Inspection of
Environment, Safety,
and Health Management
at the

Kansas City Plant

May 2004

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

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Abbreviations Used in This Report

CAIRS	Computerized Accident/Incident Reporting System
CAR	Corrective Action Request
CATS	Corrective Action Tracking System
CFR	Code of Federal Regulations
CSWP	Construction Safe Work Permit
CY	Calendar Year
DOE	U.S. Department of Energy
EM	Office of Environmental Management
EMS	Environmental Management System
ES&H	Environment, Safety, and Health
FES	Facilities Engineering Services
FM&T	Honeywell Federal Manufacturing and Technologies
FR	Facility Representative
FY	Fiscal Year
GSA	General Services Administration
ISM	Integrated Safety Management
ISO	International Organization for Standardization
IWPF	Industrial Wastewater Pretreatment Facility
JHA	Job Hazards Analysis
KCP	Kansas City Plant
KCSO	Kansas City Site Office

(Continued on inside back cover)

OVERSIGHT

1.0 Introduction

The Secretary of Energy's Office of Independent Oversight and Performance Assurance (OA) conducted an inspection of environment, safety, and health (ES&H) at the U.S. Department of Energy (DOE) Kansas City Plant (KCP) site during April and May 2004. 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, which reports directly to the Secretary of Energy.

Aerial View of Kansas City Plant

The National Nuclear Security Administration (NNSA) has line management responsibility for KCP. At the site level, the NNSA Kansas City Site Office (KCSO) has line management responsibility for KCP activities. Under contract to DOE, KCP is managed and operated by Honeywell Federal Manufacturing and Technologies (FM&T). The DOE Office of Environmental Management provides funding for a number of environmental remediation projects that are being performed by FM&T, with KCSO providing line management oversight.

The primary KCP mission involves the manufacture of non-nuclear mechanical, electronic, and engineered material components for U.S. national defense systems. KCP also provides technical support services for national laboratories and government agencies in a variety of areas, including laboratory testing and analysis, training program development, and vehicle safeguards.

KCP activities involve a variety of potential hazards that need to be effectively controlled. Chemical hazards include cyanide; alloys containing beryllium; mercury; chromium; acids; caustics; and ammonia. Potential physical hazards include machine operations, noise, high voltage electrical equipment, excavation, pressurized systems, and construction.

The purpose of the ES&H inspection was to assess the effectiveness of selected aspects of ES&H management at KCP as implemented by FM&T under the direction of KCSO. Using a selective sampling approach, the OA inspection evaluated selected aspects of the integrated safety management (ISM) program:

- KCP implementation of the core functions of safety management for selected facility activities, including production work, maintenance, construction, and environmental protection.
- KCSO and FM&T feedback and continuous improvement systems.
- KCP management effectiveness in managing selected aspects of ES&H program that have been identified by OA as focus areas warranting increased management attention; specific focus areas included management of legacy hazards and safety during excavations and blind penetrations.

Section 2 provides an overall discussion of the results of the review of the KCP ES&H programs, including positive aspects and weaknesses. Section 3 provides OA's conclusions regarding the overall effectiveness of KCSO and FM&T management of the ES&H programs. Section 4 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. Appendix C provides the results of the review of the application of the core functions of ISM for the KCP work activities. Appendix D presents the results of the review of the KCSO and contractor feedback and continuous improvement processes. Appendix E presents the results of the review of the selected focus areas.

2.0 Results

2.1 Positive Attributes

Several positive attributes were identified in ISM implementation at KCP. Many work activities were performed with a high regard for safety, and the environmental protection program was effective.

KCSO and FM&T management continue to demonstrate leadership in environmental protection and implement an effective environmental compliance program. Environmental protection is being improved as part of the KCP continuous improvement process. For example, FM&T changed the chemical process used in the industrial wastewater pretreatment plant to reduce hazardous waste sludge and installed new chillers that use a more environmentally friendly coolant. By controlling the introduction of chlorinated potable water, KCSO and FM&T have received state agreement to remove the residual chlorine limit in the stormwater permit. KCSO and FM&T actions have been effective in addressing solvents in the groundwater. KCSO and FM&T have developed a plan to address a legacy issue involving polychlorinated biphenyls (PCBs), which involves storm water discharges at levels above permit limits; this legacy issue had been addressed but now requires additional action because of changes in discharge limits. KCSO and FM&T have been proactive in developing the plan to address these issues and bringing the issue to the attention of NNSA and the DOE Office of Environmental Management (EM); timely resolution of responsibility for funding the additional efforts is needed to ensure compliance with environmental requirements. FM&T has implemented a process for a systematic analysis of waste streams. The FM&T system for central control and issuance of waste containers is a noteworthy practice; the system ensures proper labeling, has controls to identify unapproved waste streams, and has effective measures to ensure that regulatory time limits of containers are not exceeded. An effective and well-maintained groundwater-monitoring network has been established to demonstrate that contaminants have been defined from legacy operations. Environmental compliance and environmental operation controls were being effectively implemented during the performance of work, including waste management activities and operation of environmental facilities.

Sample Pickup Tube Downstream of Sluice Gate

FM&T has made significant improvements in hazard identification and control processes for production activities since the 2001 OA review. The preliminary hazards analysis process is now completely automated and is being used extensively by the production organizations as a planning tool to obtain the appropriate ES&H requirements for proposed changes to materials, processes, or equipment. Job hazards analyses are more comprehensive, and production organizations have developed many more voluntary job hazards analyses to address production activities beyond those already in place for higher-risk activities. FM&T has also significantly improved the formality, documentation, and implementation of exposure assessments. The exposure assessment program is now extensively defined in a process description and associated work instruction. Industrial hygiene personnel are performing more focused exposure assessments for specific hazards in the field and have already completed department-level hazards assessments for every department in the plant.

The KCP Construction Safety Improvement Team has been effective in identifying and implementing improvements in the KCP construction safety programs through benchmarking best-in-class construction programs identified at other DOE and commercial construction sites. The KCP Construction Safety Improvement Team was established in calendar year 2003 to improve the overall safety performance of construction subcontractors at the KCP. Several of the team's initiatives, such as project activity hazards analyses, daily safety task analyses with craft signoffs, and a full-time onsite safety professional, are being implemented on a prototype basis with the three current captive (i.e., continued onsite presence) KCP construction contractors. An award/incentive fee has also been incorporated into several of the fixed-price subcontractor contracts. Although these initiatives have been in place for less than a year, improvements in safety performance have already been observed by the FM&T safety engineers, and reductions in Occupational Safety and Health Administration (OSHA) performance metrics, such as recordable injuries and lost workday cases, are evident. Other recent initiatives, such as the subcontractor superintendent's monthly safety meeting, have been effective in communicating safety expectations and requirements. Additional initiatives, such as performance-based safety program specifications and development of supplier performance indexes, are planned for implementation in the near future.

FM&T has established a rigorous process to control high voltage maintenance activities. FM&T has developed a specific work instruction that clearly describes the process for performing high voltage switching. The process includes use of switching instructions developed specifically for each maintenance activity, detailed review of switching instructions with all personnel involved in the switching operation, clear requirements for step-by-step implementation of switching instructions, and pre- and post-job briefings. Furthermore, FM&T holds quarterly high voltage briefings among engineers, safety professionals, maintenance personnel, and KCSO to discuss schedules, operations, and safety improvements and continues to improve processes and controls for safe performance of high voltage tasks.

FM&T effectively uses multidisciplinary teams to categorize injury and illness events, investigate injuries and illnesses, and perform causal analysis and preventive action development for corrective action requests. The team approach capitalizes on the experience of individuals with expertise in various management and ES&H disciplines, and provides for additional confidence in injury and illness reportability decisions. An Accident Review Team, consisting of ES&H and occupational medicine subject matter experts, evaluates occupational injury and illness cases to determine OSHA recordability classifications. Accident/Incident Investigation Teams, composed of ES&H subject matter experts and line personnel and led by a trained investigator, conduct the investigation of accidents, including occupational injuries and illnesses. The process includes causal analysis, development of corrective and preventive actions, and documentation of the investigation for reporting to DOE. Teams of ES&H subject matter experts and line personnel conduct analysis of more significant ES&H issues, identify corrective and preventive actions, and perform follow-up to ensure implementation of those actions.

2.2 Items for Management Attention

Although some aspects of ISM at KCP are effective, some KCP hazard analysis and control processes are not sufficiently rigorous or documented. KCSO and FM&T feedback and improvement programs are not sufficient to ensure that ES&H requirements are effectively implemented and that deficiencies are self-identified and corrected.

Construction safety programs have not met DOE performance expectations in certain areas, such as activity-level hazards analyses for fixed-price contractors, safety permits, and ensuring subcontractor compliance with OSHA required safety and training programs and construction safety requirements when performing work. With the exception of the captive construction contractors (see positive attribute above), there are few effective mechanisms for identifying, analyzing, and documenting activity-level construction hazards for fixed-price and service subcontractors. One existing mechanism, the safety plan, is sometimes ineffective in documenting activity-level hazards and linking hazards to specific controls, particularly for larger and longer-term fixed-price contracts, which typically involve a greater variety of hazards and controls. Some subcontractors have not developed or implemented safety programs required by OSHA, DOE, and FM&T in such areas as hazard communications, respiratory protection, and beryllium. Several subcontractors have not adequately identified

Lined Lateral Pipe

safety training requirements commensurate with the hazards to which their workers are exposed, and do not have a means for maintaining safety training records or verifying that training is adequate prior to performing work. Some safety permits, such as the construction safe work permit, lack sufficient instructions to ensure that the permit is completed, applied, and authorized as intended. In some cases, construction workers have not followed the requirements documented in hazards analyses or the KCP *Construction Safety Handbook*.

