

Summary Report

Inspection of
Environment, Safety, and Health
and Emergency Management
at the

Lawrence Livermore National Laboratory



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

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Abbreviations Used in This Report

DOE	U.S. Department of Energy
EM	DOE Office of Environmental Management
EPI	Emergency Public Information
EPID	Emergency Plan Implementing Procedure
ES&H	Environment, Safety, and Health
FY	Fiscal Year
ISM	Integrated Safety Management
IWS	Integrated Work Sheet
LLNL	Lawrence Livermore National Laboratory
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
OA	Office of Independent Oversight and Performance Assurance
OAK	Oakland Operations Office
PMP	Project Management Plan
R&D	Research and Development
UC	University of California

OVERSIGHT

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an inspection of environment, safety, and health (ES&H) and emergency management programs at the U. S. Department of Energy (DOE) Lawrence Livermore National Laboratory (LLNL) in June 2002. The inspection was performed as a joint effort by the OA Office of Environment, Safety and Health Evaluations and the Office of Emergency Management Oversight.



Aerial View of LLNL

Background

The National Nuclear Security Administration (NNSA) Office of the Deputy Administrator for Defense Programs is the cognizant secretarial office for LLNL. As such, it has overall Headquarters line management responsibility for programmatic direction, funding of activities, and ES&H at the site. The DOE Headquarters Office of Environmental Management (EM) is responsible for directing and funding certain activities at LLNL, including waste management. At the site level, DOE line management responsibility for LLNL operations and safety falls

under the Oakland Operations Office (OAK) Assistant Manager for National Security. LLNL is operated by the University of California (UC), under contract to DOE. As a multiprogram laboratory, LLNL receives funding for research and development (R&D) programs from various sources, including NNSA, EM, other DOE program offices, various United States agencies, and commercial industry.

In accordance with the changes in line management directed by the NNSA Administrator in March 2002, OAK is planning for a reorganization of line management responsibilities. Current plans call for establishing a Livermore Site Office that will be a direct report to the NNSA Administrator. This office will be given increased responsibility and accountability for managing and directing the LLNL contractor, including contract administration.

LLNL's primary mission is to provide scientific and engineering support to U.S. national security programs. LLNL performs research, development, design, maintenance, and testing in support of the nuclear weapons stockpile. LLNL also performs theoretical and applied R&D in such areas as energy, biomedicine, and environmental science.

To support these activities, LLNL operates numerous laboratories, test facilities, and support facilities at two major sites, the LLNL main site and Site 300. The LLNL main site, located in Livermore, California, encompasses approximately 800 acres. Site 300 occupies approximately 11 square miles and is about 15 miles east of the LLNL main site. LLNL activities involve various potential hazards that need to be effectively controlled, including exposure to external radiation, radiological contamination, nuclear criticality, hazardous chemicals, and various physical hazards associated with facility operations (e.g., machine operations, high-voltage electrical equipment, pressurized systems, noise, and construction/maintenance activities). Significant quantities of radiological and chemical hazardous materials are present in various forms at LLNL.

Throughout the evaluation of ES&H and emergency management programs, OA reviews the role of DOE organizations in providing direction to contractors and conducting line management oversight of the contractor activities. OA is placing more emphasis on the review of contractor self-assessments and DOE line management oversight in ensuring effective ES&H and emergency management programs. In reviewing DOE line management oversight, OA focuses on the effectiveness of NNSA and OAK in managing the LLNL contractor, including such management functions as setting expectations, providing implementation guidance, allocating resources, monitoring and assessing contractor performance, and monitoring/evaluating contractor self-assessments. Similarly, OA focuses on the effectiveness of contractor self-assessments, which DOE expects to provide comprehensive reviews of performance in all aspects of ES&H and emergency management.

ES&H Review Scope and Overview

The ES&H portion of this inspection evaluated the effectiveness of selected aspects of ES&H management as implemented by LLNL under the direction of NNSA and OAK. The ES&H portion of the inspection was organized to evaluate four related aspects of the integrated safety management (ISM) program: (1) implementation of the guiding principles of ISM by OAK and LLNL, (2) OAK and LLNL feedback and continuous improvement systems,



Aerial View of 332 Complex

(3) LLNL implementation of the core functions of safety management for various work activities, and (4) OAK and LLNL implementation of environmental protection programs at the LLNL site.

