Volume I
Summary Report

Independent Oversight
Inspection of
Environment, Safety,
and Health Programs
at the

Argonne National Laboratory

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Office of Independent Oversight and Performance Assurance
Office of Security and Safety Performance Assurance
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OVERSIGHT

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Abbreviations Used in This Report

AGHCF	Alpha-Gamma Hot Cell Facility
ANL	Argonne National Laboratory
APS	Advanced Photon Source
ASO	Argonne Site Office
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EH	DOE Office of Environment, Safety, and Health
EMS	Environmental Management System
ES&H	Environment, Safety, and Health
ISM	Integrated Safety Management
OA	DOE Office of Independent Oversight and Performance Assurance
OSHA	Occupational Safety and Health Administration
PFS	Plant Facilities and Services
PPE	Personal Protective Equipment
SAR	Safety Analysis Report
SC	DOE Office of Science
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
WMO	Waste Management Operations

1.0 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) inspected environment, safety, and health (ES&H) programs at the DOE Argonne National Laboratory (ANL) during April and May 2005. The inspection was performed by the OA Office of Environment, Safety and Health Evaluations. OA reports to the Director of the Office of Security and Safety Performance Assurance, who reports directly to the Secretary of Energy.

Aerial View of ANL

Within the DOE, the Office of Science (SC) has line management responsibility for ANL. SC provides programmatic direction and funding for research and development, facility infrastructure activities, and ES&H program implementation at ANL. ANL also receives funding from other DOE program offices and other government and industry organizations. At the site level, the Argonne Site Office (ASO) has line management responsibility for ANL and reports to SC. The SC Integrated Service Center, which encompasses the Chicago Operations Office and the Oak Ridge Operations Office, provides support to ASO in several areas (e.g., legal, human resources, and employee concerns) and may provide technical ES&H specialists to support ASO. Under contract to DOE, ANL is managed and operated by the University of Chicago, which has operated ANL since the Manhattan Project.

ANL's mission is to serve DOE and national security by advancing the frontiers of knowledge, by creating and operating preeminent scientific user facilities, and by providing innovative and effective approaches and solutions to energy, environmental, and security challenges to national and global well-being, in the near and long term, as a contributing member of the DOE laboratory system. Most ANL research activities are in the areas of basic science, energy resources, environmental stewardship, and national security. ANL also operates various scientific facilities that are used by scientists from ANL, other DOE organizations, other government organizations, academia, industry, and other nations.

ANL activities involve various hazards that need to be effectively controlled. These hazards include exposure to external radiation, radiological contamination, beryllium, hazardous chemicals, and various physical hazards associated with facility operations (e.g., machine operations, high-voltage electrical equipment, pressurized systems, and noise). Radioactive materials and hazardous chemicals are present in various forms and quantities at ANL.

The purpose of this OA inspection was to assess the effectiveness of ES&H programs at ANL as implemented by the University of Chicago under the direction of ASO. OA used a selective sampling approach to evaluate a representative sample of activities at ANL, including its management systems, facilities operations, maintenance, construction, and engineered safety systems. Specifically, the sampling approach was used to evaluate:

- ANL[1] implementation of the core functions of integrated safety management (ISM) for selected activities, including maintenance work during the scheduled maintenance shutdown at the Advanced Photon Source (APS), waste management and work activities performed by

[1] Consistent with common practice, the term "ANL" is used to refer to both the physical facility and onsite contractor management.

the Waste Management Operations (WMO) organization, and selected aspects of construction, building maintenance, and craft work performed by the Plant Facilities and Services (PFS) organization. OA focused primarily on implementation of ISM at the facility and activity/task levels.

- SC, ASO, and ANL feedback and continuous improvement systems and selected aspects of management roles, responsibilities, and authorities.

- Functionality of essential safety systems that are designed to prevent and mitigate accidents at the Alpha-Gamma Hot Cell Facility (AGHCF), including the hot cell structural barriers, fire suppression system, ventilation system, nitrogen system, and supporting systems and components.

- ASO and ANL effectiveness in managing and implementing selected aspects of the ES&H program that OA has identified as focus areas, including implementation of DOE Order 450.1, *Environmental Protection Program,* requirements*;* hoisting and rigging; the chronic beryllium disease prevention program; safety systems oversight; and corrective action management. OA selects focus areas—areas that warrant increased attention across the DOE complex—based on a review of operating events and inspection results.

The scope of the review of ANL considered the results of the 2002 OA inspection, which identified generally effective systems in a number of important areas. Specifically, in 2002, ASO (which was at that time an area office within the Chicago Operations Office) and ANL had worked cooperatively to establish and implement the institutional ISM program, such as responsibilities for ISM implementation and ensuring that individuals are trained and qualified to implement their safety responsibilities. For the most part, systems in these areas were effective. In addition, OA determined that many aspects of the ISM program for experimental activities were effectively implemented by ASO and ANL in the 2002 timeframe. The safe conduct of experiments had received considerable attention, and an institutional experiment safety review process system was being effectively implemented at the division level. As a result of the analysis of previous results, on this 2005 inspection, OA focused primarily on areas where performance in 2002 was not sufficiently effective, such as in non-experimental work, nuclear safety systems, radiation protection, and feedback and improvement.

