (ERDO), SNL emergency director, SSO public affairs and SNL emergency public information (EPI) personnel, and selected EOC support staff, including a consequence assessment team (CAT).

Two operational emergency scenarios were developed for the LSPTs: a facility operational event that results in release of radiological material, and a malevolent act involving potential release of a hazardous chemical. During the first scenario, it was expected that the event would be classified as a General Emergency because of its accidental release and associated consequences, in accordance with SNL emergency action levels (EALs). During the second scenario, it was expected that the event would initially be categorized as an Operational Emergency due to the malevolent act, in accordance with SNL guidance, and later classified as a General Emergency due to the potential release of chemicals in accordance with facility-specific EALs. The LSPT scenarios, which were developed by Independent Oversight in conjunction with SNL trusted agents, were presented to the participants by SNL trusted agents to ensure scenario validity and delivery of accurate event cues.

E.2 Status and Results

In an emergency, the SNL IC provides initial direction and control of the SNL emergency response. Depending upon the nature and severity of the event, the IC is supported at the event scene by a number of organizations, including the Kirtland Air Force Base (KAFB) fire department, SNL security, and the SNL emergency response team. The IC is responsible for making key decisions regarding the safety of SNL emergency responders, event classification, protective actions for site workers, and protective action recommendations (PARs) for offsite populations. After the EOC is activated and declared operational, the IC retains responsibility for event classification and associated protective actions; the emergency director assumes responsibility for the overall emergency response. Key emergency director responsibilities are to verify categorization,

classification, and protective action determinations made by the IC, and review and approve employee notifications and press releases. The SSO emergency manager reviews the emergency director's decisions and provides concurrence or recommendations, as necessary. CAT members in the EOC support both the IC and the EOC by identifying areas that could be affected by the hazardous material release.

The 2006 Independent Oversight inspection identified that revisions to procedures and processes had improved the ability of the incident command teams and EOC teams to complete time-critical notifications. Improvements in the CAT and in EPI also benefited the performance of the emergency responders. However, because not all ERO members attended drills intended to develop proficiency in applying newly-revised SNL processes and procedures and because inconsistencies existed in procedure application, ERO performance was inconsistent, including some non-conservative protective actions and instances where news releases (and joint information center activation decisions) were either not timely or inaccurate. This 2009 inspection identified a number of positive observations including: effective performance by the ICs in implementing an incident command system; the mostly effective performance by communication coordinators in maintaining reliable communications and completing required offsite notifications; and the improved performance of public affairs personnel in issuing employee notification messages and press releases. However, Independent Oversight observed several weaknesses related to timely event categorization and classification, the ability of ICs to consistently formulate and implement timely and appropriate protective actions and PARs, and the inconsistent performance of CATs in providing timely and accurate estimates of event consequences.

E.2.1 SNL Emergency Response Organization

SNL ICs effectively demonstrated the capability to implement an incident command system and to lead the field response. ICs responded to all events and assumed command of all SNL response assets and personnel. Deputy ICs supported the IC during each response, assuming decision-making responsibility for event categorization, classification, notification, protective actions, and PARs. Additionally, ICs maintained operational control of the response at the event scenes and constantly transmitted information to the team of communication coordinators in the operations center. ICs and communication coordinators utilized repeat-backs to ensure accuracy of information. Furthermore, ICs effectively used checklists and communications equipment to maintain control of the emergency response. Incident command staff also ensured that response personnel exercised necessary precautions for personnel safety by keeping responders upwind, closely monitoring weather conditions, and periodically assessing the habitability of the command post. Lastly, mutual aid was received, routed, and staged in a safe manner.

Overall, field response personnel demonstrated familiarity with their roles and responsibilities, site protocols for implementing the SNL emergency response, and methods used to keep personnel safe. Knowledgeable personnel staffed incident command teams, including a hazardous materials group supervisor and a security group supervisor (field lieutenant) to advise the IC and manage tactical and task-level operations at the event scene. In addition, ICs developed strategic goals and tactical objectives with each response team (security, KAFB fire department, KAFB explosive ordnance disposal unit, and the emergency response team). Most field responders effectively used checklists, maps, response plans, and other resources to support assessments of the event and to develop mitigation strategies. Furthermore, security field lieutenants appropriately established and maintained traffic control points and a security cordon. Finally, all response teams demonstrated knowledge (or awareness) of appropriate use of personal protective equipment, accountability of emergency response teams, and contamination control measures.