The OA inspection team used a selective sampling approach to determine the effectiveness of OAK and LLNL in implementing DOE requirements. The sampling approach involves examining selected institutional programs that support the ISM program, such as OAK and LLNL assessment programs. To determine the effectiveness of the institutional programs, the OA team examined implementation of requirements by selected LLNL organizations and facilities. Specific organizations and facilities reviewed included: the Defense and Nuclear Technologies Directorate, focusing on activities in Buildings 191 (an explosives handling facility) and 332 (a plutonium facility); the Chemistry and Materials Science Directorate, focusing on activities in Building 132 (chemical laboratories) and Building 235 (material science laboratories); sitewide environmental monitoring and waste management facilities/activities performed by the Site Safety, Security, and Environmental Protection Directorate; Building 131 High Bay (testing and manufacturing) operations and activities conducted by the Engineering Directorate; and maintenance functions performed by the Laboratory Services Directorates.

As discussed in this report, most aspects of ISM are effectively implemented at LLNL, and work observed by the OA team was performed with a high regard for safety. Weaknesses were identified in a few areas, including testing and maintenance of fire protection systems, corrective action management, and some aspects of the LLNL work planning and controls system (Integrated Work Sheets). Although further improvements are needed in a few areas, OAK and LLNL management have made significant improvements, and the ISM program at LLNL is generally effective and continues to mature and improve.

Emergency Management Program Review Scope and Overview

In addition to OAK's emergency management oversight and operational awareness activities, the OA inspection of the LLNL emergency management program evaluated progress since the August 2001 emergency management program status review on upgrading the site emergency management program,

which is managed and administered by the Hazards Control Department's emergency preparedness section, particularly as applied to selected facilities within the Defense and Nuclear Technology & Engineering directorates and at the Hazardous Waste Management Facility. In addition, OA evaluated the site's institutional-level emergency public information and exercise programs. Finally, the inspection team conducted tabletop performance tests with a sample of the site's key decision-makers to evaluate their ability to employ available tools and skills when responding to postulated emergency conditions.

As discussed in this report, the results of this review indicate that, overall, OAK and LLNL continue to make progress in improving the technical basis and implementing structure of the site emergency management program. During tabletop performance tests, responders demonstrated effective initial decision-making and command and control principles. However, the OA team identified a number of programmatic and implementation concerns, including important procedural and performance weaknesses and lapses in corrective action management processes. In addition, OAK and LLNL face significant challenges in implementing all of the expected near-term improvements in the site's emergency management program. OAK and LLNL line management attention is necessary in two key areas to ensure that (1) potential challenges to the interim fiscal year (FY) 2002 upgrade objectives and the overall goal of implementing a comprehensive emergency management program by the end of FY 2003 are addressed, and (2) appropriate direction is provided to efforts to integrate and formalize OAK and LLNL emergency public information plans and response procedures.



Building 332

Organization of Report

Section 2 of this report provides an overall discussion of the status and results of the review of the LLNL ES&H and emergency management program elements that were evaluated. Section 3 provides OA's conclusions regarding the overall effectiveness of OAK and LLNL management of the ES&H programs. Section 4 presents the ratings assigned as a result of this review. Appendix A provides supplemental information, including team composition. Appendix B identifies the specific findings that require corrective actions and follow-up.

More detailed information on the inspection results is contained in two separate volumes of this report, which were provided to OAK and LLNL and which are available to other DOE sites on request. Volume I provides more detailed information on the review of the LLNL ISM program, and Volume II provides more detailed information on the review of LLNL emergency management programs.

2.1 Positive Attributes

ES&H Positive Attributes

The ISM program at LLNL has significantly improved as various management systems have matured and new processes have been established. Several positive attributes were identified in the institutional management systems. Many aspects of ISM implementation at the facility and activity level were also particularly effective.

The OAK operations teams are effectively implemented to perform line management oversight of LLNL. OAK operations teams are led by a line manager and include Facility Representatives, technical specialists, and program staff. The operations teams conduct a comprehensive program of day-to-day operational awareness activities and perform regular assessments. The operations teams are focusing on performance and identifying ES&H program deficiencies, and are fostering continuous performance improvement at LLNL. OAK's allocation of personnel resources and technical expertise/skill mix to the operations teams is consistent with the relative risks (e.g., the operations teams for the higher-risk facilities generally have more experienced personnel and more types of technical expertise among the team members). OA team observations indicated that the OAK operations team approach is an effective mechanism for providing line management oversight of LLNL activities.