Alpha-Gamma Hot Cell Facility

Sections 2 and 3 provide a discussion of the key positive attributes and weaknesses identified during this review. Section 4 provides a summary assessment of the effectiveness of the major ISM elements reviewed on this inspection. Section 5 provides OA's conclusions regarding the overall effectiveness of SC, ASO, and ANL management of the ES&H programs. Section 6 presents the ratings assigned during this review. Appendix A provides supplemental information, including team composition. Appendix B identifies the specific findings that require corrective action and follow-up.

Volume II of this report provides four technical appendices (C through F) containing detailed results of the OA review. Appendix C provides the results of the review of the application of the core functions of ISM for ANL work activities. Appendix D presents the results of the review of SC, ASO, and ANL feedback and continuous improvement processes and management systems. Appendix E presents the results of the review of essential safety system functionality, and Appendix F presents the results of the review of safety management of the selected focus areas. For each of these areas, OA identified opportunities for improvement for consideration by DOE and contractor management. The opportunities for improvement are listed at the end of each appendix so that they can be considered in the context of the status of the areas reviewed.

2.0 Positive Attributes

Several positive attributes were identified in ES&H implementation at ANL, in such areas as environmental management system implementation and focused improvement initiatives by certain organizations.

The ANL ES&H Manual effectively identifies applicable site-specific requirements and regulatory requirements. The manual is effective in identifying regulatory requirements applicable to ANL and providing specific and useful information for ANL personnel. For example, the ES&H Manual section on chemical carcinogens provides a composite listing of applicable carcinogens, thereby eliminating the need for workers and line managers to independently analyze a variety of listings of known, suspect, and likely carcinogens, and arriving at conclusions that are often inconsistent. In addition, the ES&H Manual includes guidance for implementing some industry good practices that are not mandated by regulations. For example, although a written safety program for lead is not required by the Occupational Safety and Health Administration (OSHA), ANL has recently incorporated requirements and guidance for lead usage and surface contamination levels within the ES&H Manual.

APS Main Entrance

Several ANL organizations have made improvements in various aspects of work planning and control processes. Several ANL organizations have made improvements in work planning and control for their activities. Most work performed by WMO is governed by a work clearance permit, which is now accompanied by a specific operating procedure or job plan, as well as a job safety assessment, to define the discrete scope of work, the hazards, and the controls applicable to the work. With these mechanisms, WMO has successfully refined their process to more effectively analyze and tailor the defined hazards and controls to the specific work being performed. At APS, many activity/task-level hazards are adequately identified and analyzed using the procedure development, review, and approval process. For example, the process for etching chromium films is well described in a procedure that addresses hazards and the appropriate hazard controls. Additionally, an APS division-level organization is developing a new facility hazards analysis process, which is a useful tool for activities in APS fabrication and machine shops. With additional definition, rigor, and maturity, elements of these new organization-specific processes may warrant consideration by other ANL organizations.

ASO provides effective direction to and oversight of ANL for the development and implementation of an environmental management system (EMS), and ANL has made considerable progress in implementing the EMS. ASO has driven enhanced performance by ANL in achieving EMS milestones by using performance measures specific to these milestones. ASO and ANL environmental personnel who have been assigned EMS responsibility are well qualified. ANL has established a detailed environmental policy as part of the EMS requirement and has committed to integrating environmental protection accountability into day-to-day activities and long-term planning processes. ANL is implementing an EMS as part of their ISM systematic approach to managing continuous ES&H improvement. ANL continues to implement a pollution prevention program that includes recycling programs for such materials as paper, glass, batteries, fluorescent bulbs, and excess chemicals. ANL received a White House Closing the Circle Award for Noteworthy Practice for its reuse of nuclear targets.

SC has increased its focus on communicating lessons learned, including Office of Environment, Safety, and Health (EH) safety and health alerts, to SC site offices and laboratories. SC has also interfaced with ASO and its other site offices to ensure that the site offices monitor their laboratory performance in the area relevant to the lessons learned. For example, SC required its site offices and laboratories to review and strengthen their hoisting and rigging programs, which has resulted in the development of improvement initiatives for the ANL hoisting and rigging program. As another example, SC required its site offices to take a number of actions to enhance electrical safety following the electrical incident at the Stanford Linear Accelerator Center, resulting in some improvements in ANL electrical safety practices. In addition, SC is conducting reviews of laboratory systems and processes for electrical hot work at all of its laboratories to provide assistance and promote lessons learned from the incident at the Stanford Linear Accelerator Center. SC site offices will be required to address, implement, and report the status of corrective actions taken in response to SC review team recommendations. SC has also continued its focus on performance measures and worked with laboratories to achieve improvements. For example, SC's monitoring of ANL performance metrics indicated a need for improvement in ANL efforts to meet as-low-as-reasonably-achievable (ALARA) and person-roentgen equivalent man (rem) goals. SC, in coordination with ASO and ANL, then identified funding for ANL upgrades to AGHCF windows/shielding and replacement remote manipulator arms, which contributed to lower radiation dose rates.

3.0 Weaknesses

Although some improvements have been made, there are weaknesses in safety systems, in various ES&H programs (e.g., radiation protection and medical surveillance), and in the implementation of hazards analysis and control processes that protect workers. There also are weaknesses in feedback and improvement processes that have hindered the effectiveness of corrective actions.