FM&T has not effectively implemented its maintenance work control process to ensure that all hazards and controls are identified and has not rigorously implemented important controls for some work activities. Although FM&T has established processes and tools to support the definition of work and the identification and analysis of hazards, in many cases these tools were not effectively utilized, resulting in some hazards and controls not being identified. For example, a potential carcinogen hazard from welding stainless steel and appropriate controls, such as ventilation and signage, were not identified. Also, hazards with confined spaces in ventilation plenums have not been fully addressed. Furthermore, several weaknesses were identified in implementation of important controls, including insufficient adherence to controls for lockout/tagout, excavations, and energized electrical work; inadequate adherence to instructions for performing a high voltage test; and not rigorously following protocols for revising high voltage switching instructions. These weaknesses reduce the level of safety in performing some maintenance activities.

In some cases, production departments do not adequately tailor personal protective equipment requirements for activity-specific hazards into work instructions used by associates to perform work. The 2001 OA review identified that job hazards analysis controls had not been effectively linked or tailored to specific work activities; FM&T has made minimal progress in systematically addressing this concern. In production areas, some controls (particularly personal protective equipment requirements unique to an activity) are absent from work documents. Where controls have been integrated into work documents, personal protective equipment requirements are occasionally insufficient or inaccurate for specific hazards. In addition, requirements sometimes differ between work instructions, process engineering specifications, job hazards analyses, and other specifications.

FM&T feedback and improvement processes are not consistently implemented and do not ensure that safety performance is adequately evaluated and that causes of deficiencies are effectively addressed to prevent recurrence. FM&T has not established requirements for line management and subject matter experts to conduct periodic, planned, formal self-assessments of safety related processes and program implementation. Although external and internal assessment and inspection activities have led to safety improvements in a number of areas, they are often insufficiently rigorous to effectively evaluate process adequacy and field implementation. Assessment activities do not include sufficient observation of work. Assessments and investigations of safety issues and events do not consistently and thoroughly evaluate performance against the core functions and guiding principles of ISM. Issues management is being hindered by weaknesses in processes and implementation. Many ES&H related corrective action requests had errors or weaknesses in accurately describing the issue, citing the requirements violated, or classifying the risk category as required by procedure; accurately identifying direct, contributing and root causes; establishing preventive actions that address contributing and root causes; and, in several cases, closing the corrective action request when specified corrective actions had not been verified as complete. In many cases, the evaluations do not address deficiencies in the core functions of ISM such as work scope definition, hazard identification, specified controls, or adherence to specified controls. Although some lessons learned are being identified and communicated, weaknesses in the established processes and in the implementation of existing requirements inhibit this program's effectiveness in driving continuous improvement. The lessons-learned process is poorly detailed in the governing FM&T work instruction. There

are no procedural drivers for work planners or training to review and incorporate lessons-learned data into their products. The internal web site is not being effectively used as a tool for identifying and applying lessons learned. Many published lessons learned inadequately identify and communicate essential elements of the lessons to be learned.

The complexities and poor quality of process instructions contribute to inconsistent and deficient performance in the implementation of FM&T feedback and improvement systems. Numerous work instructions, often from several governing process descriptions owned by different FM&T organizations, delineate the process responsibilities and actions to implement several essential safety management functions, including issues management, injury and illness investigation and reporting, and accident/incident investigation. The fragmentation of process elements, combined with numerous technical and administrative errors and omissions in these work instructions, complicate the implementation of these management systems and contributed to a number of instances where requirements (e.g., reporting operational events) were not met. In addition, responsibilities for many ES&H management system activities are delegated to teams or to the collective ES&H organization without clear identification of the person or position ultimately accountable for the accuracy and quality of the end product. Few decisions in the management of issues, events, lessons learned, and injuries and illnesses require the formal review or approval of ES&H managers, and negative decisions are not documented. Revisions to command media, in which many deficiencies were noted during this inspection, do not require technical or administrative review or approval of ES&H managers.

KCSO is not currently performing effective line management oversight of FM&T activities. KCSO has made some progress in developing formal line management oversight processes since the 2001 OA review, and many aspects of the new processes are adequate to address current weaknesses, if effectively implemented. However, few of these processes have been fully implemented, and most of the deficiencies identified in the 2001 OA review (insufficient review of contractor implementation of ES&H requirements in the facilities, inadequate KCSO self-assessments, and inadequate issues management processes) are still evident. In addition, KCSO, based on NNSA guidance, has dissolved the Facility Representative program, which was not required for a non-nuclear facility but was a mature and generally effective KCSO ES&H line management oversight process, before the new processes were fully implemented. Further, there are weaknesses in some aspects of the new processes that could hinder their effectiveness. Finally, the KCSO *Line Oversight Plan* and the numerous new, planned, or recently issued processes constitute a significantly increased workload in a number of areas (e.g., the planned self-assessment program call for significantly more self-assessments than have been performed in past years). KCSO has not issued an implementation plan or other document that describes how resources will be applied to accomplish the new and expanded activities.

3.0 Conclusions

The four areas reviewed (production, environmental protection, maintenance, and construction) have different work control processes, and different organizations within FM&T have line management responsibility. As discussed below, effectiveness in implementing the core functions of ISM varied across the four activities. Most aspects of the ISM core functions are effectively implemented for production and environmental protection activities, but improvements are needed in maintenance and construction activities. In addition, feedback and improvement activities for both KCSO and FM&T need to be improved.

Production

KCP production operations represent most of the work activities at KCP. Production activities are characterized by generally strong mechanisms for implementation of the core functions, and most of these mechanisms are effective. Work scopes are adequately defined, hazard identification and analysis processes result in effective controls in most cases, and observed work was generally performed in accordance with the controls. KCSO and FM&T have made improvements in several processes, such as the preliminary hazards analysis and job hazards analysis, and have addressed some of the specific concerns identified in the 2001 OA review, such as weaknesses in exposure assessments. However, isolated problems are evident in the integration of controls unique to specific activities into work documents.

Environmental Protection and Legacy Hazards

KCSO and FM&T continue to implement a rigorous and effective environmental protection program. With few exceptions, the environmental compliance and waste management program elements reviewed on this OA inspection meet applicable requirements and are effectively implemented. The controls established for management of waste containers are a noteworthy practice that may benefit other DOE sites. The deficiencies identified on the 2001 OA review have been adequately addressed. The few identified weaknesses need to be addressed but are isolated instances within an overall effective system. In addition, KCSO and FM&T have demonstrated a strong commitment to addressing environmental hazards, as evidenced by the proactive and systematic approaches for addressing legacy hazards. However, NNSA and EM need to determine funding responsibility for further mitigating PCB releases in a timely manner to address the current exceedences of environmental requirements (i.e., the Missouri Clean Water Act), and work with KCSO and FM&T to implement a path forward in a timely manner.

Gravel Deposit Upstream of Meter Pit

Maintenance and Excavations/Blind Penetrations

For maintenance activities, FM&T has established processes, work instructions and tools that effectively support maintenance planning and control so that work can be performed safely, particularly for high voltage work processes. However, FM&T has not rigorously implemented its work control process to provide maintenance work packages that clearly define the scope of work and identify all hazards and controls, and several weaknesses were identified in implementation of important controls. FM&T also took some actions to address weaknesses identified in a 2001 OA review in the areas of safety during excavations

and blind penetrations, which are performed by maintenance or construction personnel. However, these actions were not fully effective. A recent electrical intrusion event during a construction excavation prompted KCSO and FM&T to take additional actions to enhance safety during excavations and blind penetrations. While these represent a significant improvement, further process enhancements and oversight are needed to ensure that they are effectively implemented.

Construction

In the area of construction, a number of effective mechanisms, such as construction safety orientation, pre-construction meetings, and a construction safety handbook, are used to communicate safety expectations for construction activities to subcontractors. The FM&T construction safety engineers are actively involved in providing guidance for new subcontractors concerning expectations when working in DOE facilities. The recent initiatives of the Construction Safety Improvement Team have already yielded improvements in the construction safety programs for the captive subcontractors. However, a number of weaknesses need to be addressed in activity-level hazards analyses for fixed-price and service subcontractors, definition and verification of safety training requirements, implementation of safety programs required by OSHA and DOE, clarification of some safety permitting processes such as the construction safe work permit, and greater adherence of construction subcontractors to the safety requirements. The identified deficiencies, particularly with the other (non-captive) subcontractors, indicate that much improvement is needed. The initiatives recently applied for captive subcontractors, as part of the longer-term Construction Safety Improvement Team, provide a good framework for improvement and need to be further expanded and implemented for other subcontractors.