With the support of OAK, LLNL senior management has demonstrated strong leadership to effect the cultural change necessary for the implementation of ISM. Successful implementation of an effective ISM system—a standards-based approach to safety—was a significant challenge within the decentralized and autonomous LLNL organizational structure, which historically had relied on an expert-based approach. In making the transition to ISM, the LLNL senior management team built upon effective processes, such as ES&H teams and

planning and resource allocation processes, and stressed management accountability for performance. A few years ago, LLNL implemented a comprehensive and integrated work control process, which addressed the most significant weakness identified in the most recent DOE Headquarters independent oversight evaluation. LLNL senior managers have taken an active role in ISM leadership. For example, the Deputy Director for Strategic Operations serves as the “point person” and leads such major efforts as the LLNL ES&H Manual and the internal independent assessment program. LLNL organizations are also devoting considerable effort to prepare good quality documents that clearly state LLNL management expectations. The leadership is also continuing to establish and enhance communications mechanisms to reach out to employees and emphasize personal accountability. LLNL encourages and rewards participation in safety committees, such as the Plant Engineering Division's grassroots safety committee and the Laboratory Services Directorate's behavior-based safety program. LLNL management has also emphasized strategic planning processes and has maintained effective institutional processes for integrating ES&H into mission activities, maintaining facilities and infrastructure, and allocating ES&H resources.

The LLNL ES&H team concept is an effective mechanism for integrating ES&H support and hazard control into programmatic activities at LLNL. LLNL has five ES&H teams, each of which covers certain organizations and facilities and has appropriate technical expertise in the applicable technical disciplines (e.g., environmental protection and radiation protection). The ES&H teams work closely with LLNL researchers, facility personnel, and line managers during all stages of work planning to support line management in identifying applicable hazards and tailoring the controls to the work activity. The ES&H team concept is a mature process that is effectively implemented. As implemented at LLNL, the ES&H team concept ensures that line management has ultimate responsibility for safety,

in accordance with ISM principles, while providing ES&H support to facility personnel and monitoring line management performance. OA team observations indicated that the ES&H team is a major contributor to the safety-conscious approach to work at LLNL.

LLNL has a rigorous program for establishing and controlling the safety basis at non-nuclear hazardous facilities. LLNL has implemented a systematic approach to developing appropriate safety basis documents for non-nuclear facilities, in accordance with DOE-UC contract provisions. For explosive and accelerator facilities, LLNL uses procedures that are similar to the unreviewed safety question procedure used for nuclear facilities to control the safety basis. This degree of rigor provides assurance that non-nuclear hazardous facilities are safely operated and that safety-related equipment is correctly configured and operational.

The LLNL Integrated Work Sheet (IWS) process provides a comprehensive and integrated method for defining, analyzing, and authorizing work and was effectively implemented for most programmatic work activities that were reviewed. The IWS process is appropriately designed to clearly define work, management responsibilities, and hazards. It contains and references controls, and provides an effective mechanism to certify that hazard controls are in place before starting work activities. Although the IWS process is relatively new and is still evolving and improving, the implementation of IWS by LLNL directorates has resulted in improved safety and control of work activities. The LLNL ES&H Manual clearly defines the general IWS process and responsibilities for implementing IWS provisions. The Manual also provides comprehensive controls for generic and laboratory-wide hazards, such as lockout/tagout controls and laser safety.



Building 132

In many cases, engineering controls were more rigorous than those normally found at DOE sites, providing an added measure of protection to workers. For example, hazard control processes at the Chemistry and Materials Science Directorate for the chemistry operations in Building 132N include stringent engineering controls such as access controls for individual laboratory rooms that allow access only to individuals authorized by the laboratory supervisor. In Building 132N, fume hoods have variable airflow controllers to ensure that the proper flow rate is automatically maintained in all conditions. Engineering controls were also used extensively in Buildings 235 and 191.

With few exceptions, LLNL has a strong environmental protection program and highly qualified and competent environmental protection personnel. LLNL has established appropriate administrative and engineering controls for monitoring and controlling groundwater contamination from legacy sources. These controls include a series of portable treatment units that have been constructed at the Livermore site to optimize contaminant mass removal. LLNL has also devoted substantial resources to establishing engineering and administrative controls for effluent waste systems to characterize and control releases of hazardous or radioactive materials into the environment. For example, LLNL has taken action to reduce the potential impact from inadvertent release of hazardous or radioactive waste to the City of Livermore sewage treatment system or to the groundwater. These controls include upgrades to facility retention tank systems, sewer line upgrades, and diversion tanks at the site boundary to hold the sewer flow if monitoring indicates a release of hazardous or radioactive waste. These controls are implemented by highly qualified and competent environmental protection staff.

Emergency Management Program Positive Attributes

OAK and LLNL continue to make progress in implementing an emergency management program that meets the Department's expectations. Positive attributes of the emergency management program are cited below.