Typically, ICs promptly requested that communication coordinators activate the CAT and the situation analysis team to support the field response. Situation analysis teams, consisting of an EOC manager, EOC coordinator, SSO ERDO, and Security captain, determined the need for additional staffing and requested activation of

the EOC. Additionally, EOC managers verified minimum staffing and declared the EOC operational; EOC emergency directors and SSO emergency managers assumed responsibility for senior leadership. Overall, emergency directors and emergency managers demonstrated effective command and control, decision-making, and leadership within the EOC. Furthermore, there was effective collaboration between emergency directors and emergency managers to maintain a strategic focus within the EOC. Lastly, periodic situational briefings ensured consistent understanding of events and response activities within the EOC.

E.2.2 Event Categorization and Classification

ICs consistently used operator aids and EALs to categorize and classify events; emergency directors and emergency managers referred to EALs to ensure understanding and confirm event classification decision-making. Form 1109, *Criteria for Operational Emergency Identification*, was used to categorize the security event scenarios (Operational Emergencies not further classified). Likewise, ICs used EALs to categorize and classify the radiological event, with assistance from the CAT; however, event categorization and classification was delayed awaiting input from the CAT. During three of the four LSPTs, ICs did not categorize and classify events within the allotted 15 minutes following receipt of adequate information to do so. Moreover, most categorization and classification decisions approached 30 minutes from the time sufficient information to categorize was available. Specific examples of how classification decision-making was encumbered are described in Section E.2.4. Lastly, the absence of an EAL that clearly applied to the security event scenario (an explosion event occurring outside the facility with the potential for adverse consequences to surrounding hazardous materials) delayed event classification following the determination by the KAFB explosive ordnance disposal unit that the suspicious item was a credible explosive device.

Finding #2: During limited-scope performance tests, SNL incident commanders did not categorize and classify events in a timely manner, as required by DOE Order 151.1C and the SNL Emergency Plan.

A contributing factor that delayed event categorization and classification is the reinforced protocol (through training, drills, and exercises) that encourages ICs to contact the CAT, which concurrently performs timely initial assessment (TIA) following incident detection and recognition, before making categorization and classification decisions.

E.2.3 Notification and Communications

With very few exceptions, communication coordinators successfully completed initial offsite notifications, update notifications, and upgrade notifications. Additionally, communication coordinators completed verbal notification to the DOE Headquarters Watch Office within 15 minutes of each emergency declaration. Further, the EOC transmitted accurate and timely situation reports to the DOE Headquarters Watch Office.

In most cases, the SNL ERO reliably maintained continuous, effective, and accurate communications among response components throughout the postulated emergencies. Communication coordinators effectively dispatched SNL response units; maintained effective and accurate communications with response components, and provided offsite organizations with timely information. Also, important information regarding significant event conditions and assigned tasks to ERO members was displayed in the EOC (i.e., plasma displays, visual maps of SNL, and manual display of event status and action tracking). However, equipment difficulties associated with operating the IC's laptop computer and the wireless communication device resulted in delays and gaps in receiving information from the CAT.

Communication coordinators effectively demonstrated timely recall of the ERO using the paging system. In addition, communication coordinators consistently made timely notifications to site employees using the

tone alert radio system and the supplemental telephone dialing system; however, Independent Oversight observed some weaknesses related to the notification of the National Training Center (NTC) employees. ERDOs made initial event notification to NTC (60 minutes and 50 minutes after the release occurred on day one and day two, respectively); nevertheless, the protracted time for initial event notification did not support timely implementation of protective measures at the facility. Further, day-one communication coordinators recognized the need to notify NTC employees to implement protective actions and requested security police officers to assist with shelter-in-place notifications (completed one hour after receiving the initial 911 call reporting the event); however, SNL responders did not pursue a similar course of action during day two and follow-up with communication coordinators revealed uncertainty regarding the method by which NTC would receive the shelter-in-place order. Lastly, ERDOs did not provide any follow-up or updated protective action messages to NTC.

SNL EPI personnel diligently followed position-specific checklists and maintained expected communications between the EOC EPI officer and the media relations center. Additionally, the SSO public affairs officer quickly established initial contact with the National Nuclear Security Administration Office of Public Affairs and made required notifications. Further, the review and approval process for employee messages and news releases was consistent, well documented, and identified and corrected inaccuracies in draft news releases. Misinformation, introduced as part of the LSPT scenario, was promptly investigated and corrected. The joint information center was activated immediately upon declaration of a General Emergency and when significant media interest was anticipated.

SNL EPI staff effectively completed important tasks such as the development of accurate and informative employee notification messages and news releases. EPI staff use a flow diagram that identifies the review and approval process for all employee messages and news releases. The issuance of employee messages was timely; however, in one case the initial news release was not issued until 90 minutes after the Operational Emergency was declared. EPI personnel did not use available "fill-in-the blank," pre-approved news releases, and, as a result, news releases contained some specific event information but their issuance was slowed by the information gathering and review/approval processes. Furthermore, although news releases were informative, in one instance, when the event was upgraded from an Operational Emergency not further classified to a General Emergency, the event description in the second news release was essentially the same as the initial news release. The second news release did not explain what changed (suspicious package was determined to be a credible bomb threat with the potential for a hazardous material release) other than the classification.