Feedback and Improvement

KCSO and FM&T have made some progress in addressing weaknesses in feedback and improvement systems. KCSO has developed an overall process and several implementing documents to implement the draft NNSA line oversight policy and has a well-defined process for managing the contract performance incentive process. FM&T has established and implemented mechanisms that provide feedback on safety performance and conditions in work areas, and FM&T ES&H staff are conscientious and actively and extensively involved in managing ES&H feedback and improvement processes. An extensive internal quality assurance audit program routinely evaluates ES&H-related management systems, identifies deficient processes and performance, and initiates corrective action. A formal and comprehensive plant condition inspection process routinely identifies housekeeping deficiencies and unsafe working conditions.

However, while some progress has been realized, much work remains to effectively implement feedback and improvement processes for both KCSO and FM&T. Efforts to complete and implement KCSO self-assessment and contractor oversight processes are in progress, but KCSO is not currently implementing an effective line management oversight program. Although FM&T has a number of assessment processes that focus on physical conditions and the existence of documentation, FM&T assessments need to focus more on evaluation of performance and work observations to verify that ES&H requirements are effectively implemented. Further, weaknesses in the FM&T issues management and lessons-learned processes and implementation of those processes hinder their effectiveness in ensuring that identified deficiencies are addressed, trends are identified, and recurrence controls are established.

Summary. Overall, FM&T management, ES&H subject matter experts, and the individuals who conduct work activities and safety management at KCP are experienced and exhibit a commitment to safety and quality work. The site has a good safety record, and safety performance metrics indicate improving trends. Most work that was observed was conducted in a safe manner and consistent with specified controls. However, the effectiveness of ISM implementation varied for the activities that OA evaluated. KCSO and FM&T have effectively implemented the ISM core functions in production and environmental protection, with few weaknesses. However, maintenance and construction activities exhibited a number of weaknesses in implementation of ES&H processes and requirements. A number of deficiencies in work control need to be addressed, particularly for maintenance and construction activities, to reduce the likelihood of additional events and injuries. While some enhancements have been made in KCSO and FM&T feedback and improvement processes, many process and performance weaknesses remain. Further refinement and effective implementation are needed in KCSO's new processes, and FM&T needs to address a number of weaknesses in feedback and improvement processes and implementation.

4.0 Ratings

The ratings reflect the current status of the reviewed elements of the KCP ISM program:

Implementation of Core Functions for Selected Work Activities

Core Functions #1-4 Implementation – Production ..... EFFECTIVE PERFORMANCE
Core Functions #1-4 Implementation – Environmental Protection ..... EFFECTIVE PERFORMANCE
Core Functions #1-4 Implementation – Maintenance ..... NEEDS IMPROVEMENT
Core Functions #1-4 Implementation – Construction ..... NEEDS IMPROVEMENT

Feedback and Improvement

Core Function #5 – Feedback and Continuous Improvement ..... NEEDS IMPROVEMENT

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APPENDIX A
SUPPLEMENTAL INFORMATION

A.1 Dates of Review

Scoping/Planning Visit	February 23-27, 2004
Onsite Review Visit	April 26-May 7, 2004
Report Validation and Closeout	May 17-20, 2004

A.2 Review Team Composition

A.2.1 Management

Glenn S. Podonsky, Director, Office of Security and Safety Performance Assurance
Michael A. Kilpatrick, Director, Office of Independent Oversight and Performance Assurance
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

Thomas Staker, Team Leader
Phil Aiken, Feedback and Improvement, NNSA
Robert Compton, Feedback and Improvement, FM&T
Vic Crawford, Environmental Protection, Legacy Hazards
Jim O'Brien, Maintenance, Electrical Safety for Excavation and Blind Penetration Activities
Jim Lockridge, Construction
Edward Stafford, Production

A.2.4 Administrative Support

Mary Anne Sirk
Lee Roginski
Tom Davis

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APPENDIX B
SITE-SPECIFIC FINDINGS

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

FINDING STATEMENTS	REFER TO PAGE
1. FM&T has not established effective mechanisms to ensure that all appropriate hazard controls unique to a specific activity are accurately incorporated into the work documents used by the associates performing the work.	17
2. FM&T has not effectively implemented all of its work control processes for maintenance work to ensure that all appropriate hazards are identified and adequately support development of controls.	20
3. Maintenance supervisors and craft personnel have not rigorously implemented all controls established by FM&T to ensure that maintenance work is performed safely.	22
4. For fixed-price construction work, FM&T has not ensured that construction contractors have implemented an activity-level hazards analysis process for the identification, documentation, and control of construction hazards as required by DOE Policy 450.4.	24
5. FM&T has not ensured that KCP construction subcontractors have developed and implemented safety programs required by OSHA, DOE, and their contracts, such as respiratory protection, hazard communications, and beryllium control programs.	26
6. FM&T has not ensured that KCP construction subcontractors have adequately defined safety training requirements and training documentation commensurate with expected hazards, and that the training status of construction workers is verified before they perform work.	27
7. KCSO does not currently implement processes for line oversight of environment, safety, and health that meet the requirements of DOE Policy 450.5.	40
8. KCSO and the NNSA Service Center have not established a program for training KCSO personnel that meets requirements of DOE Order 360.1B, *Federal Employee Training*.	43
9. FM&T has not established and implemented a fully effective assessment program that rigorously and consistently evaluates the implementation of individual safety and health program elements and safety management processes, and accurately evaluates overall safety and health performance.	46
10. FM&T has not established and implemented a fully effective issues management process that consistently and rigorously categorizes, documents, and manages events and issues, evaluates causes, establishes effective preventive actions, and verifies that corrective and preventive actions have been implemented.	50

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

FINDING STATEMENTS	REFER TO PAGE
11. FM&T has not established and implemented an effective lessons-learned process that consistently and formally identifies potential lessons from internal and external events and activities, evaluates them for applicability, determines needed actions, and applies those lessons to prevent accidents and operational events at KCP.	53
12. Deficiencies in the command media providing the descriptions and implementation instructions for many feedback and improvement processes adversely affect the implementation and effectiveness of these programs.	54
13. NNSA Headquarters and EM Headquarters have not resolved responsibility for providing resources to ensure compliance with Missouri Clean Water Act requirements for storm water discharges at the KCP.	61
14. FM&T has not established adequate controls to ensure that excavations and blind penetrations are performed safely.	62

APPENDIX C
CORE FUNCTION IMPLEMENTATION (CORE FUNCTIONS #1-4)

C.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluated work planning and control and implementation of the first four core functions of integrated safety management (ISM) for selected Kansas City Plant (KCP) activities. The OA review of the ISM core functions focused on environment, safety, and health (ES&H) programs as applied to four types of activities:

- **Production (Section C.2.1)**
- **Maintenance (Section C.2.2)**
- **Construction (Section C.2.3)**
- **Environmental protection (Section C.2.4).**

For all four areas, OA reviewed procedures, observed ongoing operations, toured work areas, observed equipment operations, interviewed managers and technical staff, reviewed interfaces with ES&H staff, and reviewed ES&H documentation (e.g., permits and safety analyses). Specific processes in each area, OA team activities, and work observed in the four areas are discussed further in the respective results sections.

C.2 Results

C.2.1 Production

OA's evaluation of implementation of the first four core functions of ISM for production activities focused on evaluation of safety performance across several departments of Honeywell Federal Manufacturing and Technologies (FM&T), which manages and operates KCP under contract to DOE. Production work observed by OA included manufacture of a curing agent in the Polymer Production area, mixing and application of coatings in the Production Paint Shop, and laminating and plating activities in the Microelectronics area. Procedures and policies (e.g., stop-work policies) were evaluated, and the KCP hazards analysis and control system components were examined.

Core Function #1: Define the Scope of Work

FM&T continues to have an effective process for defining the scope of new and existing production work. The process and material engineers obtain part or material specifications from the design authority through such mechanisms as process plans, procurement orders, or other requests and then define required materials and supplies and develop needed documentation, such as material specifications, process engineering specifications, preliminary hazards analyses (PHAs), job hazards analyses (JHAs), or other instructions using systems such as the Manufacturing Execution System. In the observed departments, these documents described the processes, products, and schedules in sufficient detail to adequately define the scope of work to support appropriate hazards analysis and identification of hazard controls.

Summary. KCP has a longstanding, established process for defining the scope of work and scheduling activities. This process results in descriptions of work sufficiently detailed to facilitate subsequent hazards analysis.

Core Function #2: Analyze the Hazards

The hazard identification and control process at KCP includes the PHA process, the JHA process, and the exposure assessment process. The hazard identification and control process also includes provisions for identifying specific hazards and associated controls in other mechanisms, such as plans and permits (e.g., radiation work authorizations, and chemical hygiene plans).

The PHA process is the most widely used hazards analysis process and is used as a planning tool for line management to obtain the appropriate ES&H requirements for a proposed change to materials, processes, or equipment. The system is now completely automated and is used extensively by the production organizations. The process has a comprehensive set of thresholds delineating when PHAs are required, such as when new items (e.g., equipment, materials, or chemicals) or activities are added, changes to existing

items or activities, items or activities not used in the last two years, and items or activities associated with specific hazards, such as beryllium or radiological concerns.