OAK is proactively engaged in oversight and improvement of the site's emergency management program. OAK has implemented a well-structured approach for conducting and

documenting line management oversight of the site's emergency management program and is effectively using a variety of operational awareness activities, which are integrated with an LLNL programmatic upgrade plan, to monitor the status of LLNL's efforts. OAK is also making effective use of a performance metric in Appendix F of the contract to provide incentive for and convey expectations regarding LLNL's improvement efforts in the emergency management area. As part of its efforts to improve OAK response readiness, as well as that of LLNL, OAK emergency preparedness staff developed, conducted, and critiqued an extensive tabletop drill involving both OAK and LLNL emergency response personnel. In addition, OAK devoted considerable time to observing the process by which the OA team prepared for and conducted the tabletop performance tests that were part of this inspection in order to improve future OAK oversight efforts.

LLNL is making progress in all areas evaluated during this inspection. LLNL continues to institutionalize various aspects of the emergency management program, as indicated by improved structure in the emergency preparedness hazards assessment development and maintenance process, enhanced response procedure content in event classification, and improved breadth and definition of procedures and processes that govern such program administrative functions as the conduct of exercises and the handling of corrective actions. LLNL has also continued efforts to enhance the capabilities of its emergency preparedness staff by defining three core positions and staffing them with personnel who have extensive emergency preparedness experience outside of LLNL. LLNL is meeting the aggressive deliverable schedule established by the programmatic upgrade plan, with 18 of 37 important technical basis, response, and other documents delivered to date. The exercise program has been structured to promote further program improvements. Even in the emergency public information (EPI) area, which has several important weaknesses, there is a positive trend in terms of program definition, approach, and implementation.

LLNL emergency responders demonstrated effective initial decision-making during the performance tests, and LLNL devoted considerable resources to the OA tabletop performance test process. During tabletop performance tests conducted as part of this inspection, LLNL emergency response personnel effectively prioritized initial response actions at the event scene,

including protecting emergency responders; implemented appropriate initial predetermined protective actions for site workers and the public; and demonstrated effective command and control. LLNL's commitment to improving its response readiness is evident by the involvement of management, emergency preparedness staff, and response personnel in preparing for and conducting these performance tests.

2.2 Program Weaknesses

ES&H Weaknesses

Although most aspects of the LLNL ISM program are effective, weaknesses were identified in a few areas (corrective action management, fire protection system testing and maintenance, some aspects of IWS, and some aspects of environmental protection).

The LLNL corrective action management system is not sufficiently rigorous to ensure timely documentation, evaluation, and resolution of ES&H issues and deficiencies. The LLNL issues management process is not systematic or comprehensive and is not institutionalized in a policy, plan, and/or procedure. The ES&H Manual provisions for the ES&H Deficiency Tracking System do not adequately address crosscutting issues involving several directorates and/or of institutional programs. The deficiency tracking system is not always used by LLNL to capture and manage issues. The OA team identified several institutional issues that were known to the laboratory but were being informally managed without appropriate controls and visibility; limited progress had been made on some of these issues. In addition, there are weaknesses in the use of the tracking system and resolution of corrective actions. For example, issues were closed without rectifying the underlying root causes. Some of the weaknesses in corrective action management identified by the OA team had been previously identified through OAK and LLNL assessments but had not been adequately addressed by LLNL.

Preventive maintenance, testing, and documentation for Building 191 fire protection systems do not meet applicable requirements. The National Fire Protection Association (NFPA) standards require annual testing of the entire fire protection system and quarterly and semiannual testing of the specific elements in the system. For Building 191, the fire protection system includes fire alarm, wet

fire sprinkler, and deluge systems, which have quarterly, semiannual, and annual preventive maintenance and testing requirements. The wet fire sprinkler system has received satisfactory preventive maintenance and testing but the fire alarm and deluge systems have not. Contrary to the requirements and recommendations of the NFPA, Building 191 preventive maintenance implementing procedures do not have provisions for comparing completed test results with the original and previous results. Additionally, these procedures do not contain acceptance criteria for the majority of the fire protection preventive maintenance testing. At the time of the inspection, LLNL's fire protection preventive maintenance and testing did not provide reasonable assurance that the fire alarm and mitigation systems in Building 191 were capable of performing their protective functions. Although completion of required maintenance and testing may address this concern in the short term, fundamental changes and improvements to the maintenance and testing program are necessary to provide reasonable assurance over the long term. Because of the sitewide applicability of NFPA requirements, similar deficiencies may exist in other facilities. In the past few years, LLNL had self-identified some aspects of the deficiencies and was evaluating corrective actions. However, the corrective actions were not always comprehensive or timely and the extent of condition was not fully analyzed.