E.2.4 Protective Actions and Protective Action Recommendations

ICs appropriately ordered ad hoc protective measures before event categorization and classification at the radiological event scene, typically after reviewing the initially recommended EAL and its protective -action zone and isolation zone. However, Independent Oversight observed some weaknesses related to implementation of initial onsite protective actions for the security scenario. For example:

- Response personnel used conflicting building evacuation distances and/or outdoor evacuation distances for blast effects. During the day-one security scenario, the security lieutenant used a 1000 feet outdoor distance, the IC used 1850 feet, and the CAT used 1200 feet. Eventually, all field responders used the more conservative 1850 feet outdoor distance, which required some security police officers to be relocated to a safe distance beyond their initial cordon points.

- During the day-two security scenario, ICs used Form 1103, *IC Response Aid – Suspicious Item*, to derive a bomb blast stand-off distance of 1000 feet, rather than the more conservative 1850 feet

specified by the Department of the Treasury and the Bureau of Alcohol, Tobacco, and Firearms. Also, ICs did not initially consider evacuation of buildings adjacent to the credible device.

- During the day-one security scenario, the security lieutenant and IC did not secure the use of radios and cellular phones in close vicinity of the credible explosive devices (300 feet default value in accordance with the applicable procedure).

- During the day-two security scenario, the security lieutenant secured the use of radios, but used a 100-foot radius from the device, instead of the default value of 300 feet.

Typically, ICs and emergency directors formulated a course of action based on their current knowledge of the event situation; however, Independent Oversight observed some weaknesses related to execution of responsibilities and situational awareness. The most significant issue involved protective actions for which the IC and EOC did not conduct any follow-up to determine implementation status. Specifically, personnel evacuation and accountability was not tracked and verified, and the order to shelter in place was not tracked to ensure completeness or verify the status of building ventilation systems.

Lastly, ICs delayed initial protective action and PAR decision-making while waiting for the CAT to concurrently complete a TIA using current meteorological data and revise the protective-action plan specified by the EAL. This practice resulted in the IC being highly reliant on the CAT for support in classifying events and determining protective actions, which impeded timeliness (particularly when the CAT output was delayed). For example:

- During the day-one radiological scenario, the classification and protective actions were determined and transmitted to the communication coordinator 28 minutes after the event was identified and understood by the IC.

- During the day-two security scenario, there was a 20-minute lag between the agreement to classify the event as a General Emergency and the order implementing the revised protective actions.

- During the day-two radiological scenario, the classification and protective actions were determined and transmitted to the communication coordinator 32 minutes after the information needed to classify the event was available.

- During the day-two security scenario, the initial categorization was declared 27 minutes after the suspicious package was reported. However, ICs did not recognize the threat presented by the explosive device near chemicals in the area of Building 858EF for 55 minutes following the Operational Emergency declaration and, consequently, they did not identify an EAL and protective actions until classification was recommended by the CAT and then accepted by the IC without review.

Finding #3: During limited-scope performance tests, SNL incident commanders did not promptly implement appropriate protective actions to minimize the consequences of emergencies to site workers and the public, as required by DOE Order 151.1C and the SNL Emergency Plan.

E.2.5 Consequence Assessment

CAT personnel, located in the EOC, demonstrated knowledge of their required tasks, including the need to support other key activities such as event classification and protective action decision-making. As event

information became available, CATs developed dispersion plume plots using a variety of dispersion modeling programs, meteorological monitoring systems, and information provided by ICs and EOC staff regarding the amount of material at risk. CAT personnel effectively used and followed their position-specific checklists and operator aids.

One CAT accurately computed and correctly assessed onsite and offsite consequences of hazardous material releases and demonstrated proficiency using Emergency Prediction Information Code (EPICode), HOTSPOT health physics code, and National Atmospheric Release Advisory Center (NARAC) dispersion modeling programs. For example:

- During the radiological scenario, the TIA of the consequences of the spill release was quickly and effectively generated; the CAT completed timely ongoing consequence estimates for the spill release of the radiological materials, consistent with the accuracy of the input data; and CAT personnel verified EAL and protective action decision-making.

- HOTSPOT was used to obtain a more accurate plume plot projection than the TIA tool and was further refined using NARAC, and the CAT-calculated ground surface deposition plume projections to assist in field monitoring endeavors.

- During the security scenario, a TIA of the consequences of an explosive release was made in a well-timed, effective manner; the CAT determined protective-action zone and isolation zone distance estimates for the potential release of the hazardous materials; and when actual chemical source term data was obtained, modelers used EPICode and NARAC to obtain a more accurate plume plot projection than that available from the TIA tool.