ANL has not established adequate processes for ensuring that all applicable requirements are identified, responsibilities for implementation are assigned, appropriate implementing documents/procedures are developed, and effective implementation is verified by management. ANL has not implemented some applicable institutional requirements in a number of areas, such as radiation protection, feedback and improvement processes, the cognizant system engineer program, medical surveillance, lockout/tagout assessments, hoisting and rigging, lead control, and beryllium program assessments. A common theme in these deficiencies is that ANL does not have adequate processes for ensuring that applicable requirements are implemented. ANL has not clearly defined roles, responsibilities, authorities, and requirements for developing and implementing key ISM processes in institutional Tier 2 documents, and some safety requirements have not been flowed down into line organization Tier 3 documents. Although subject matter experts have been assigned who are responsible for specific sections of the ES&H Manual, the institutional-level ownership of safety programs and processes is unclear. In addition, the authority and importance of some requirements delineated in Tier 2 documents are not understood or accepted by line organizations, as reflected in the number of ES&H Manual and quality assurance program plan requirements not implemented by line organizations. ANL management has not adequately ensured the establishment and effective implementation of some ISM processes.

The ANL institutional radiation protection program does not ensure effective sitewide radiation protection performance and compliance with 10 CFR 830 and 10 CFR 835 requirements. The ANL institutional radiation protection program fails to meet minimum DOE expectations in such key areas as organization and administration, implementing procedures, radiation control technician training and qualifications, and technical basis documentation. These weaknesses contribute to fundamental deficiencies in line management implementation of requirements in such areas as posting and labeling, radiological surveys and monitoring, radiological recordkeeping, air sampling, and radiation work permits. Corrective actions taken to address prior concerns from the 2002 OA inspection have not resolved recurring weaknesses, as evidenced by continuing and similar deficiencies. Senior ANL management action since 2002 to correct previous problems, such as the appointment of a radiation safety officer and new coordinating committee, has provided only limited improvement, due in a part to the lack of sufficiently defined roles, responsibilities, authorities, and accountabilities for these positions.

Medical surveillance requirements for some ANL workers and ANL subcontractors are not being performed for beryllium, lead, and respiratory protection as required by DOE orders, OSHA standards, and ANL procedures. ANL has developed the elements (e.g., procedures, computer databases) required for an effective medical surveillance program. However, these elements are not integrated and are not consistently implemented. As a result, ANL does not meet all applicable medical surveillance requirements of DOE orders and OSHA standards. Specific concerns were identified in medical surveillance for beryllium, lead, and respiratory protection. The deficiencies in beryllium medical surveillance include failure to offer medical surveillance and screening for beryllium workers, as required by the beryllium rule. Prior to this OA inspection, approximately 70 ANL workers were enrolled in the ANL lead medical surveillance program. However, recently the ANL Medical staff recognized that many of the ANL workers who had been identified as lead workers or lead users through the job hazard questionnaire process had not been enrolled in the lead surveillance program

or evaluated or screened by ANL Medical staff. As a result, enrollment in the lead surveillance program has now surged to over 300 ANL workers. Although some of these workers may not need to be in the lead medical surveillance program, a medical review is required to determine their actual status. ANL Medical is currently developing screening criteria for the lead surveillance program. Furthermore, the thresholds for enrollment into the lead surveillance program are inconsistent between the ES&H Manual requirements and the ANL Medical lead surveillance program requirements. In addition, some ANL workers who wear respirators and have maintained annual respirator fit testing and training requirements are not current with respect to their medical certification or certification updates. A respirator wearer is required by OSHA, DOE, and the ANL ES&H Manual to be medically certified prior to being fit tested. The ANL ES&H Manual requires that respirator wearers who have previously completed a medical questionnaire provide the Medical Department an updated questionnaire before undergoing fit testing. In some cases, the medical updating process is being missed. According to ANL Medical, some respirator wearers have not had their medical status updated in over three years, although they have been fit tested and trained annually during this period. Furthermore, some construction workers are wearing filtering face piece respirators without the OSHA-required training, fit testing, or medical surveillance.

APS Storage Ring Sector

Implementation of ES&H requirements and work control processes at the activity level has not been effective for some non-experimental work activities. Some improvements have been made in all of the organizations reviewed, including establishment of work control and hazards analysis processes. However, these efforts have not been sufficiently rigorous and comprehensive, as indicated by the deficiencies in implementation of the ISM core functions for all of the organizations reviewed. For some APS activities, hazards and hazard controls (including exposure assessments and the resultant requisite controls) have not been sufficiently documented at the activity level in procedures or other work documents to ensure that risks to workers and the environment have been adequately identified, analyzed, and controlled. APS line management has not ensured that all applicable ANL ES&H Manual and Waste Handling Procedures Manual requirements flow down to activity-level work control documentation. The definition, rigor, and quality assurance associated with preparation of some work planning and control documents in WMO are not sufficient to ensure consistent and effective implementation of controls. Some radiological control requirements in WMO and APS were not being effectively implemented. WMO workers are not always meeting facility procedure compliance expectations outlined in the WMO Conduct of Operations Manual. For other PFS organizations, requirements for hazards analysis methods presented in the ES&H Manual and the PFS Supervisory Handbook do not provide sufficient performance criteria and descriptions to ensure that all hazards are adequately analyzed and result in identification of the appropriate controls. Collectively, these deficiencies reduce the assurance that workers are adequately protected.