The PHA process includes a mechanism for the appropriate ES&H subject matter experts (SMEs) to review the proposed changes and identify required controls. SMEs can assign action items and follow up as needed, including reviews at the work area. Overall improvement in PHA process implementation is evident since the 2001 OA review, and continued attention to SME implementation of the process will ensure a mature and robust system.

FM&T has enhanced several aspects of the JHA process since the last OA inspection. JHAs are more comprehensive, and many more voluntary JHAs have been developed by production line management beyond the mandatory JHAs for higher-risk activities. For example, a recent initiative involves developing JHAs that incorporate a chemical safety plan for hazardous chemicals; previously, JHAs included a chemical safety plan only for carcinogenic chemicals. Proposed initiatives, such as fully implementing chemical safety plan JHAs for all applicable departments and expanding department-level hazards assessments to specific processes, are appropriate to ensure that these hazards are rigorously analyzed.

FM&T has significantly improved the formality, documentation, and implementation of exposure assessments. The exposure assessment program is now extensively defined in a process description and associated work instruction. Industrial hygiene personnel have performed several assessments in the field, including a department-level hazards assessment for every department in the plant, as well as focused exposure assessments for specific hazards. For example, significant exposure assessments were performed in response to carbon dioxide exposure concerns identified in the 2001 OA review. Future plans for the exposure assessment program include addressing exposure assessments at an activity or process level, beginning with higher-risk activities or processes first. Some informality in ES&H SME inputs was observed in a few cases; however, improvement in the exposure assessment program has been significant, and planned enhancements will result in a mature, robust program if fully and effectively implemented.

In addition to the formal hazards assessment and control process, production departments actively work to minimize production hazards and environmental concerns in less formal ways, such as substitution of safer materials or techniques. For example, the Production Paint Shop utilizes a non-hazardous powder coating system whenever possible in place of more traditional paints, thereby reducing the use of volatile organic compounds. In another example, Polymer Production replaced an ozone-depleting solvent (CFC-113) with hexane for a portion of a curing agent synthesis process. This change not only eliminated the use of an ozone-depleting substance, but also virtually eliminated operator exposure to the new solvent.

Summary. FM&T has significantly increased the rigor and formality of hazards analysis processes since the 2001 OA review, and results of these efforts are evident in the use of the hazards analysis products by production line management. The hazard identification and control system is effective in identifying and analyzing hazards. Continued attention to implementation by SMEs and continued progress toward planned improvements will enhance the system.

Core Function #3: Identify and Implement Controls

Production departments use engineering controls wherever possible to minimize hazards. The Microelectronics Department has installed state-of-the-art engineering controls, including hoods, exhaust ventilation systems for the clean rooms, and an extensive waste collection system. The Production Paint Shop uses hoods and ventilated paint booths extensively in their work. In older facilities, such as the Polymer Production Facility, engineering controls such as exhaust hoods and ventilation systems are adequately maintained. In addition, Polymer Production has made improvements in some of the originally designed engineered controls. For example, the equipment used for reaction filtration processes has been modified to use encapsulated disposable filters, thereby eliminating operator exposure to the hazardous contents of the used filters. Previous operations involved extensive operator exposure because of the need to manually open filter housings and the need for an extensive cleaning process after filter changeout, with some materials requiring multiple filter changes. These engineered control systems are effective in minimizing many production hazards.

As a supplement to the engineering controls, production departments utilize a combination of administrative controls to effectively address most hazards. Although some deficiencies exist in communication of the need for personal protective equipment (PPE), as described below, the combination

of PHAs, JHAs, exposure assessment action items, postings, permits, material safety data sheets (MSDSs), process engineering specifications, and work instructions effectively controls most routine hazards.

Response to the analysis of the carbon dioxide exposure hazard discussed in the 2001 OA review has resulted in comprehensive engineering and administrative controls for hazard mitigation. The two biggest users, the Telemetry and Environmental Testing departments, have installed appropriate carbon dioxide monitors and alarms, ventilation alarms, and associated alarm responses. Ventilation systems have been analyzed, and the systems have been realigned to maximize fresh air introduction. In the environmental testing laboratory, a new ventilation system is being installed to better maintain appropriate ventilation. In addition to actions at these two departments, ES&H has identified all uses of carbon dioxide in the plant, assessed the corresponding hazards, and implemented appropriate controls where required.

Although identification of hazard controls is effective, a few deficiencies exist in the implementation of controls. In some cases, production departments do not adequately tailor PPE requirements for activity-specific hazards into work instructions used by workers (called associates at FM&T) to perform work. The 2001 OA review identified that controls have not been effectively linked or tailored to specific work activities, and the Kansas City Site Office (KCSO) and FM&T have made minimal progress in systematically addressing this concern. In production areas, controls (particularly PPE requirements unique to an activity or beyond those applicable to entire workspace) are, in some cases, absent from work documents.

The absence of PPE in work documents contributed to an event on June 28, 2002, in which an associate developed dermatitis on the forearms and neck after handling an isocyanate-based material without proper PPE (the associate was wearing latex gloves not suitable for the chemical and was not wearing a lab coat). The exposure resulted in an Occupational Safety and Health Administration (OSHA) recordable lost workday case. The accident investigation determined the root cause to be that ES&H requirements in a February 1998 exposure assessment had not been incorporated into the department's engineering documents and work instructions. ES&H used an electronic exposure assessment to notify all departments that use isocyanates about proper PPE and the inappropriateness of using latex gloves for protection from isocyanates; however, the root cause listed in the investigation report (the failure to incorporate controls into engineering documents and work instructions) was not addressed by the corrective actions for other departments.

Where controls have been integrated into work documents, PPE requirements are occasionally insufficient or inaccurate for specific hazards. In addition, PPE requirements sometimes differ among work instructions, process engineering specifications, JHAs, and other specifications. For example, the Microelectronics JHA for gold electroplating specifies a face shield (among other equipment) for activities that could expose associates to cyanide plating solution. The process engineering specification allows goggles to be substituted for a face shield, thereby reducing protection of the face and neck. The Microelectronics JHA for maintaining a chemical list only specifies safety glasses and gloves as required PPE for work with the cyanide solution, which provides even less protection for the face and eyes. The command media work instruction addressing chemical protective clothing and equipment requires *both* a face shield and goggles where the potential for splash or spray exists, which is more conservative than the process engineering specification and the two JHAs. In another example, the process engineering specifications for several operations provide specific PPE requirements for work with acids, but provide no PPE requirements for making up a new solution using a strong caustic (potassium hydroxide). Additionally, the specific PPE requirements for the use of acids (hydrofluoric and hydrochloric acids) in these process engineering specifications and in the Microelectronics JHA for maintaining a chemical list are less conservative than the work instruction addressing chemical protective clothing and FM&T MSDSs for the acids in that they do not require both face shields and safety goggles.

Finding #1. FM&T has not established effective mechanisms to ensure that all appropriate hazard controls unique to a specific activity are accurately incorporated into the work documents used by the associates performing the work.

Summary. Extensive use of engineered controls at KCP significantly reduces major hazards associated with production activities, and hazard identification and control system processes are effective in identifying the additional administrative controls necessary to provide a comprehensive set of controls for production activities. Implementation of most administrative controls is adequate; however, in some cases, the integration of controls unique to specific activities into

work documents is not fully effective. Management attention is needed to ensure the same level of rigor applied to work instructions affecting product quality is applied to work instructions affecting ES&H.

Core Function #4: Perform Work Within Controls

Production departments effectively verify readiness to perform work at the activity level using a combination of scheduling, morning meetings, and supervisor involvement. For example, the Production Paint Shop supervisor holds a morning meeting to communicate scheduled work for the day, assign associates to specific tasks, and verify from associates that necessary parts, controls, and equipment are in place. The meetings include discussions of potential hazards and appropriate controls.

Production associates generally performed work safely in accordance with work instructions and established controls. Associates are experienced and knowledgeable of their work processes and associated hazards. They were aware of their stop-work authority and indicated that they would not hesitate to exercise it. Associates were not hesitant to raise safety issues and expressed confidence in their management to resolve safety problems. Consideration for safety was evident, and workers were conscientious in maintaining good ergonomic practices, such as maintaining body position upwind of hoods and spray areas, keeping hazard postings (such as those for carcinogen areas) current with existing activities, and using appropriate work practices during drum handling activities.

Althugh most work was performed in a safe manner, associates did not follow established PPE requirements in a few cases. For example, in two cases observed by OA, workers did not don impervious lab coats or coveralls when working with carcinogens, as required by the JHA. In addition to these observations, on April 15, 2003, an associate in MF-3 developed skin dermatitis after working with an isocyanate-based material while wearing latex gloves instead of the gloves required by the PHA, resulting in an OSHA recordable restricted workday case. More rigorous incorporation of controls into work documents, as discussed under Core Function #3, should reduce the likelihood of such incidents and, consequently, reduce the likelihood of an illness or injury from the inadequate use of PPE.

Summary. For production work activities, readiness to perform work is adequately verified. Production associates perform work safely and, with few exceptions, within established controls. In a few cases, associates did not use all appropriate PPE, and in at least one case, the inappropriate PPE contributed to an occupational illness. Improvements in the quality of hazard controls is a prerequisite to ensuring that associates consistently use appropriate PPE.