However, performance was inconsistent between the two CATs, and the performance of the second team was marked by several weaknesses. For example:

- During the radiological scenario, the CAT developed a TIA (using the TIA tool) for the consequences of a spill release; however, this information was not supplied to the IC. Additionally, the TIA identified that protective actions could be significantly reduced and a different protective-action plan used, but this information was also not communicated to the IC and EOC. Furthermore, the CAT used different wind speeds and directions for each of the analyses performed rather than using the meteorological conditions at the time of the release.

- During the security scenario, the first TIA was not made until 75 minutes after the CAT reported to the EOC due to the difficulty identifying an EAL that would bound or represent the event, likely because there are no analyzed facility explosion events for explosions occurring outside the facility. In addition, although silane was identified as a concern, actual silane inventory data was not obtained and analyzed for potential consequences.

- During the security scenario, the CAT did not determine in a timely manner the distance estimates for the protective action and isolation zones for the potential release of hazardous materials; consequently, the IC based protective action decision making on distances seven times greater than considered necessary (17,900 feet versus 2,400 feet and 11,500 feet versus 1,400 feet for the protective-action zone and isolation zone, respectively). In addition, the CAT did not complete a more accurate plume plot projection other than the TIA tool, using EPICode and NARAC assessments, at the time the LSPT was terminated (one hour after hazardous material information was available for use in ongoing assessments).

Finding #4: During limited-scope performance tests, consequence assessment teams did not consistently provide timely and accurate estimates of event consequences, as required by DOE Order 151.1C and the SNL Emergency Plan.

E.3 Conclusions

During LSPTs, Independent Oversight observed the response of two sets of SNL ERO personnel to two postulated emergency events. ICs demonstrated effectively their ability to implement an incident command system and lead the field response. Likewise, emergency directors and emergency managers demonstrated effective command and control, decision-making, and leadership within the EOC. With a few minor exceptions, communication coordinators quickly and accurately completed all offsite notifications. In most cases, public affairs staff effectively completed important tasks such as the issuance of accurate and informative employee notification messages and news releases. However, ICs demonstrated several weaknesses in declaring emergencies and implementing protective actions. During three of the four LSPTs, ICs required almost 30 minutes to categorize and classify events following their awareness of sufficient information to perform these tasks. More significantly, ICs delayed the implementation of predetermined protective actions and PARs while waiting for the CAT to complete the TIA and revise the protective-action plan specified by the EAL. To a large extent, these response weaknesses reflect the content and complexity of the EALs and the overly conservative nature of the predetermined protective actions, as discussed in Section C.2.2, and the IC workload challenges posed by the implementation of protective actions over a large geographic area. Further, performance was inconsistent between the two CATs, and timely, accurate estimates of consequences were not provided by one CAT. Collectively, the various response weaknesses described in this section indicate that for an actual event, there is reduced assurance that SNL emergency responders can appropriately protect site workers and the public.

E.4 Rating

A rating of NEEDS IMPROVEMENT is assigned to the area of Emergency Response.

E.5 Opportunities for Improvement

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

Sandia Site Office

- To enhance the ERO's ability to accurately classify events and select appropriate protective actions, consider instituting a formal requirement that the SSO ERDO or emergency manager understand the logic for EAL and protective action selection.

Sandia National Laboratories

- To improve event classification and protective action decision making, consider the following:
  - Provide EALs for emergency planning hazards assessment facility explosions that occur outside the facility.
  - For malevolent acts involving potential vehicle bombs or explosive devices that do not involve the potential for a hazardous material release, use the evacuation distances developed by the Department of the Treasury and the Bureau of Alcohol, Tobacco, and Firearms.
- Consider building upon existing ERO knowledge of the *Emergency Response Guidebook* by providing training in its use in making event classification determinations and formulation of protective actions. As part of the training, provide information on hazardous materials transported within SNL and then drill responders on different types of hazardous material releases.
- To improve event classification, protective action decision making, and consequence assessment functions, evaluate the need for additional training and more frequent drills and exercises that include the following:
  - Objectives that reinforce the need for timely event recognition, categorization/classification, and initial protective actions based on the conservative estimates implicit in the EALs.
  - Objectives for applying bomb blast standoff charts for selecting safe shelter and standoff distances.
  - Periodic joint exercises with security, facility operations, and emergency management assets.
  - Scenarios that represent typical operations (such as during hazardous material transportation, delivery, operations, and waste accumulation and disposal); make use of bomb blast standoff charts for use in selecting safe shelters; have the potential for a hazardous material release from an explosion or a spreading fire; and require time-sensitive employee notifications.
- Consider the follow actions to achieve consistent CAT performance.
  - Identify, define, and document the prerequisite qualifications and training topics for all individuals expected to perform as CAT members.
  - Ensure training topics address all the tools used to perform the consequence assessment function.
- During some drills and exercises, for positions such as consequence assessment and ERDO where a group of individuals typically respond, consider restricting participation to only the number of official roster positions to permit evaluating individual proficiency as well as performance with minimum staffing.
- Consider expediting the implementation of WebEOC and the use of electronic event status boards to strengthen information management during drills, exercises, and actual emergency responses.