The safety-significant fire suppression system at AGHCF is inoperable due to inadequate available water pressure, and therefore a fire outside a hot cell could compromise cell confinement and shielding and could result in greater worker exposure than is currently analyzed. The safety-significant AGHCF fire suppression system design is inadequate to perform its safety analysis report (SAR)-defined safety function. It has insufficient water pressure in areas adjacent to the hot cells to be operable. With the current condition, workers may be placed in greater danger than is currently analyzed as a result of a fire that could compromise the hot cell confinement. In addition, the current fire suppression system administrative control limit static header pressure of 65 pounds per square inch gauge (psig) is inadequate for system operability. These conditions had been previously identified in a 1993 fire hazards analysis and/or the 2002 OA assessment but corrective actions were not adequate. Because of OA's observations, the facility staff has decided to aggressively remove combustibles and

flammable liquids from the facility. However, additional compensatory measures are needed, such as a fire watch.

The AGHCF and G and K Wing Laboratories documented safety analysis (DSA) and SAR lack sufficient supporting documentation; contain a number of non-conservative assumptions, errors, omissions, and inconsistencies; and do not have an adequate unreviewed safety question (USQ) process. The current AGHCF SAR does not meet 10 CFR 830 requirements. AGHCF was not able to produce formal documentation (e.g., analyses and rigorous calculations that are independently verified) to support the SAR conclusions/assumptions. AGHCF subsequently determined that a detailed analysis was warranted and decided that a potentially inadequate safety analysis (PISA) existed. Currently, corrective actions are being planned that will include revising the SAR and associated technical safety requirements (TSRs) to ensure that they are 10 CFR 830-compliant. These deficiencies demonstrate that ASO and ANL did not thoroughly review the SAR to validate compliance with 10 CFR 830 when the regulation was put into effect. Furthermore, ANL has not adequately performed USQ screenings and determinations as required by 10 CFR 830.

Front of Hot Cell

Some nuclear safety requirements have not been fully implemented for ANL's AGHCF and G and K Wing Laboratories. The AGHCF and G and K Wing Laboratories did not implement all of the natural phenomena hazard requirements of DOE Order 420.1A, which requires that safety systems be capable of withstanding the effects of natural phenomena to ensure life safety and confinement of hazardous material. G and K Wing Laboratories did not implement some of the cognizant system engineer program requirements of DOE Order 420.1A, which requires that configuration management be applied to ensure consistency among system requirements, performance criteria, system documentation, and physical configuration. In addition, required condition assessment surveys are not conducted at the G and K Wing Laboratories. The AGHCF is not fully compliant with fire protection design requirements as specified in DOE Order 420.1A. Important elements of maintenance, testing, surveillance, and operations for AGHCF safety systems do not meet applicable requirements. Several of the TSR controls for monitoring and surveillance testing of AGHCF safety structures, systems, and/or components are incorrect, incomplete, or inadequate to provide the required assurance that they can perform their safety functions. Further, a significant number of surveillance and testing procedures have incorrectly or inadequately translated the SAR and TSR requirements. In two cases, surveillances were not performed and documented on time, resulting in TSR violations. Maintenance programs do not meet several important DOE Order 433.1 requirements for formal control of replacement parts, a master equipment list, and review of outside organizations' work procedures for the facility. A few adequate operating procedures are in place, but operating procedures have not been established for the majority of the safety-significant systems. Collectively, these deficiencies reduce the assurance that the safety systems will perform their safety functions.

ANL has not established clearly defined feedback and improvement programs at the institutional or divisional levels that are consistently effective in identifying and analyzing safety deficiencies, establishing appropriate corrective and preventive actions, and identifying and applying lessons learned to prevent injuries, operational events, and non-compliance with standards. Self-assessment processes do not result in proactively identified, planned, and scheduled assessments that are tailored to the organization's activities and conditions based on risk. Assessment activities and corrective action processes are often insufficiently documented and are not rigorous in evaluating performance or in identifying causes and establishing documented preventive actions that are tracked to completion. Some assessments required by OSHA, DOE standards, and ANL policy documents are not being performed. ANL has not established a documented, cohesive, and comprehensive corrective action program that effectively manages the

documentation and resolution of safety process and performance deficiencies for all Laboratory organizations. Weaknesses in processes and performance for investigating operational incidents and safety basis deficiencies may be impacting compliance with DOE orders and safety regulations. Injury and illness investigations are poorly documented and typically do not address the elements of ISM, reflect determination of causes, or address appropriate preventive actions. ANL management has not established sufficient controls and monitoring/evaluation for these programs to ensure their adequacy and effective implementation.