Plant Engineering work activities performed under generic IWSs are not always sufficiently well defined to facilitate identifying and tailoring hazard controls to specific work activities. Plant Engineering uses generic IWSs for many types of recurring activities, such as electrical work. In many cases, the work scopes in the generic IWSs are excessively broad, resulting in controls that are rarely tailored to the specific work activity. Consequently, many ES&H-related decisions, such as which hazards from a broad list might apply to that particular work and what controls would control those hazards, are left to the crafts personnel. Therefore, LLNL is not fully realizing the benefit of preplanned analysis by work planners, supervisors, and line ES&H personnel. Furthermore, many of the generic IWSs reference the ES&H Manual, Occupational Safety and Health Administration guidelines, and other upper-tier and regulatory documents and thus do not effectively tailor the controls to the working level. Plant Engineering typically uses an ES&H assessment form to bridge the hazard controls defined by the Plant Engineering IWSs to facility IWSs. While this mechanism serves to

minimize the number of work-specific IWSs generated for low-hazard jobs, the instructions in the Plant Maintenance Management Systems Manual governing use of the forms do not provide sufficient detail to correctly and consistently complete the forms. The weaknesses in the use of generic IWSs contribute to a number of problems with the implementation of hazard controls in the work activities observed by the OA team.



Drum Storage

LLNL has a large inventory of legacy waste materials stored on site, some of which is experiencing container degradation problems associated with outdoor storage. LLNL is not achieving significant reductions in legacy waste volumes and is not systematically establishing disposal priorities that optimize hazard reduction. LLNL has over 10,000 drum equivalents of transuranic waste, low-level waste, and mixed waste in storage, some of which is not stored under optimal conditions (e.g., stored outside). Containers with microgram quantities of plutonium, americium, uranium, cesium, and other isotopes are stored outside, unprotected from the elements. With the exception of a small number of administrative violations, LLNL meets regulatory requirements for this waste storage and this inventory does not currently represent a significant risk to the public or the environment. However, waste storage containers are being affected by extended exposure to environmental conditions such as rain, sunlight, and thermal variations. LLNL's administrative controls to inspect these drums have not fully addressed the exposure concerns as evidenced by rusting drums and faded labels. Although improvements are needed, no instances of leaking drums or imminent danger situations were identified. LLNL has had to defer disposal of low-level waste and extend milestones for waste on the LLNL site treatment plan because of budget

limitations by EM for the legacy waste at LLNL. In addition, the performance measures in the DOE-UC contract provide incentives based on the volume of waste disposed but does not consider the relative risks. LLNL has some higher-hazard wastes that have been in storage since the late 1980s that are not a current high priority for disposal, including approximately 200 55-gallon drums that contain pyrophoric depleted uranium machine turnings.

Emergency Management Program Weaknesses

Although the LLNL emergency management program currently provides assurance that initial emergency response decision-making will adequately protect responders, site workers, and the public, important weaknesses were noted in the systems in place to ensure the consistent formulation and dissemination of follow-on protective actions for affected populations and in the programmatic basis for the emergency public information element. Concerns in the quality of documents delivered by LLNL to OAK as part of the upgrade program and in LLNL's corrective action identification and closeout process were noted as well. Specific weaknesses are cited below.

Procedures for formulating, disseminating, and implementing protective actions and protective action recommendations do not ensure timely and accurate response. The LLNL response procedures and tools currently in place have several notable weaknesses that collectively inhibit effective protective action decision-making. Clearly-defined processes for communicating onsite protective actions and identifying protective action recommendations for affected offsite sectors are absent from the emergency plan implementing procedure (EPIP) for protective actions. The emergency action level tables lack clear instructions for rapidly identifying the appropriate areas in which protective actions should be taken. In addition, LLNL has not established adequate procedures and job aids to ensure that consequence assessment calculations and plume dispersion plots are accurately determined. As a result, emergency responders experienced difficulty in performing protective action decision-making and consequence assessment tasks during tabletop performance tests after the initial decision-making phase was complete. Furthermore, facility-specific emergency plans do not contain any

guidance regarding the process for implementing a shelter-in-place protective action order.