APPENDIX F
Readiness Assurance

F.1 Introduction

Emergency management program administration includes elements of readiness assurance as well as performance of some planning and response functions. Readiness assurance activities ensure that emergency management program plans, procedures, and resources of the Sandia Site Office (SSO) and Sandia National Laboratories (SNL) will facilitate an effective response to an emergency at the site. Readiness assurance activities include implementation of a coordinated schedule of program evaluations, appraisals, and assessments. Key elements of the readiness assurance program include the active involvement of National Nuclear Security Administration (NNSA) line organizations in monitoring program effectiveness, implementing self-assessment programs, and ensuring timely corrective actions are taken for identified weaknesses. U.S. Department of Energy (DOE) field elements also have direct responsibility for performing some emergency response activities, including oversight of the site's emergency response and activities related to the release of emergency public information to site workers and the public.

This inspection examined the processes by which SSO provides guidance and direction to and maintains operational awareness of the SNL emergency management program. The inspection included reviews of SSO emergency management program assessment processes and SNL emergency management self-assessment and issues management processes.

F.2 Status and Results

F.2.1 NNSA Line Program Management

In 2006, Independent Oversight found that SSO had continued to improve its ability to provide line management oversight and direction to the SNL emergency management program. However, the SSO emergency response organization (ERO) training and qualification program and corrective action management process required additional effort to ensure effective implementation. In addition, newly improved and implemented processes needed time to mature to enable SSO to demonstrate effective performance across its emergency management line oversight function. This 2009 inspection found that SSO assessment and issues management processes have matured and that SSO continues to enhance their ability to provide line management oversight and direction to SNL. However, some weaknesses are still noted in the SSO ERO training and qualification program.

The NNSA Office of Emergency Management Implementation (NA-43) provides active oversight of the SSO and SNL emergency management programs through a variety of mechanisms. NA-43 activities include participating in the SSO weekly emergency management steering committee meetings and assisting SSO in evaluating exercises, conducting assessments, and validating completion of SSO corrective actions. In addition, NA-43 participates in the development and evaluation of emergency management performance measures in the SNL Performance Evaluation Plan. NA-43 is also in the process of implementing the recently approved functional management plan for emergency management, including finalizing a draft assessment and review schedule for the NNSA sites and preparing a self-assessment procedure.

SSO uses varied and effective processes for routine monitoring of the SNL emergency management program. SSO meets with SNL frequently to review the status of the emergency management program and to discuss current actions and issues as well as to ensure that any unresolved emergency management issues are raised to the appropriate level of management for attention. Additionally, SSO has implemented a comprehensive process for review and approval of key SSO and SNL emergency management documents that includes the use of specific review criteria by Facility Representatives, and other subject matter experts, to perform technical document reviews and ensures transmittal of approved documents to DOE Headquarters. Further, SSO successfully uses the SNL Performance Evaluation Plan to continually improve the quality of the SNL emergency management program through performance objectives that have appropriately evolved from more general performance incentives designed to encourage development of a minimally acceptable emergency management program to more tailored performance measures designed to enhance specific areas of the program.

SSO has established and implemented a comprehensive process for performing assessments of the SNL and SSO emergency management programs, and several issues that will lead to useful improvements have been identified through these assessments. SSO uses detailed procedures that describe the process for performing assessments and prepares an emergency management oversight plan and schedule annually that include a suitable mixture of formal assessments, routine oversight activities, and assessment of the effectiveness of the contractor assurance system. In addition, SSO assessments document the specific evaluation criteria and objective evidence that were used to determine whether criteria were met or not met and often include the degree that requirements are implemented as stated in procedures and plans. Further, SSO identified several issues during their assessments that required corrective actions as well as verified the effectiveness of corrective actions implemented for issues identified during previous assessments.