ASO line management oversight has not been sufficiently rigorous to drive improvements in ANL safety management. ASO operational awareness activities are not always being conducted with sufficient rigor and focus on observing work and ANL feedback and improvement processes to prevent recurrence or drive continuous improvement in the Laboratory. ASO has not yet established sufficient systems to provide feedback on the implementation and effectiveness of ASO operational awareness activities to ensure that management expectations are being fully met. In addition, ASO has not established and implemented a fully effective issues management and corrective action process that ensures that safety deficiencies identified through ASO line management oversight activities are appropriately documented and tracked to closure. Verification of closure and effectiveness of corrective actions to previous deficiencies has not always been sufficiently rigorous to prevent recurrence or drive continuous improvement of the contractor.

4.0 Summary Assessment

The following paragraphs provide a summary assessment of the ASO and ANL activities that were evaluated by OA during this inspection. Additional details relevant to the evaluated organizations are included in the technical appendices in Volume II of this report.

ISM Core Function Implementation

The first four core functions of ISM are implemented with varying levels of effectiveness for non-experimental work by the various line organizations reviewed. ANL personnel are typically very experienced, and many work activities are performed with a high regard for safety. Some hazards are adequately analyzed and controlled. However, there are deficiencies in work planning and control in all organizations reviewed. Further, there are deficiencies in some institutional safety requirements that impact the effectiveness of ES&H programs at the facility and activity level. As a result, in addition to the deficiencies discussed below in individual ANL organizations, some ES&H requirements have not been implemented, some medical surveillance activities have not been performed, and there are deficiencies in some aspects of radiation protection at the activities reviewed.

Aerial View of APS

APS Work Planning and Control. APS operational and maintenance activities are generally well defined, and most hazards are well analyzed. The APS safety assessment document and activity-level work documents define work to be conducted, and the safety assessment document further provides an extensive facility-level hazards analysis. Such mechanisms as the procedure development process, job safety analyses, and other work control processes provide appropriate analyses of activity/task-level hazards in most cases. However, in a few cases, individual activities or facility conditions have not been sufficiently analyzed to ensure that the appropriate controls can be identified. Although APS has established many of the appropriate engineering, administrative, and personal protective equipment (PPE) controls commensurate with the hazards present, in some cases engineering and administrative controls have not been adequately implemented. Instances were identified where ANL ES&H Manual and Waste Handling Procedures Manual requirements were not incorporated into activity-level work documents. Although individual requirements were not followed in a few cases, the vast majority of work was performed safely and in accordance with established controls.

WMO Work Planning and Control. The scope of work for activities performed by WMO is generally clearly defined and sufficiently detailed to enable effective hazard identification. Several mechanisms are used for hazards analysis, and recent WMO efforts to tailor these tools to specific work activities represent a continuing improvement and, with few exceptions, effective hazards analysis. The prevalence of radiological and chemical hazards associated with WMO work dictates significant use of administrative controls and PPE to mitigate hazards. However, improvement is needed in the definition, application, implementation, and quality control of these mechanisms to ensure effectiveness of controls. In addition, continuing deficiencies in fundamental aspects of the site's radiation protection program and line implementation of radiological requirements limit the effectiveness of radiological controls and defensibility of radiological data needed to ensure compliance with regulatory requirements. Many

work activities in WMO were conducted safely and in accordance with established controls. However, lack of attention to requirements and governing documents has resulted in the failure to meet some nuclear facility conduct of operations and quality assurance requirements. Additional management attention is needed to ensure that workers understand all procedure compliance expectations, including the need to review and either follow or correct governing work control mechanisms before completing their tasks.

PFS Construction Section, Construction Crafts, and Building Maintenance. In many cases, the PFS groups that OA reviewed have adequately implemented the first four core functions of ISM. The Construction Section has established a rigorous process for definition of work. PFS personnel were well trained and knowledgeable. The work activities observed by OA were generally performed safely. In most cases, standard industrial hazards encountered by Building Maintenance mechanics and the Construction Crafts group are adequately addressed by job hazard questionnaires, job hazards analyses, and task evaluation processes, and construction project hazards were generally well analyzed because of the formal requirements placed in subcontractor contracts and the involvement of construction field representatives and safety personnel in work planning. Although PFS has shown improvement in implementation of ISM since the 2002 OA inspection, some deficiencies still exist. The formal work order process for Construction Crafts and Building Maintenance sometimes results in a definition of work that may not be sufficient in detail to adequately analyze all potential hazards. PFS hazard controls are implemented through various mechanisms; however, the informality and/or lack of administrative direction for some of these mechanisms have resulted in deficiencies in implementation of controls. In some PFS groups, corrective actions from the 2002 OA inspection have not been fully effective, as evidenced by recent events that resulted in injuries to PFS workers. Overall, the PFS work hazards analysis and control processes as implemented rely too much on individual work experience and informal communication between supervisors and workers.

Safety System Functionality and Safety System Oversight

The AGHCF managers and operators were knowledgeable of the operations and controls of the safety-significant AGHCF systems. Some progress has been made to enhance nuclear safety systems in a few areas, such as efforts to establish configuration management and a systems engineer program. However, AGHCF safety systems and the SAR did not fully comply with 10 CFR 830 requirements, and the systems were not adequately designed and analyzed to ensure that they could perform their safety functions under design basis accident conditions. DSAs for the evaluated facilities contain omissions, inconsistencies, and non-conservative statements. Additionally, there was no documentation to support the analytical information presented in the AGHCF SAR. The AGHCF fire protection system was determined to be inoperable. ANL did not adequately evaluate and implement many of the requirements of DOE Order 420.1A. ANL has not instituted a functional configuration management program, the USQ procedure does not reflect the requirements of 10 CFR 830, and many AGHCF USQ screenings and determinations were inadequately supported or incorrect. Several important aspects of maintenance procedures, testing and surveillance practices, and operating procedures were inadequate. Some of the discrepancies that were identified have been attributed to insufficient nuclear safety system oversight by ASO, weaknesses in the ANL feedback and improvement and cognizant system engineer programs, and the need for an expanded nuclear safety infrastructure.