C.2.2 Maintenance

OA's review of maintenance focused on work activities performed by four maintenance crews: construction and arrangement, infrastructure services electric shop, millwright crib, and roof crib. OA focused on activities with potential electrical, physical, or exposure hazards, such as lockout/tagout, lifting and rigging, and welding. Specific jobs reviewed in detail included testing of a high voltage 13 kV cable, preventive maintenance of a 480 V substation, demolition and removal of two pieces of equipment, installation of two pieces of equipment (including a half-ton jib crane), fabrication of a stainless steel work table and tank, test and repair of a ventilation fan, and replacement of ventilation cooling coils. In addition, maintenance shops were toured and documentation and records from numerous in-progress and recently completed jobs were reviewed.

Core Function #1: Define the Scope of Work

FM&T's *Maintenance Standard* defines the KCP approach to performing maintenance. This standard is intended to ensure that the depth and detail of planning and the resources expended on maintenance are commensurate with the potential impact on safety, environmental compliance, safeguards and security, and present and future programmatic missions and that they provide a foundation for performing maintenance commensurate with that of commercial industry. The maintenance process is further defined in a process description and work instructions for preventive maintenance and corrective maintenance, which generally provide good instructions for controlling the maintenance work from initiation through planning, execution, and closeout.

The process description and work instructions state that the computerized maintenance work order system (MAXIMO) is to be utilized as a tool for controlling maintenance work activities. MAXIMO has some useful features for defining the scope of work, identifying hazards and controls, prioritizing work, and scheduling and tracking resources. All maintenance work observed by OA was appropriately processed

through the MAXIMO system to define the work, assign a work priority, and allocate resources.

Some of the work orders OA reviewed during the current evaluation provided good instructions in the MAXIMO work order. In particular, work orders for equipment preventive maintenance and some more complex jobs processed through Facility Engineering Services (FES) included clear instructions defining the scope of work. For example, a work order for excessing an x-ray spectrometer appropriately described the extent of demolition, identified interfaces with other groups (and associated work orders) to support the demolition work, and included drawings identifying specific equipment and utilities to be removed. However, many of the work orders contained little detail and were not sufficient to define the scope of the work such that specific hazards and controls could be fully identified to support maintenance work activities. OA found similar weaknesses during its 2001 OA review. Examples of weaknesses in the definition of work scopes on recent jobs include:

- The work order for the jib crane installation did not provide details on the lifting operation, such as the weight of the objects to be lifted, which are important for analyzing whether a critical lift plan was warranted to support the installation.

- The work order for fabrication of a work table and tank did not include information on the type of material or the fabrication technique (welding) to be used.

- The work order for replacement of chilled water coils did not identify the need to replace supply piping and temperature controls.

Furthermore, several maintenance jobs processed through FES were not fully evaluated for as-built conditions and equipment capabilities. As a result, job scopes had to be changed after the initiation of work, as summarized below:

- During the jib crane installation, the crane had to be relocated because of overhead clearance concerns. This condition was not identified during engineering design and walkdowns.

- During air compressor installation, several scope changes were needed because the job had not been thoroughly evaluated. Job scope changes included pulling of electrical cable to a new breaker, modification of one relief setpoint, and addition of another relief to the system.

- During the demolition of an x-ray spectrometer, changes were needed in the extent of demolition of cable and conduit due to access concerns that had not been identified during engineering design and walkdowns.

- For a high voltage cable test, an additional switching step had to be added to the work order in the field to allow the test to proceed.

These changes adversely impacted the performance of the maintenance activity and did not receive the same level of formal design review and hazards analysis as the original activity. For example, email exchanges between the FES engineer and the work planner were used to authorize an increase in work scope for the air compressor installation job; these emails focused on approval of the additional cost and did not receive the formal and systematic review provided for the original work. In addition, the original work package for testing the high voltage cable did not recognize some important steps (isolating the transformer and removing grounds) that were necessary to perform the test effectively and safely.

Summary. FM&T has a well defined process and tools to support planners and designers in defining the scope of work. However, in several instances, implementation of the processes was not effective and the scope was not well defined, adversely impacting the efficiency of performing work and the ability to identify potential hazards and appropriate controls.

Core Function #2: Analyze the Hazards

MAXIMO is designed to support planners in identifying hazards. Hazard categories are predefined in MAXIMO for many work activities and are linked to appropriate controls (e.g., PPE and permits). For some more complex jobs (such as equipment demolition and installation and high voltage work), maintenance planners have the option of using FES to support job planning, which then results in generation of a PHA to identify hazards.

Many of the work orders reviewed by OA identified standard hazards (such as “activities involving sharps” and/or “Hot work”) and controls (such as gloves and/or hot work permits). For one higher-risk maintenance

job, which involved the repair of an exhaust fan from a hood where hazardous chemicals were handled, the hazards were well identified and analyzed, including a review by an industrial hygienist.

However, several work orders did not explicitly identify all hazards associated with the job, and therefore controls were not specifically linked to the hazard. Some work orders compensated for this weakness, in part, by adding some additional PPE controls under a non-applicable hazard. For example, some work orders include welding goggles as a PPE under the hazard "activities involving sharps." However, because the hazards and controls are not directly associated with each other, the craft personnel must interpret the work orders and decide for themselves what controls should be implemented for the task being performed. In this situation, safety relies on the individual (i.e., utilizing the skill of the craft) rather than a clear safety control based on a hazards analysis performed by professionals. In addition, the indirect link between hazards and controls may contribute to the belief expressed by craft personnel that PPE controls are merely recommendations and reminders and do not have to be implemented in all situations.

Furthermore, some MAXIMO work orders reviewed by the OA team did not adequately identify or describe all the applicable hazards and did not compensate by including appropriate controls under other unrelated hazards. As examples:

- The potential carcinogen hazard from welding stainless steel was not identified in a work order, and thus associated controls (e.g., PPE and signage) were not identified.

- A grinding hazard was not identified in a work package for modifying and painting a carboy crate.

- A painting hazard was not identified in work packages for fabricating metal pipes.

Some of the observed deficiencies in hazards analysis result from the weaknesses in defining the work, as discussed above under Core Function #1.

In addition, FM&T has not evaluated all hazards for preventive and corrective maintenance activities for heating, ventilating, air conditioning, and chillers in any of its formal hazards analysis processes (e.g., MAXIMO, PHA, exposure assessment, or JHA). Specifically, FM&T has not evaluated hazards associated with maintenance jobs that require entry into plenums through restricted access doors. Many of these entrance ways meet the OSHA criteria for a confined space, i.e.: (1) large enough for an employee to enter fully and perform assigned work, (2) not designed for continuous occupancy, and (3) limited or restricted means of entry or exit. These plenums have not been formally evaluated and identified as confined spaces; therefore, the hazards associated with work within them have not been analyzed, nor have appropriate controls been established. One instance of a similar observation was raised in the 2001 OA review.

Finding #2. FM&T has not effectively implemented all of its work control processes for maintenance work to ensure that all appropriate hazards are identified and adequately support development of controls.

Summary. FM&T has established processes and tools to support the identification and analysis of hazards, and in many cases, planners and designers use them effectively. However, in several instances, important hazards were not identified. In addition, hazards associated with entry into confined spaces during certain maintenance activities have not been addressed.

Core Function #3: Identify and Implement Controls

FM&T uses several processes for developing and implementing hazard controls for maintenance work activities. The primary process is MAXIMO, which identifies controls under the Hazards and Precautions portion of the work order. For more complex maintenance work, FES may support the effort by evaluating the work hazards using the PHA process and identifying a set of controls. In addition, FM&T work instructions provide general guidance for performing higher risk activities (such as hoisting and rigging and high voltage work) and identify controls for these activities.

Most jobs that OA reviewed had appropriate controls identified, including PPE, permits, and in one instance hold points. For high voltage work, FM&T has established extensive controls, including: (1) a specific work instruction that describes the process; (2) pre- and post-job briefings; (3) switching instructions that are systematically reviewed by engineers, supervisors, and craft; (4) appropriate PPE that is identified in the MAXIMO work order system; and (5) job-specific procedures that identify how work is to be performed in a safe manner. In addition, FM&T has

improved processes and hardware to facilitate safe high voltage work (e.g., using grounding reminder tags, holding quarterly high voltage briefings to discuss work planning and worker safety, and installing ground ball studs to facilitate grounding operations).

However, in some cases, not all appropriate controls were identified for maintenance work. Some of these deficiencies are attributed to weaknesses in job scope identification, design, and planning, as discussed under Core Function #1. Examples of controls that were not identified in work packages include:

- Welding ventilation for welding stainless steel
- Warning signs for welding stainless steel
- Permits for energized electrical work.

Also, one hazard control (ensuring that wet drilling techniques are used to control crystalline silica when drilling into concrete) identified in the PHA and the Class 2 penetration permit was not included in the Hazards and Precautions portion of the work order for the jib crane job. In addition, some appropriate controls for lifting jib crane components were not identified (i.e., a formal lift plan was not developed). In this case, the supervisor recognized the unique job hazards and appropriately held a high-hazard pre-job briefing; however, he did not develop a formal lift plan that would have provided additional controls appropriate for this activity. Further, the work instruction for performing lifts does not provide clear guidance to support a decision on when a lift plan needs to be developed, and is not consistent with guidance provided in the construction safety handbook.