SSO has implemented a generally comprehensive issues management process that ensures corrective actions are effective and will prevent recurrence of findings. The SSO procedure on managing corrective action plans includes tracking of corrective actions, validation that corrective actions have been completed, and verification that the corrective actions have been effective. Additionally, SSO identified several issues during assessments of SNL and self-assessments, in addition to the numerous opportunities for improvement (OFIs) noted by SSO during their evaluations of SNL exercises. Furthermore, corrective actions for most OFIs identified by SSO during exercise evaluations, along with the findings and observations from assessments of SNL, are tracked in the SSO corrective action tracking system, Pegasus, as required. However, inconsistencies were noted in the timeliness of exercise evaluation input provided to SNL and in the tracking of corrective actions. The SSO procedure for exercise evaluation and feedback does not include a timeframe for submittal of SSO exercise evaluation input to SNL, and a few SSO exercise evaluation reports were provided to SNL three to four months after the exercise was completed, which lessens the effectiveness of the feedback. In addition, the SSO procedure on exercise evaluation and feedback contains conflicting statements regarding whether all SNL OFIs are tracked to closure in Pegasus or only those OFIs that were not self-identified by SNL. Further, SSO did not track two out of the three findings identified in SSO self-assessments in Pegasus, which is a weakness that was noted in the 2006 Independent Oversight inspection report. However, SSO did effectively resolve the issues noted in these two findings that were omitted from Pegasus.

SSO was actively involved in the closure of findings identified in the 2005 and 2006 Independent Oversight inspection reports. SSO validated that all of the corrective actions for the findings identified in these two inspection reports were completed and determined that the corrective actions for all but one of the findings had been effective. For that finding (a 2006 finding related to implementation of integrated SNL emergency management self-assessment and issues management processes), SSO appropriately concluded that more time was required to determine whether corrective actions had been effective. However, a few weaknesses were

noted in the closure of corrective actions and in the adequacy of the effectiveness review for one finding, although their impact on the eventual closure of the associated issues was minimal. Two corrective actions were closed by SSO before the corrective actions had been completed: SSO closed a corrective action related to a 2005 finding related to hazardous material inventory limits 13 months before SSO agreed that sufficient actions had been taken by SNL to improve the Chemical Information System, and a corrective action to develop an integrated public information and education program plan was closed six months before the plan was finalized and published. Additionally, with the exception of the last corrective action for each finding, SSO closed all corrective actions from the 2006 Independent Oversight inspection that were still open on February 1, 2007, in the DOE Headquarters Corrective Action Tracking System (CATS) and included a statement that these actions would be tracked locally by SSO in Pegasus. This practice impacted the visibility at the DOE Headquarters level of progress on closing corrective actions and is contrary to DOE Orders 414.1C and 470.2B. However, all of these corrective actions were tracked by the SSO emergency management steering committee and were subsequently completed, although not all of the actions were tracked in Pegasus as is stated in the Headquarters CATS. Finally, the effectiveness review for a 2005 finding related to the adequacy of SNL procedures was determined through observation of a single drill by SSO. Given the large number of changes made by SNL to key decision-making processes to correct this finding, a more in-depth effectiveness review was warranted.

SSO has established generally appropriate initial training and proficiency requirements for their ERO members. SNL provides initial training for the SSO ERO, which includes a suitable mix of courses and a demonstration of proficiency before being added to the ERO roster. Further, all SSO ERO personnel have completed all initial training and have performed an initial demonstration of proficiency. However, inconsistencies exist between the SSO and SNL lists of qualified SSO ERO members, and weaknesses were noted in training requirements and annual demonstrations of proficiency. The SSO Emergency Plan states that both SSO and SNL maintain the qualification status of the SSO ERO, and numerous discrepancies were noted between the separate lists of qualified SSO ERO personnel maintained by SSO and SNL. The SNL list does not include two SSO emergency managers, two SSO emergency response duty officers (ERDOs), and four SSO public affairs officers who are fully qualified. Conversely, another SSO emergency manager is currently not available for ERO duty and is delinquent in the annual exercise participation requirement, but is listed as qualified on the SNL list. Additionally, while ERDOs may perform the duties of the emergency manager in their absence from the emergency operations center, the ERDOs are not required to have equivalent training or demonstrate proficiency as an emergency manager. Further, SSO does not require an annual demonstration of proficiency for their ERO members, as required by DOE Order 151.1C, but instead requires annual participation in a drill, exercise, or real-world event or allows observation of another ERO member performing the duties of the position to suffice as meeting the annual participation requirement.

Finding #5: The SSO emergency response organization training requirements do not ensure that emergency response duty officers are fully trained to perform the duties of emergency manager and that SSO emergency operations center cadre members demonstrate proficiency in their assigned emergency operations center positions, as required by DOE Order 151.1C.