Implementation of DOE Order 450.1, *Environmental Protection Program*

ASO provides effective direction to and oversight of ANL for the development and implementation of an EMS, and ASO has driven enhanced performance by ANL in achieving EMS milestones by using performance measures specific to these milestones.

APS Boosters Synchrotron

ANL has developed an EMS within the ISM description document; however, the EMS implementation actions are still being developed, and additional efforts are needed to develop detailed planning documents. Despite these challenges, the EMS is on schedule to be implemented and verified in accordance with DOE Order 450.1. ANL continues to implement a pollution prevention program and, with ASO performance measure incentives, is taking actions to reinvigorate the program following changes in waste management funding.

Hoisting and Rigging

The PFS hoisting and rigging program is being updated to remain current with changing DOE regulations. Equipment operators are current in their training and have current licenses, and hoisting and rigging equipment is adequately inspected on an annual basis. However, in a number of cases, pre-use and monthly inspections are not being performed as required, and some equipment was defective. In addition, ANL hoisting and rigging requirements have not been adequately incorporated in some ANL construction subcontractor's contracts, ES&H plans, or job safety analyses.

Chronic Beryllium Disease Prevention Program

There are currently no active beryllium activities at ANL, although beryllium has been used in past ANL operations. Beryllium characterization of the ANL site facilities is complete, but only half of the beryllium-contaminated areas identified during the characterization campaign have been remediated. There have been no confirmed cases of beryllium sensitization or chronic beryllium disease reported to date. The medical data on current and former employees is robust; however, a number of workers in the current beryllium database have not been offered medical surveillance or been evaluated by Medical, as required by the ES&H Manual and 10 CFR 850. Furthermore, recent ASO oversight of the ANL beryllium program has been minimal, and no formal assessments of the beryllium program have been conducted by either ANL or ASO.

ANL Feedback and Improvement

A variety of feedback and improvement activities are conducted at ANL, and some ANL organizations have made improvements in feedback and improvement processes. However, the process and implementation deficiencies identified in the 2002 OA inspection continue to exist. ANL conducts various assessments and management walkdowns, identifies and corrects deficiencies, and shares lessons learned. In many cases, however, these activities are not proactively planned and scheduled, and the resolution of deficiencies is often informal. Little trend analysis of safety issues is performed, and some mandatory assessments are not being performed. Weaknesses were identified in the rigor applied to documenting the investigation of occupational injuries and exposures and the identification and implementation of preventive actions. Most line organization corrective action processes are fragmented, informal, and insufficiently defined, and collectively do not constitute an effective management system for rigorous and consistent identification, evaluation, and resolution of Laboratory safety issues. Institutional policies, expectations, and procedures inadequately define the roles, responsibilities, authorities, and requirements for feedback and improvement. A number of cases of failure to comply or inconsistent compliance with specific institutional requirements were identified. ANL management has not ensured that sound feedback and improvement programs have been developed and effectively implemented. Management has not set sufficiently rigorous thresholds for acceptable ISM processes and performance.

SC/ASO Oversight

SC Headquarters has been more active and involved in safety at its laboratories in the past several years. SC has established processes for developing performance indicators, setting goals, and monitoring performance measures across SC laboratories. This management focus has contributed to a generally improving trend in performance indicators at SC laboratories. ASO has established processes for conducting operational awareness activities and evaluation of contractor ES&H performance, and has made some improvements in its feedback and improvement processes. In addition, ASO is making effective use of the ANL contractual mechanism for driving improvements in worker safety and in performance in achieving EMS milestones. Although some aspects of the ASO oversight are effective, there are a number of weaknesses in ASO assessment activities limiting the effectiveness of ASO oversight of ANL performance. In addition, ASO has not established and implemented a fully effective issues management and corrective action process, and verification of closure and effectiveness of corrective actions has not always been sufficiently rigorous to prevent recurrence and drive continuous improvement of the contractor.

5.0 Conclusions

SC, ASO, and ANL have made improvements in a number of ISM elements. The ANL ES&H Manual effectively identifies applicable site-specific requirements and regulatory requirements. Several ANL organizations have made improvements in various aspects of work planning and control processes. ASO provides effective direction to and oversight of ANL for the development and implementation of an EMS, and ANL has made considerable progress in implementing the EMS. SC has also increased its focus on communicating lessons learned, including EH safety and health alerts, to SC site offices and laboratories. These activities have contributed to generally improving trends in certain worker safety performance measures.