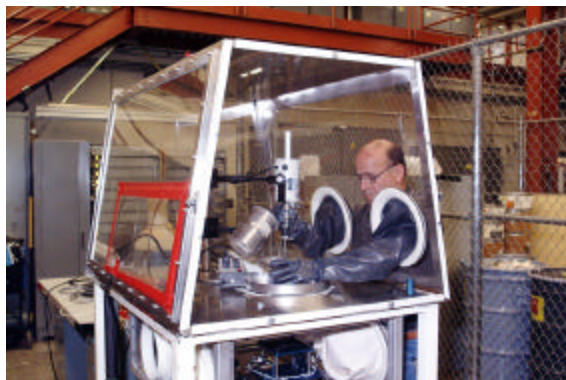
OAK and LLNL have not developed and implemented an integrated, fully developed set of EPI plans and procedures. Both OAK and LLNL are currently working to finalize their respective EPI plans and procedures. However, both programs are still evolving, there are no firm milestones for document completion and approval, and the documents contain significant inconsistencies, particularly with respect to joint information center activation, staffing, and operation. In addition, the LLNL EPI implementing procedure lacks adequate definition in several areas, including the overall press release approval process, the role of OAK in press briefings conducted at the onsite or alternative offsite media briefing centers, and public/media education strategies. Finally, because LLNL has not implemented an approved procedure with document control provisions, no formal mechanism exists to ensure that in-place response documents, such as the position checklists in the public affairs office operations support center, are current.

Institutionalization of the LLNL emergency management protocols and processes is still in progress, and significant challenges remain to completing the FY 2002 program upgrade milestones. The OA team noted a significant number of instances where follow-through on process linkages between programmatic plans, procedures, and previously-identified weaknesses was not thorough. For example, several weaknesses identified in past OA appraisals have not been effectively addressed, and commitments made in program documents and corrective action plans to proceduralize or define self-assessment processes and the emergency press release approval process were either absent or inadequately described in the referenced EPIP. The recently implemented administrative EPIPs are not specific enough to ensure that corrective actions are consistently identified, captured, tracked, and effectively addressed, and in several instances, peer or quality assurance review of documents, such as emergency preparedness hazards assessments and EPIPs, lacked rigor. Furthermore, the large number of OAK comments generated to date on the first four emergency preparedness hazards assessments delivered, combined with the OAK document review backlog and the fact that 19 additional documents are due for delivery in the 3 remaining months of FY 2002, places the contract Appendix F emergency management performance metric at risk.

LLNL ES&H Program

OAK and LLNL have worked cooperatively to establish and implement a comprehensive ISM program at LLNL. Significant improvements have been made since the most recent DOE Headquarters safety management evaluations and the deficiencies identified on the evaluation have been effectively addressed. Most notably, the LLNL IWS process addresses the most significant previously-identified deficiency and is a major improvement over the previous expert-based processes. The IWS provides a comprehensive, integrated, and effective approach to authorizing and controlling work, analyzing hazards, and establishing control. The OA team's observation of numerous work activities conducted within the IWS process indicated that work activities were conducted safely and, with few exceptions, hazards were identified, appropriate controls were in place, and the work was properly authorized. The OA team identified a few weaknesses in the IWS process as applied to some types of activities (e.g., certain types of work performed by Plant Engineering under generic IWSs) and a few examples of poor implementation or a failure to follow procedures. However, implementation of the relatively new IWS process is improving as LLNL gains experience, and as OAK and LLNL self-identify deficiencies and corrective actions.

Managers at all levels exhibited leadership, were involved in safety, and fostered continuous improvement. NNSA and OAK have provided programmatic direction, performance expectations, and resource allocations that reflect an appropriate balance between ES&H needs and mission needs. OAK and LLNL have worked cooperatively to establish a Work Smart Standards set that appropriately addresses the hazards and conditions at LLNL. Appropriate ISM institutional policies and requirements have been established and communicated. Workers and stakeholders have multiple avenues to express ES&H concerns. OAK and LLNL roles and responsibilities are adequately defined at all levels of the organization.



Glovebox at LLNL

OAK has implemented an effective and innovative process for ensuring that organizational and individual roles and responsibilities are coordinated to provide an integrated approach to line management oversight of LLNL. OAK management recognized the need to strengthen some teams associated with less hazardous operations and actions were underway. OAK is also conducting effective self-assessments of its own operations and has made improvements as a result (e.g., enhanced Facility Representative training). Although OAK has adequate staffing in most areas and is effectively implementing its mission, several staff/skill shortages with the potential to impact oversight effectiveness need to be resolved (i.e., the fire protection engineer and nuclear safety analyst positions). OAK is also pursuing the development of an improved technical qualification program.

Some aspects of LLNL implementation of ISM are especially notable. LLNL has established effective processes for providing ES&H support to line management organizations through its ES&H teams. The LLNL strategic planning process effectively ensures that ES&H needs are considered in all stages of LLNL mission activities and projects. LLNL has taken a systematic approach to the development of appropriate safety basis documents for the non-nuclear facilities and implemented an effective change control process for explosives and accelerator facilities.

Most aspects of environmental protection programs are effective and have been successfully

integrated into ISM. With few exceptions, the hazards for the facilities reviewed have been analyzed and appropriate controls have been established. However, the pollution prevention program needs to be more proactive, operational facilities have not been fully analyzed for groundwater monitoring needs, and limited progress has been made in addressing legacy waste.