To summarize, NA-43 frequently interacts with SSO and provides assistance with exercise evaluations, assessments, and validation of completed SSO corrective actions. SSO effectively uses several processes to monitor the SNL emergency management program; SSO also conducts thorough assessments and identifies issues requiring corrective action by both SNL and SSO and uses a detailed issues management process to track corrective actions identified through assessments and exercise evaluations. In addition, SSO validated the closure of all corrective actions for the findings identified in previous Independent Oversight inspection

reports and appropriately determined that additional time was needed for one finding to ascertain whether corrective actions had been effective. Additionally, training requirements are established for the SSO ERO, and all personnel have completed their initial training and demonstration of proficiency. However, SSO did not provide a few exercise evaluations to SNL in a timely fashion and closed a few corrective actions prematurely, and, in one instance, the depth of the effectiveness review for a finding related to SNL procedures was not commensurate with the extent of the corrective actions. Finally, several weaknesses were noted in the SSO ERO training including differences in the SSO and SNL lists of qualified personnel, the absence of training provided to ERDOs on the emergency manager duties they may have to perform, and the absence of a requirement for an annual demonstration of proficiency. Notwithstanding these weaknesses, NNSA is providing effective line management oversight of the SNL emergency management program.

F.2.2 Contractor Feedback and Improvement

The 2006 Independent Oversight inspection identified that SNL had thoroughly analyzed the emergency management program following the previous inspection, SNL senior managers had been engaged in corrective action implementation, and most of the corrective actions either had been completed or were well under way. Additionally, SNL had improved their ability to track issues and implement corrective actions to make program improvements. Nevertheless, SNL had not fully implemented self-assessment or issues management programs and supporting systems to address sitewide, cross-cutting issues affecting emergency management. This 2009 inspection found that SNL performs comprehensive assessments of the emergency management program and recently established a significantly improved process to track issues and implement corrective actions. However, newly implemented lessons-learned processes need time to mature to enable SNL to demonstrate effective performance, and SNL did not capture and share valuable feedback and improvement opportunities from actual emergencies that occurred over the last two years.

SNL has effective processes in place to keep SNL and SSO senior managers informed about the emergency management program. Frequent meetings are held with SNL senior managers to review the status of the emergency management program and discuss current actions and issues. In addition, formal progress updates on the SNL emergency management performance objectives are provided frequently to both SNL and SSO senior managers. Further, SNL prepares an annual Emergency Readiness Assurance Plan that accurately communicates the readiness status of the SNL emergency management program and any associated issues.

SNL has established and implemented a generally effective process for conducting self-assessments. The SNL emergency management self-assessment process properly requires that assessments be performed by competent personnel and be based on specific evaluation criteria, that the information that was reviewed be documented, and that issues identified during an assessment be categorized based on significance. Further, SNL uses a combination of mechanisms to satisfy emergency management self-assessment requirements including management assessments, surveillances, and exercise evaluations. In addition, most assessments and surveillances are conducted using appropriate evaluation criteria, and a substantial number of program and performance weaknesses were identified during the last two years. Furthermore, the majority of assessments included a review that requirements are implemented, in addition to ensuring that requirements are captured in the appropriate documents and the effectiveness of previously-implemented corrective actions were verified during some of the assessments. However, documentation of objective evidence is only required for criteria that are determined to be not met, and several assessments conducted in 2008 did not document any objective evidence.

SNL has established comprehensive issues management processes. The SNL corporate-level issues management process appropriately requires root cause analysis for high-risk findings, formal change control

for corrective actions, and objective evidence that supports the closure of corrective actions. Additional requirements for the resolution of emergency management issues are captured in a recently issued procedure and the new Issues Management and Resolution System (IMaRS) that now makes the emergency management process consistent with the corporate-level process and addresses past weaknesses in how corrective actions were developed, tracked, and closed. However, most of the corrective actions that have not been completed are overdue, ranging from one month to six months, which is an issue that was also noted in the 2006 Independent Oversight inspection report. Finally, most weaknesses and observations identified in the August 2008 annual exercise do not yet have corrective actions developed, contrary to the 30 working day requirement in DOE Order 151.1C. Implementation of the new issues management procedure and IMaRS began too recently to determine whether the new issues management process will correct the previously identified weaknesses; however, full implementation and compliance with the new procedure and IMaRS should lead to a robust issues management process in full compliance with the corporate-level process.

The SNL emergency management program has developed a lessons-learned program, although implementation has been very limited. SNL published a comprehensive lessons-learned procedure that provides detailed instructions on collecting and sharing external lessons learned and preparing and distributing internally generated lessons learned resulting from training, drills, and actual responses. Additionally, several externally generated lessons learned have been shared with the SNL emergency management staff. However, although the lessons-learned procedure was implemented in March 2008, SNL is still developing a lessons learned on a significant error in the hazardous materials screening methodology that was discovered by SNL in late 2007, which minimizes the effectiveness of the information in preventing a similar error at other DOE sites. More significantly, SNL has not prepared final emergency reports for transmittal to DOE Headquarters after Operational Emergencies have occurred. Two Operational Emergencies (not requiring further classification) were declared at SNL during the last two years. One emergency involved an inhalation of an unknown chemical by a worker, and a wildland fire caused the other emergency. SNL prepared a written critique for the inhalation Operational Emergency, but the critique only covered the incident command activities and was not transmitted to SSO or DOE Headquarters as required. A written critique was not prepared for the wildland fire Operational Emergency. In addition, SNL procedures do not include the requirement to ensure a final emergency report is prepared and transmitted to SSO that includes a summary of events, the response actions taken, lessons learned, and planned emergency management system changes. As a result, the feedback and improvement opportunities from these two actual events were not captured and shared with the rest of the SNL ERO or the DOE community.