ANL ES&H requirements are implemented with varying levels of effectiveness by line management in the various line organizations. ANL personnel are typically very experienced, and many work activities are performed with a high regard for safety. Some hazards are adequately analyzed and controlled. However, there are deficiencies in work planning and control for non-experimental work in all organizations reviewed. In addition, there are deficiencies in implementation of some institutional safety requirements, institutional radiation protection programs, and medical surveillance. The deficiencies in the institutional programs have contributed to implementation deficiencies at the activities reviewed on this OA inspection and may impact other ANL facilities and activities. In the area of safety systems, progress has been made in a few areas, but the evaluated safety systems and DSAs did not fully comply with 10 CFR 830 and were not adequately designed and analyzed to perform their safety functions under design basis conditions. The AGHCF fire suppression system is inoperable and ANL and ASO need to take timely compensatory actions.

While some enhancements have been made in ASO and ANL feedback and improvement processes, many process and performance weaknesses remain in assessments, issues management, lessons learned, and injury and illness reporting. ASO and ANL have made only limited progress in correcting a number of longstanding and systemic deficiencies identified by various internal and external assessments. Because of weaknesses in developing and verifying corrective actions, many findings have been closed before the effectiveness of the corrective actions was validated and verified. Improvements in feedback and improvement processes are key to achieving the needed improvements in safety management across ANL activities and safety systems.

Some of the areas that warrant increased ANL management attention include:

- Enhancing worker safety and health and environmental protection through more rigorous hazards analysis and implementation of controls for industrial hazards and hazardous substances.

- Ensuring compliance with ES&H requirements, and full and effective implementation of existing processes, to include clearly assigning responsibility for implementation of ES&H requirements and holding managers accountable.

- Ensuring timely actions to address fundamental weaknesses in the ANL radiation protection program through adherence to the applicable portions of the DOE Order 441.1 series of implementation guides and the DOE radiological control standard.

- Ensuring timely actions to address the inoperable AGHCF fire suppression system and prevent recurrences of TSR violations.

- Developing resource-loaded plans with milestones to revise DSAs, TSRs, and USQ programs to meet current DOE and regulatory requirements.

- Enhancing ANL feedback and improvement processes, particularly in issues management, in the rigor and quality of assessments, and in the disciplined and effective implementation of the contractor assurance system.

- Strengthening the nuclear safety program and enhancing the nuclear safety infrastructure.

SC and ASO line management need to focus on ANL efforts in the above areas and address weaknesses in its line management oversight processes in the areas of assessments, issues management, and verification of corrective actions.

6.0 Ratings

The ratings reflect the current status of the reviewed elements of the ANL ISM program.

Implementation of Core Functions #1-4 for Selected Work Activities

ANL ACTIVITY	CORE FUNCTION RATINGS			
	Core Function #1 – Define the Scope of Work	**Core Function #2 – Analyze the Hazards**	**Core Function #3 – Identify and Implement Controls**	**Core Function #4 – Perform Work Within Controls**
APS	Effective Performance	Effective Performance	Needs Improvement	Effective Performance
WMO	Effective Performance	Effective Performance	Needs Improvement	Needs Improvement
PFS	Effective Performance	Needs Improvement	Needs Improvement	Effective Performance

Feedback and Improvement - Core Function #5

ASO and ANL Feedback and Continuous Improvement Processes .....SIGNIFICANT WEAKNESS

Essential System Functionality (for selected safety systems at the AGHCF and G and K Wing Laboratories)

Engineering Design and Compliance with DOE Order 420.1A .....SIGNIFICANT WEAKNESS
Configuration Management .....SIGNIFICANT WEAKNESS
Surveillance and Testing.....SIGNIFICANT WEAKNESS
Maintenance .....NEEDS IMPROVEMENT
Operations .....NEEDS IMPROVEMENT

APPENDIX A
SUPPLEMENTAL INFORMATION

A.1 Dates of Review

Planning Visit	April 12 – 14, 2005
Onsite Inspection	April 25 – May 5, 2005
Report Validation and Closeout	May 18 – 20, 2005

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Director, Office of Security and Safety Performance Assurance
Michael A. Kilpatrick, Director, Office of Independent Oversight and Performance Assurance
Patricia Worthington, Director, Office of Environment, Safety and Health Evaluations
Thomas Staker, Deputy Director, Office of Environment, Safety and Health Evaluations

A.2.2 Quality Review Board

Michael Kilpatrick	Patricia Worthington
Dean Hickman	Robert Nelson

A.2.3 Review Team

Patricia Worthington, Team Leader

Vic Crawford	Robert Freeman	Michael Gilroy	Bill Miller
Bob Compton	Joe Lischinsky	Jim Lockridge	Joe Panchison
Don Prevatte	Michael Shlyamberg	Ed Stafford	Mario Vigliani

A.2.4 Administrative Support

MaryAnne Sirk	Tom Davis	
Shirley Cunningham	Latonya Parker	Kim Zollinger

A.3 Ratings

The Office of Independent Oversight and Performance Assurance uses a three-level rating system to provide line management with a tool for determining where resources might be applied toward improving environment, safety, and health. 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 three ratings and the associated management responses are:

- Effective performance, which indicates that management should address any identified weakness
- Needs improvement, which indicates a need for significantly increased management attention
- Significant weakness, which indicates a need for immediate management attention, focus, and action.