There are deficiencies in preventive maintenance and testing of fire protection systems at LLNL non-nuclear facilities. Proper testing and maintenance are required by NFPA codes and are important in ensuring that these systems are capable of performing their intended function during a fire or other upset conditions. For some of the fire protection subsystems, either preventive maintenance activities were not being conducted at the prescribed frequency, or the maintenance procedures were not rigorously followed and/or completed. LLNL self-identified some of the deficiencies in testing and preventive maintenance programs for fire protection systems in the past three years and is working on developing corrective actions. However, the needed corrective actions have not been timely or comprehensive. LLNL is now taking steps to accelerate corrective action for testing and maintenance deficiencies.

The continuous feedback and improvement programs at OAK and LLNL have improved significantly and include numerous assessment activities and safety committees. Many of the feedback mechanisms are of high quality and have contributed to improvements in LLNL ES&H programs. However, there are some weaknesses in feedback and improvement, most notably in corrective action management systems and timeliness of corrective actions.

Overall, OAK and LLNL have made significant improvements in ES&H and have established an effective ISM program. NNSA, OAK, and LLNL have provided leadership and devoted resources to ES&H programs and ISM. Work observed by the OA team was performed with a high regard for safety and environmental protection. While some ISM elements require further improvement, such as testing and maintenance of fire protection systems, some aspects of IWS, certain aspects of environmental protection, and corrective action management, the overall ISM program is effectively implemented.

LLNL Emergency Management Program

OAK and LLNL continue to make progress in improving the site emergency management program. OAK is expending significant effort in conducting line management oversight of LLNL's program upgrade efforts and implementing improvements in the OAK response protocols. These activities were planned and are being implemented through a well-defined and structured process that was developed and implemented since the August 2001 OA status review. LLNL is improving emergency preparedness hazards assessments, EIPs, and other program elements via a schedule specified in the DOE-UC contract Appendix F emergency preparedness FY 2002 project management plan (PMP), which was also developed and implemented since the last OA visit, and to date approximately half of the required deliverables have been submitted to OAK. When the FY 2002 PMP is completed, all of the emergency preparedness hazards assessments, major EIPs, and key programmatic documents will have been upgraded, and other important activities will have been completed, such as the planning, conduct, and reporting of the FY 2002 exercise.

Also as part of the upgrade project, LLNL has improved the administrative structure that provides the framework for continuous improvement processes, such as self-assessments, exercises, and their associated corrective action processes. Furthermore, OAK and LLNL are in the process of developing EPI plans and procedures, and LLNL is working with local response agencies to develop a consistent public education approach and supporting materials. LLNL's involvement in the planning and conduct phases of the OA tabletop performance test process is laudable, and is indicative of LLNL's commitment to improving the site's response posture, both now and over the long term. During tabletop performance tests, responders demonstrated effective initial decision-making and command and control principles. The consistency and appropriateness of the observed initial decision-making are, to a significant degree, indicative of overall progress in moving from an expert-based response approach to one that is based on formally established emergency response protocols.

The OA team identified a number of programmatic and implementation weaknesses, many of which OAK

and LLNL had already recognized. The most significant of these is in the area of protective action decision-making, where procedural weaknesses inhibit effective protective action formulation in a time-urgent environment. Performance weaknesses were also evident in the consequence assessment area, which is in part a function of the evolving nature of the approach used to conduct this activity. The EPI area has several important weaknesses, most notably the absence of a fully developed set of integrated OAK and LLNL EPI plans and implementing procedures. Finally, the OA team observed a significant number of instances where weaknesses previously identified both internally and by OA were not consistently identified and effectively addressed, as well as lapses in document peer and quality control review processes.

OAK and LLNL face significant challenges in implementing all of the FY 2002 improvements in the site's emergency management program that were initially expected when the PMP was approved. OAK and LLNL have different management perspectives on LLNL's ability to complete the FY 2002 PMP satisfactorily. In addition, as a result of past difficulties regarding the quality and timeliness of LLNL emergency preparedness initiatives, OAK's perception is that it

must document in detail all comments generated during the deliverable review process and obtain LLNL's response to each comment. Given the large number of comments that OAK is generating, the process is cumbersome and negatively impacts both LLNL's ability to effectively consider the most significant comments in a timely manner and OAK's ability to address its review backlog, which is currently almost two months. If not resolved, such delays may ultimately impede the overall goal of both organizations, which is to implement a comprehensive emergency management program by the end of FY 2003.