Finally, although FM&T has an informal process for periodically updating its high voltage electrical diagrams during review of switching instructions, it has not established a formal process for controlling high voltage electrical schematics to ensure that they are updated in a timely manner. Electricians performing electrical switching need accurate information on the current configuration of the switchgear to ensure safety, particularly when the system owner/engineer may not be available.

Summary. FM&T maintenance processes provide instructions and processes for establishing controls, and appropriate controls were identified in most work packages that OA reviewed. Controls established for performing higher hazard activities, such as high voltage switching, are generally effective. However, some controls are not clearly linked to specific hazards so that workers can readily identify controls for their work activity. Furthermore, FM&T has not clearly identified criteria for when lift plans are needed and has not established a formal process for maintaining high voltage electrical schematics. Improvements in the definition of work scope and hazards analysis processes (see previous discussion under Core Functions #1 and #2) could help to alleviate these weaknesses and facilitate better definition of controls.

Core Function #4: Perform Work Within Controls

In most cases, controls were appropriately followed during work activities observed by OA, and work was performed with a high regard for safety. As examples:

- Proper PPE was used for most high voltage jobs.
- Proper PPE was used for welding of the stainless steel table and tank, and grinding of a carboy.
- Appropriate barricades were established for high voltage electrical work.
- A blind penetration permit was appropriately used.
- All permit for energized electrical tasks forms were appropriately completed.

Furthermore, craftsmen performed work in a competent and efficient manner, generally demonstrated good understanding of hazards and appropriate controls associated with their work, and utilized appropriate PPE even when the PPE was not explicitly identified in the work order. They were aware of their stop work authority, which was reinforced during two high hazard briefings observed by OA during this inspection, and indicated that they would not hesitate to use that authority.

However, in several instances some procedures were not appropriately followed, and some controls were not applied:

- Switching instructions were not followed step by step in three recently completed high voltage switching jobs that OA reviewed. In these cases, changes were made to the switching instruction during the performance of work without the maintenance team manager initialing the switching instruction as called for in the high voltage work instruction.

- The job plan for the potential test of a high voltage cable was not followed. The job plan called for initial test conditions to be established per a switching instruction specifically developed for the test. However, the switching instruction that was utilized was for installation of the cable and did not specifically (or completely) address test conditions.

- Lockout/tagout was not applied as specified in the lockout/tagout program. According to the lockout/tagout procedure, the process for excessing equipment should use either an equipment-specific lockout/tagout from the FM&T database or, if one is not in the database, a specially developed lockout/tagout procedure. For one excess equipment job that OA reviewed, this process was not followed.

- Work was performed on energized equipment without obtaining proper permits. During two in-progress maintenance jobs that OA reviewed, the electrician pulled and connected wire to energized 120 V panels without obtaining the appropriate permit. This situation can be attributed, in part, to a failure to identify the need for permits in the work order; however, the work instruction for electrical work identifies when permits should be obtained, and craft personnel should have known and implemented this requirement.

In addition, some hazard controls were not effectively implemented in maintenance shops. For example, there were numerous blocked electrical panels in carpenters' and millwright shops, and one electrical panel cover was not properly sealed. Furthermore, OA found poor housekeeping in maintenance shops (oil left on machines, a guard for a band saw not fully in place, and an instance where an oil spill was not cleaned up, causing a potential slip hazard). FM&T took prompt actions to correct these deficiencies.

Finding #3. Maintenance supervisors and craft personnel have not rigorously implemented all controls established by FM&T to ensure that maintenance work is performed safely.

Summary. For most maintenance jobs that OA evaluated, work was performed within controls (e.g., appropriate PPE, barricades, and permits). However, in several instances, controls were not rigorously followed, particularly those related to electrical safety.

C.2.3 Construction

Construction activities at the KCP are diverse in scope and duration, and vary in the level of hazards to which construction workers are exposed. The construction work force consists of three captive subcontractors (i.e., subcontractors that have ongoing presence at KCP, typically working under time and materials contracts) and a varying number of fixed-price subcontractors and their lower-tier subcontractors. The size of the construction workforce may range from 150 to over 400 construction workers, depending on the extent of the planned construction activities and available funding. Currently, over 120 companies have been pre-qualified to provide construction or construction support activities to the KCP.

FM&T and FES construction engineers and managers serve as the construction design and management team, providing direction and monitoring of construction activities being performed by the captive and fixed price subcontractors and their lower-tier subcontractors. Maintenance of the Construction Safety Handbook, conduct of new subcontractor safety orientation training, and day-to-day oversight of construction safety are performed by two FM&T construction safety professionals in the ES&H Division.

OA's evaluation of implementation of the core functions of ISM for construction activities focused on evaluation of captive and fixed price construction subcontractors, and OA observed work at ongoing construction projects. Specific projects reviewed included site demolition and installation work for the National Nuclear Security Administration (NNSA)/General Services Administration (GSA) Space Exchange Project (Area 1), installation of a temperature controlled modular laboratory, chiller upgrades in the West Powerhouse, modifications to the main guardhouse (Building 32), relocation of existing stores cribs into an area formerly occupied by D/37B, and demolition and relocation of maintenance areas A, D, E, and F. In addition, construction work planning and safety meetings, and safety orientations were attended; and procedures, safety permits, construction work documents, safety plans, and training programs were reviewed.

Core Function #1: Define the Scope of Work

KCP construction work activities are well defined in construction specifications and drawings for fixed-price construction subcontractors, and in work orders

and drawings for construction work being conducted by the captive construction subcontractors. For example, the work steps for concrete core drilling for polychlorinated biphenyl (PCB) analysis, which was being conducted by the captive remediation construction subcontractor, were sequentially described in facility work orders and further detailed in waste identification tables, permits, and safety task assignments. Similarly, demolition and installation work in the NNSA/GSA Space Exchange Area, which was being conducted by another captive subcontractor, was also sufficiently defined in work orders, permits, drawings, and JHAs. Work tasks associated with the year-long relocation of maintenance work areas, which is being conducted by a fixed-price construction subcontractor, were well documented in construction specifications and accompanying drawings.

In addition to well defined work scopes, construction work planning and scheduling is aided by several types of construction planning meetings. The KCP pre-construction meeting, for example, is an effective work planning tool. The pre-construction meeting allows new KCP construction subcontractors to meet with FM&T and FES staff to verify work scope, identify construction contacts and roles and responsibilities, confirm construction schedules and milestones, and review ES&H expectations. A KCP pre-construction meeting is required for all fixed-price subcontractors prior to commencement of work.

Weekly and monthly construction planning and safety meetings are well attended by FM&T, FES, and construction subcontractor managers. During the weekly construction planning and scheduling meeting, construction schedules and resource plans are critically reviewed, accomplishments are acknowledged, materials and technical issues are identified, and plans for resolving issues are developed.

The FM&T Construction Management Guide to Effective Contracting dated calendar year (CY) 2002, which defines key elements of the KCP construction management process, is well written, informative, and easy to understand. The Guide defines the roles and responsibilities of key construction personnel during pre-contract and pre-construction activities, provides guidance for a variety of construction processes (e.g., contract submittals and inspections), and documents a number of construction safety and health expectations. The Guide provides detailed instructions for construction processes that are not found in construction-related process descriptions and work instructions.

However, the Guide has not been consistently followed by FM&T and FES construction personnel, contributing to ineffective planning or resource allocation for some construction projects. For example, the Guide provides expectations that a subcontractor's qualified safety professional develop safety plans and perform documented bi-weekly and daily inspections of construction work, as appropriate. However, for a maintenance relocation construction project, requirements for the involvement of a safety professional were not specified in the contract terms and conditions, the construction specifications, or the subcontractor's safety plan. As a result, there has been no direct involvement of a qualified safety professional in either the planning or conduct of this construction activity, contributing to the safety deficiencies and lack of safety programs observed by OA.

Summary. KCP construction work activities are well defined for most construction activities. Pre-proposal conferences, pre-construction meetings, and weekly construction planning meetings provide additional mechanisms to ensure an adequate work definition prior to and during construction. In some cases, however, the lack of clear expectations in construction work documents, or the absence of instructions from the Guide in contract specifications, contributed to safety concerns identified by the OA team (described in the following subsections).

Core Function #2: Analyze the Hazards

Construction hazard identification and analysis at KCP is a two-phase process. At the construction design phase, hazards are identified by the construction planning team, and FM&T ES&H prepares a PHA for each construction project. Recommendations from the PHA process, including the identification of hazard controls, are integrated into construction specifications, work orders, and waste identification tables. In general, the PHA process, when combined with reviews of legacy hazard documentation and project walkdowns by FM&T and FES staff, provides an effective mechanism for identifying and documenting project-related hazards during the design phase of construction.