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APPENDIX B
SITE-SPECIFIC FINDINGS

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

FINDING STATEMENTS
1. ANL has not established adequate processes for ensuring that all applicable requirements are identified, responsibilities for implementation are assigned, appropriate implementing documents/procedures are developed, and effective implementation is verified by management.
2. The ANL institutional radiation protection program does not meet minimum DOE expectations in such areas as organization and administration, implementing procedures, radiation control technician training and qualifications, and technical basis documentation as needed to ensure effective sitewide radiation protection performance and compliance with 10 CFR 830 and 10 CFR 835 requirements.
3. Medical surveillances for a number of workers at ANL are not being implemented for beryllium, lead, and respiratory protection as required by DOE orders, OSHA standards, and ANL procedures.
4. For some APS activities, hazards and hazard controls (including exposure assessments and the resultant requisite controls) have not been sufficiently documented at the activity level in procedures or other work documents to ensure that risks to workers and the environment have been adequately identified, analyzed, and controlled.
5. APS line management has not ensured that all applicable requirements in the ANL ES&H Manual and the Waste Handling Procedures Manual flow down to activity-level work control documentation.
6. The definition, rigor, and quality assurance associated with preparation of some WMO work planning and control documents are not sufficient to ensure consistent and effective implementation of controls.
7. Some radiological control requirements in WMO, including posting and labeling, radiological surveys and monitoring, radiological recordkeeping, air sampling, and radiation work permits, are not being effectively implemented in accordance with institutional and/or regulatory requirements.
8. WMO workers are not always meeting facility procedure compliance expectations outlined in the WMO Conduct of Operations Manual.
9. Requirements for hazards analysis methods presented in the ES&H Manual and the PFS Supervisory Handbook do not provide sufficient performance criteria and descriptions to ensure that all hazards are adequately analyzed and that appropriate controls are identified.
10. ASO has not implemented a fully effective program of operational awareness and assessment activities with sufficient scope and rigor to ensure that contractor ES&H performance at all levels and in all organizations is sufficiently and accurately evaluated, as specified in DOE Policy 450.5.

Table B-1. Site-Specific Findings Requiring Corrective Action (continued)

FINDING STATEMENTS
11. ASO has not established and implemented a fully effective issues management and corrective action process that ensures that safety deficiencies identified through ASO line management oversight activities are appropriately documented and tracked to closure, as required by DOE Order 414.1B.
12. ASO has not always conducted or required the contractor to conduct sufficient reviews of contractor corrective actions to verify closure and effectiveness in ensuring resolution of internal and external findings and preventing recurrence, as required by DOE Order 414.1B and DOE Order 470.2B.
13. ANL has not established and implemented a fully effective program of assessment activities with sufficient scope and rigor to ensure that ES&H performance at all levels and in all organizations is consistently and accurately evaluated.
14. ANL has not established an effective corrective actions program that ensures that safety deficiencies are appropriately documented and rigorously categorized and evaluated in a timely manner, with root causes and extent of condition accurately identified, and appropriate recurrence controls identified.
15. The ANL injury and illness program lacks sufficient rigor to ensure that incidents are reported and sufficiently documented, causes are identified, and appropriate, effective corrective and preventive actions are identified, documented, and implemented.
16. ANL has not established a sufficiently rigorous lessons-learned program that ensures that applicable lessons learned are identified and that actions to apply the lessons are taken to improve safety performance and prevent adverse events or non-compliance with regulations.
17. ANL has not fully implemented the requirements of DOE Order 420.1A for the natural phenomena hazards, cognizant system engineer, and fire protection programs.
18. The safety-significant AGHCF fire suppression system is inoperable, and therefore a fire outside a hot cell could compromise cell confinement and shielding and could result in greater worker exposure than is currently analyzed.
19. The AGHCF safety analysis report (Chapter 4, “Safety SSC,” Chapter 3, “Hazard and Accident Analysis,” and Chapter 5, “Derivation of TSR Requirements”), the G and K Wing Laboratories DSA, the technical safety requirements document, and supporting records contain numerous omissions, inconsistencies, and non-conservative statements and do not fully meet the requirements of 10 CFR 830.
20. Contrary to the requirements of 10 CFR 830, ANL has not instituted a functional configuration management and USQ process for its nuclear facilities, has not established an adequate USQ procedure, and has not adequately performed USQ screenings and determinations.
21. Many surveillance, testing, maintenance, and operating procedures and practices in the AGHCF are not adequate to ensure that safety structures, systems, and/or components remain within the limits and capabilities required by the SAR and the TSRs and comply with the requirements of applicable regulations, rules, orders, codes, and standards.

Table B-1. Site-Specific Findings Requiring Corrective Action (continued)

FINDING STATEMENTS
22. ANL failed to perform a TSR-required monthly test of the backup power system automatic start function within the maximum allowed interval at AGHCF and a TSR-required monthly validation of the material inventory in the facility at the G and K Wing Laboratories.
23. SC and ASO have not provided effective line management oversight of the ANL nuclear facility safety systems.
24. ANL feedback and improvement systems (such as self-assessments and the Nuclear Safety Review Committee) and nuclear safety organization are not adequate to ensure that ANL nuclear facilities and safety systems comply with 10 CFR 830 requirements and DOE expectations for operation of a Category 2 nuclear facility.

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