OAK and LLNL line management attention is necessary to ensure that appropriate priorities have been placed on PMP document delivery and comment resolution activities; that adequate resources have been assigned; and that expectations for acceptable document quality have been clearly communicated and understood by OAK and LLNL emergency preparedness personnel at all levels. In addition, OAK and LLNL management attention is necessary to resolve inconsistencies in approach and set expectations for formalizing the EPI program documents so that systems are in place to ensure that emergency information can be disseminated to the public and the media in a timely manner.

4.0 Ratings

The ratings reflect the current status of the reviewed elements of the LLNL ISM and emergency management programs:

Safety Management System Ratings

Guiding Principle #1 – Line Management Responsibility for Safety EFFECTIVE PERFORMANCE
Guiding Principle #2 – Clear Roles and Responsibilities EFFECTIVE PERFORMANCE
Guiding Principle #3 – Competence Commensurate with Responsibility ... EFFECTIVE PERFORMANCE
Guiding Principle #4 – Balanced Priorities EFFECTIVE PERFORMANCE
Guiding Principle #5 – Identification of Standards and Requirements EFFECTIVE PERFORMANCE

Feedback and Improvement

Core Function #5 –Feedback and Continuous Improvement NEEDS IMPROVEMENT

LLNL Programmatic Work Activities, Facility Operations, and Maintenance Work Activities

Core Function #1 – Define the Scope of Work EFFECTIVE PERFORMANCE
Core Function #2 – Analyze the Hazards EFFECTIVE PERFORMANCE
Core Function #3 – Develop and Implement Controls NEEDS IMPROVEMENT
Core Function #4 – Perform Work Within Controls EFFECTIVE PERFORMANCE

Environmental Protection

Environmental Protection (Core Functions 1-4) EFFECTIVE PERFORMANCE

Emergency Planning

Hazards Survey and Emergency Preparedness Hazards Assessments EFFECTIVE PERFORMANCE
Program Plans and Procedures NEEDS IMPROVEMENT

Emergency Preparedness

Exercise Program..... EFFECTIVE PERFORMANCE
Emergency Public Information NEEDS IMPROVEMENT

Emergency Response

LLNL Response Decision-Making NEEDS IMPROVEMENT
OAK Emergency Response EFFECTIVE PERFORMANCE

Readiness Assurance

DOE Performance Monitoring EFFECTIVE PERFORMANCE
Contractor Assessments and Issues Management NEEDS IMPROVEMENT

APPENDIX A

SUPPLEMENTAL INFORMATION

A.1 Dates of Review

Scoping Visit	April 16-18, 2002
Onsite Inspection	June 10-20, 2002
Report Validation and Closeout	July 9-11, 2002

A.2 Review Team Composition

A.2.1 Management

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

A.2.2 Quality Review Board

Michael Kilpatrick	Patricia Worthington
Robert Nelson	Dean Hickman

A.2.3 Review Team

Thomas Staker, Team Leader

Safety Management Systems

Ali Ghovanlou, Topic Lead
Tim Martin
Bernie Kokenge
Al Gibson
Robert Compton (Feedback and Improvement)

Environmental Protection

Bill Eckroade, Topic Lead
Vic Crawford
Joe Lischinsky
Tom Naymik

Technical Team

Bob Freeman, Topic Lead
Marvin Mielke
Bill Miller
Jim Lockridge
Michael Shlyamberg
Edward Stafford
Mario Vigliani
Mark Good
Shivaji Seth (Richland Operations Office)

Emergency Management System

Steve Simonson, Topic Lead
James O'Brien
Tom Rogers

A.2.4 Administrative Support

MaryAnne Sirk
Tom Davis

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APPENDIX B

SITE-SPECIFIC FINDINGS

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

LLNL processes and implementation for ES&H and emergency management issues management and corrective action are insufficient to ensure consistently appropriate and timely identification and resolution of safety and health concerns and crosscutting or institutional issues.
LLNL is not performing some of the fire detection and mitigation system preventive maintenance actions that are required by the National Fire Protection Association and facility authorization basis documents.

Table B-2. Site-Specific Emergency Management Findings Requiring Corrective Action Plans

The LLNL protective action EPIP does not adequately support protective action decision-making in a time-urgent environment, as required by DOE Order 151.1.
LLNL emergency action levels do not adequately support prompt and accurate event classification, as required by DOE Order 151.1.
OAK and LLNL have not implemented an integrated set of fully developed EPI plans and procedures that ensure that timely and accurate information will be effectively communicated to site workers and the public during rapidly developing events, as required by DOE Order 151.1.
During tabletop performance tests, LLNL emergency responders in the emergency operations center did not demonstrate the ability to continuously evaluate event conditions and provide updates to offsite protective action recommendations, as required by DOE Order 151.1.

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