However, the PHA is not an effective hazards analysis tool for identifying construction hazards during the construction phase of a construction project. Although some construction projects have identified the PHA as fulfilling this need, the PHA was not intended to be, and is not, an appropriate tool for ongoing hazards analysis for construction projects, for two reasons: (1) the PHA is typically prepared well before construction starts and does not reflect more recent changes to the construction plan, and (2) the PHA does

not address most physical and exposure hazards associated with the construction work. In addition, the PHA is a FM&T process, and is not accessible to or usable by the subcontractors who manage and perform the construction work. PHAs are rarely updated to reflect a new hazard identified during construction, such as the cadmium sludge-laden trench that was recently identified during the Area 1 NNSA/GSA Space Exchange construction project, as further described in this section.

For the construction phase, new initiatives for identifying and documenting activity-level hazards for the three captive construction subcontractors are being prototyped though the KCP Construction Improvement Safety Team. One such initiative, the Project Activity Hazards Analysis (PAHA), has required the captive construction subcontractors to prepare construction PAHAs for each construction activity and to post the PAHA at the job sites. The PAHAs, which are unrelated to the FM&T JHA process, are prepared by each captive subcontractor using guidelines established by FM&T. In general, these PAHAs were detailed and posted at the construction job sites. As another element of this prototype initiative, the three captive subcontractors are also required to use some form of a daily task analysis safety checklist to supplement the PAHA by identifying hazards for daily construction work activities. Each of the three captive subcontractors has developed a means for conducting and documenting daily work tasks and associated hazards.

Although some improvements in construction hazards analysis are evident, a number of weaknesses remain, particularly with the fixed price construction subcontractors who have yet to benefit from the KCP Construction Safety Improvement Team initiatives in this area.

Unlike the captive construction projects, no formal activity level hazard analysis process has been implemented for most fixed-price construction and service projects. The PAHA and daily task analyses being prototyped for the captive construction subcontractors, or a comparable process, have not been established for most fixed-price and service subcontractors. Furthermore, FM&T has not communicated the expectations for an activity-level hazards analysis process, as required by DOE Order 450.4, to the fixed-priced subcontractors through contract terms and conditions, construction specifications, of the safety handbooks.

Although each fixed-price construction subcontractor has prepared a safety plan, typically they do not identify all the hazards of the construction activity, provide a mechanism to link construction hazards to hazard controls, or tailor hazards and controls to daily work activities. For example, the subcontractor's safety plan for the Maintenance Relocation Construction Project describes the overall planned construction work, and identifies some hazard controls (e.g., dust curtains during demolition, use of qualified electricians, and vehicle and equipment inspections). However, the safety plan does not identify, detail, or analyze the demolition or construction hazards for each phase of the construction activity, nor does it identify and link any administrative, engineering, or personal protective controls to these hazards to protect the workers. For the year-long duration of this project, the construction hazards will be extensive and will include many physical and exposure hazards associated with construction work, heavy equipment operation, and the demolition and removal of legacy materials, which may be contaminated with asbestos, lead, mercury, and beryllium. Most construction work for this project has been considered as skill of the craft, and there has been no delineation between those activities that can be assumed to be safely performed by trained and qualified construction craft personnel and those that require specified hazard controls.

In another example, the safety plan for the Guardhouse Modification Construction Project does not identify the hazards associated with roof work, elevated work on siding removal, and the silica dust hazards associated with the removal of concrete. As a result, for a number of longer-duration construction projects with a variety of construction hazards, the activity-level hazard identification and analysis process relies solely on the knowledge and experience of the construction supervisor and a trained workforce, which, as described under Core Function #3, may be lacking in safety expertise or cannot be verified as adequate through training records.

Finding #4. For fixed-price construction work, FM&T has not ensured that construction contractors have implemented an activity-level hazards analysis process for the identification, documentation, and control of construction hazards as required by DOE Policy 450.4.

In some cases, construction hazards were not identified, adequately analyzed, or documented in construction work control documents. For example, for the Maintenance Relocation Construction Project,

the construction subcontractor did not analyze or document the hazards associated with the mixing of vinyl powder concrete sealant. As a result, some of the hazard controls, such as the presence of an eyewash station as required by the MSDS, were not implemented. In the NNSA/GSA Space Exchange Project, the captive subcontractor did not identify in the PAHA the potential silica hazard associated with concrete demolition. As a result, hazard controls for silica dust, such as wet demolition methods (identified in the KCP Construction Safety Handbook), local ventilation, or respirators, were not used, and workers were at risk of overexposure to airborne silica. In another example, a captive subcontractor did not adequately analyze and document the potential airborne cadmium hazard associated with the removal of sludge from a trench as required by the OSHA Cadmium Standard 29 CFR 1926.1127. Because the cadmium hazard was not analyzed, respiratory protection and training requirements were missed, and specific cadmium hazard warnings were not placed on waste containers as required by 29 CFR 1926.1127.

Summary. For the design stage, a number of effective hazards analysis processes are in place, such as the PHA and construction site walkdowns; these identify and document the dominant facility hazards, particularly with respect to environmental and legacy hazards (asbestos and beryllium). For the construction phase, new hazard identification and analysis initiatives are being prototyped for the three captive construction subcontractors. However, there are few established processes for identifying, analyzing, and documenting activity-level construction hazards for fixed-price and service subcontractors, and existing processes (such as the safety plan) are often ineffective in documenting hazards and linking hazards to controls. The insufficient activity-level hazards analysis process is a greater concern for larger and longer-term fixed-price contracts, which typically involve a greater variety of hazards and a higher risk for worker injuries resulting from construction work.

Core Function #3: Identify and Implement Controls

Hazard controls for KCP construction projects consist of local engineering controls, such as portable ventilation systems and enclosures for asbestos abatements; a network of administrative controls, such as postings, permits, training, procedures, and several new initiatives intended to minimize the number of construction-related injuries and illnesses; and PPE, such as respirators, fall protection equipment, protective clothing, and eye protection.

During the past year, the KCP Construction Safety Improvement Team was established with the intent of reducing construction injury rates and adopting best-in-class construction practices identified at other DOE and commercial construction sites. The Team, consisting of representatives from KCSO, FM&T, and FES, visited a number of construction sites at Los Alamos National Laboratory, Idaho National Engineering and Environmental Laboratory, and Sandia National Laboratories to identify construction practices that could benefit the KCP construction work process.

Several new or improved construction practices have been implemented at KCP on a prototype basis during CY 2004 as a result of Construction Safety Improvement Team initiatives, and with considerable success. For example, FM&T has required each of the three captive construction subcontractors to have a full-time safety engineer on site. As a result, subcontractors have increased their sense of ownership for safety, as observed by the FM&T construction safety staff. In addition, a safety incentive/penalty clause was added to a number of fixed price construction contracts whereby the subcontractor could gain or lose up to 1 percent of the value of the contract based on safety performance, which is evaluated on a monthly basis. Systems for documenting JHAs were also implemented for the three captive construction subcontractors. Additional initiatives are planned for 2005, such as piloting performance based safety program specifications.

Several ongoing administrative controls have also been effective in improving construction safety. For example, construction safety boards are placed at the entrance to each construction site, and are well maintained. Boards typically include the project identification, subcontractor, key points of contact, emergency numbers, and activity permits (e.g., construction safety work permits). The KCP Construction Safety Handbook, prepared by FM&T Construction Safety, is a useful mechanism for communicating to subcontractors the safety and health requirements for working at the KCP. FM&T has implemented a citation and warning system, which FM&T construction safety engineers use routinely to formally document and communicate safety infractions to construction subcontractors. FM&T has also implemented a pre-qualification program for prospective construction subcontractors to ensure that a subcontractor's prior safety performance is considered when awarding a construction contract.

Another positive and effective attribute of the KCP construction program is the KCP construction safety orientation. All KCP construction and service subcontractors are required to attend a two-hour construction safety orientation class, which is taught by FM&T construction safety engineers, prior to working at KCP. Upon successful completion of the training, students are given a construction safety awareness sticker for their hard hats to indicate that they have completed this requirement.

Although there have been successes in the definition and implementation of hazard controls, there are also several areas in construction safety that are in need of improvement, as discussed in the following paragraphs.

In several instances, KCP construction subcontractors have not developed or implemented several significant safety programs required by OSHA, DOE, or their contracts with FM&T, particularly with respect to respiratory protection, hazard communications, and beryllium. For example, one captive construction subcontractor has four or five workers who are required to wear respirators, yet the company does not have a written respiratory protection program as required by 29 CFR 1926.103 and 1910.134. In addition, on a recent construction work activity, this company prescribed the use of dust masks in a site-specific safety plan, although the dust mask wearers had not been medically approved, fit tested, or trained to wear the prescribed respirator. In the case of one fixed-price subcontractor, the respiratory protection program had not been tailored to the KCP worksite and the types of respiratory hazards that might be expected.

Several captive and fixed-price subcontractors do not have a written hazard communication program, or a hazard communication program that meets the OSHA requirements stated in 29 CFR 1926.59 and, by reference, 29 CFR 1910.1200. These subcontractors have also not met the requirements of the KCP Construction Safety Handbook, which requires all construction subcontractors to have a written hazard communication program on site in compliance with 29 CFR 1926.59. The KCP Construction Safety Handbook is included in the contract terms and conditions of both captive and fixed-price subcontractors.