Finding #6: SNL does not prepare final reports on actual emergency responses requiring activation of the site's emergency management team, as required by DOE Order 151.1C.

To summarize, SNL uses effective methods to keep senior management apprised of the status of the SNL emergency management program and prepares an annual Emergency Readiness Assurance Plan to communicate the status of the SNL emergency management program and any associated issues. SNL has established and implemented a generally effective process for conducting self-assessments through a combination of management assessments, surveillances, and exercise evaluations. In addition, SNL has recently established a comprehensive issues management process that is consistent with corporate-level processes through a detailed procedure and introduction of IMaRS. SNL also established a formal lessons-learned program by publishing a comprehensive lessons-learned procedure. However, several self-assessments conducted in 2008 did not document any objective evidence, most of the open corrective actions are overdue, and corrective actions have not been developed for most of the weaknesses and observations noted during the August 2008 annual exercise. Finally, SNL did not capture or share the lessons learned gained by discovery of a screening methodology error or feedback and improvement opportunities from two

Operational Emergencies that occurred at SNL. While progress has been made by SNL to improve their lessons learned and feedback and improvement mechanisms, and many positive aspects of this element were noted, additional time is needed for the new SNL emergency management issues management processes to mature to confirm that the various weaknesses noted in the closure of corrective actions over the last two years have been addressed and to demonstrate the long-term effectiveness of these new processes.

F.3 Ratings

A rating of EFFECTIVE PERFORMANCE is assigned to the area of NNSA line program management.

A rating of NEEDS IMPROVEMENT is assigned to the area of contractor feedback and improvement.

F.4 Opportunities for Improvement

This Independent Oversight inspection identified the following OFIs. These potential enhancements are not intended to be prescriptive. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management and accepted, rejected, or modified, as appropriate, in accordance with site-specific emergency management program objectives and priorities.

Sandia Site Office

- Enhance the effectiveness of SSO oversight processes in achieving improvements in the emergency management program. Consider the following actions:
  - Establish and implement a timeframe for SSO to provide exercise evaluations to SNL.
  - Clarify corrective action tracking requirements for OFIs identified by SSO in exercise evaluations.
- Improve the SSO corrective action processes through consideration of the following specific actions:
  - Integrate and track corrective actions for weaknesses and observations identified by self-assessments with corrective actions resulting from SNL assessments, external assessments, and exercise evaluations.
  - Close corrective actions based only on programs or documents that are approved and implemented.
  - Ensure that the status of corrective actions is accurately reported in DOE Headquarters CATS.
- Consider increasing the depth of effectiveness reviews to include a series of observations of performance for findings related to key decision-making tasks.
- Continue to enhance the ability of SSO ERO members to perform their roles during an emergency event. Specific actions to consider include:

  - Add ERDO training and demonstration of proficiency requirements that encompass the SSO emergency manager responsibilities they may perform.
  - Document the acceptable methods for accomplishing the annual demonstration of proficiency.
  - Designate a single responsible entity for tracking the qualification status of the SSO ERO.

Sandia National Laboratories

- Strengthen the procedure that specifies the expectations for the conduct of assessments. Specific attributes to consider are:
  - Additional written guidance and training to assessors on the application of evaluation criteria, the standards of acceptable performance, and the expected level of detail for assessment reports
  - An emphasis on using performance-based assessments whenever possible
  - A set of approved evaluation criteria that are clearly identified in assessment plans and reports
  - Documentation in the assessment reports of the objective evidence that was used to determine whether evaluation criteria were met or not met.
- Enhance the SNL issues management processes through consideration of the following specific actions:
  - Specify due dates for developing and entering corrective actions into IMaRS for OFIs identified during exercises.
  - Emphasize the timely completion of corrective actions.
  - Close corrective actions based only on programs or documents that are approved and implemented.
- To strengthen feedback and improvement opportunities within the SNL ERO and DOE community, consider conducting a critique at each emergency response venue after an Operational Emergency, and prepare a final emergency report that includes: a summary of events and actions taken at each emergency response venue, lessons learned, and issues identified for corrective action.
- To improve the effectiveness of the emergency management lessons-learned process, consider analyzing for trends in drill and exercise and program deficiencies to help develop lessons learned, and ensure that lessons learned are communicated appropriately to all cognizant personnel, including the DOE community.