The KCP construction subcontractor that has been assigned remediation responsibilities for hazardous materials, such as PCBs, lead, and asbestos, has been conducting beryllium cleanup and decontamination activities in plant areas contaminated with beryllium above 3 micrograms per 100 square centimeters (cm^2) without a documented beryllium control program. The KCP Construction Safety Handbook states that "the seller must address in their safety plan the worker protection portion of 10 CFR 850, *Chronic Beryllium Disease Prevention Program*." The subcontractor's safety plan does not address the applicability or adherence to the requirements of 10 CFR 850. Furthermore, the subcontractor's safety engineer was unfamiliar with the requirements of 10 CFR 850 and indicated that such requirements were not applicable to their construction activities. Typically, this subcontractor conducts beryllium cleanup work as directed by FM&T, although the beryllium training and air sampling is conducted by the subcontractor at their discretion. In general, for this construction subcontractor, as well as other construction subcontractors that work in plant areas with low levels of beryllium contamination (i.e., between 1 and 3 micrograms per 100 cm^2), beryllium hazard controls, such as training, protective equipment, and medical surveillance, have not been sufficiently defined by FM&T.

Finding #5. FM&T has not ensured that KCP construction subcontractors have developed and implemented safety programs required by OSHA, DOE, and their contracts, such as respiratory protection, hazard communications, and beryllium control programs.

Because much of the work performed by construction subcontractors is skill of the craft, ensuring that construction workers have the appropriate worker safety training, commensurate with the hazards to which they are exposed, is a particularly critical hazard control measure. Well documented safety training records are of particular importance to construction workers on fixed-price contracts, where hazards and the appropriate control measures for those hazards (e.g., fall protection, local ventilation, and respirators) are not well defined in safety plans, as previously discussed under Core Function #2. In such conditions, safety depends on the experience and training of individual workers.

The OA team observed that some KCP subcontractors were unaware of the OSHA training requirements commensurate with the hazards identified for their construction projects, or were unaware of the training prerequisites for the hazard controls that they

implement. Few of the construction safety plans or PAHAs evaluated by the OA team identified OSHA safety training requirements in areas typically encountered at KCP construction sites, such as hazard communications, fall protection, respiratory protection, scaffolding, and confined spaces. Furthermore, most of the subcontractors that OA evaluated do not maintain safety training records at the site, and in one case, the subcontractor was unable to determine the training status of his workers because training records could not be obtained from a number of offsite locations (e.g., union halls, third-party subcontractors, and individual records).

Although all of the subcontractor construction line managers who were interviewed by OA perceived that their workers had sufficient training, none of these managers could readily provide training records to the OA team to validate their perceptions. Further, construction line managers do not have a mechanism to verify the adequacy of a worker's safety training before the worker begins work for which specific training is a prerequisite. In some cases, the OA team confirmed that work was being performed without the prerequisite OSHA safety training having been completed and/or verified prior to performing work. Examples include hazard communication, respiratory protection, fall protection, and work in confined spaces. In addition, hazardous waste operator (Hazwoper) training was not identified or provided for subcontractor workers required to remove the cadmium-bearing hazardous waste sludge in the Area 1 trench.

FM&T construction monitoring processes typically do not review a subcontractor's compliance with respect to required training or OSHA program requirements. For example, although over 100 citations and warnings were issued from 2003 to the present, no warnings or citations were issued in the areas of training or safety program deficiencies.

Finding #6. FM&T has not ensured that KCP construction subcontractors have adequately defined safety training requirements and training documentation commensurate with expected hazards, and that the training status of construction workers is verified before they perform work.

One of the primary controls for ensuring the safety of construction workers is the safety permitting system. The KCP Construction Safety Handbook identifies a number of safety permits required for construction work involving beryllium, hot work, excavation, utility location, confined spaces, and aisle impairment. Some of these permits, such as excavation and utility location have recently been updated, and procedures have been established to clarify their use and application. However, some other permits have limited instructions, and their purpose, intended application, and directions for completion and/or revision of the permit are unclear. One such permit is the construction safe work permit (CSWP).

FMT personnel indicated that the intent of the CSWP is to identify high hazard construction activities and inform area owners of these hazards. However, the purpose of the CWSP is not well documented and communicated to subcontractors. The FM&T CSWP process does not provide sufficient instructions to ensure that the requirements and purpose for the CSWP are adequately communicated and that the CSWP is consistently completed and appropriately authorized prior to performing work. Although a work instruction has been issued for the CSWP, the expectations for completion and use of the permit are not well defined in the work instructions. A number of completed CSWPs lack signatures for the "Area Owner/ Representative" although the KCP Construction Safety Handbook requires participation of the area owner. A paragraph in the Handbook indicates that the CSWPs are issued for potentially hazardous operations, and a number of hazardous operations are listed, such as critical lifts, cranes, and steel erection. However, the list of hazardous operations in the Construction Safety Handbook is inconsistent with other descriptions of the CSWP provided in the KCP Construction Management Guide to Effective Contracting or the CSWP form. The CSWP form provides a section for "Hazard/Controls," but there is no explanation for some of the hazards or controls listed, their interrelationship, the purpose for this section of the permit, or how the permit is to be completed. Construction subcontractors interviewed by the OA team also indicated their confusion about the purpose, use, and completion of the CSWP. For one construction project involving overhead work, the only "Hazard/Control" that was indicated was "appropriate signage." A number of other construction projects involved drilling or cutting of concrete masonry. Although the CSWP lists "concrete/masonry" as a "Hazard/Control," a CSWP was not issued for these work activities. On the CSWP form, a section is provided for identifying other permits that may be used in conjunction with the CSWP. A permit for beryllium is identified; however, there is no description of a beryllium permit in the KCP Construction Safety Handbook, or in other construction-related references typically provided to the construction subcontractors.

The CSWP, if reconstructed and better defined, could serve as an element of a more robust activity-level hazards analysis process, which is much needed for fixed-price and service-related construction contracts (see Finding #4).

Summary. The KCP Construction Safety Improvement Team has developed and implemented a number of construction process improvements, such as integration of full-time safety engineers into captive construction contracts and the introduction of incentive/penalty clauses. A number of administrative controls, such as safety boards, citations and warnings, and the KCP Construction Safety Handbook have been effective in communicating and controlling most construction hazards. However, a number of significant issues with hazard controls were also identified with respect to required safety programs not being developed or implemented, inadequately defined and verified safety training requirements, and safety permits without sufficient instruction to ensure consistent application that meets the intended purpose.

Core Function #4: Perform Work Within Controls

Construction projects verify a readiness to perform work through the issuance to the construction subcontractor of a notice to proceed. Such notices are issued only after the subcontractor's construction plans, schedule, and budget have been submitted and approved, funding has been allocated, the subcontractor's safety plan has been submitted and approved, and any issues identified at the pre-construction conference have been resolved. Most subcontractors conduct daily or weekly meetings to discuss work scope, task assignments, and safety concerns. For the captive subcontractors, a daily review of potential hazards and controls is required, as well as a review of the applicable section of the PAHA. For fixed-price subcontractors, the extent of ongoing review of hazards and controls is less formal and is at the discretion of the construction supervision.

Construction workers generally perform work safely and in accordance with general industry practices. During CY 2003, the KCP recordable injury rate for construction work was reduced to nearly half the rate of the previous year, and no lost workday cases were recorded. The KCP construction recordable injury rates have remained below the national average rates for construction subcontractors, although the total recordable case rate for CY 2004 is currently higher than that for CY 2003.

Workers were aware of their stop work authority, which is well documented in the Construction Management Guide to Effective Contracting and the KCP Construction Safety Handbook, and is communicated to construction workers during their safety orientation. Construction workers and construction line management expressed a commitment to safety in the workplace, and line management was timely in correcting safety deficiencies identified by OA. The FM&T construction safety engineers and FES construction management staff routinely inspect construction sites, and they issue warnings and citations to subcontractors if they observe unsafe conditions or conditions out of compliance with safety requirements.

Although most work that OA observed was performed in a safe manner, construction subcontractor line managers and first line supervisors do not always follow the requirements specified in work control documents. For example, one captive subcontractor did not follow the posted PAHA for demolition activities with respect to noise assessment and hearing protection and has not protected site workers from noise hazards. The PAHA requires that noise sources be measured and evaluated, and that signs be posted at work area perimeters requiring hearing protection. However, noise levels had not been measured, and no noise signage had been posted. Two jobs were observed (reciprocating saw use and concrete chiseling) that are typically high-noise activities (i.e., greater than 95 dBa), but most workers were not wearing hearing protection. At the same work site, the subcontractor did not control the dust hazards for concrete demolition as required by the KCP Construction Safety Handbook. In other examples, subcontractors did not follow hazard communication and beryllium requirements as defined in the Handbook, as previously discussed.

During walkdowns of construction projects, a number of safety deficiencies were identified. For example, at a gas transfer construction project, construction workers were observed operating a high-noise power saw without hearing protection. When the workers observed the safety engineer accompanying the OA team, they immediately stopped work and sought hearing protection. At two construction work sites, security guards were observed in the construction area without hard hats or safety glasses, contrary to FM&T construction safety requirements. In one case, a security guard approached a construction activity that was well within the construction boundary to discard trash. The security guard had neither a hardhat nor safety glasses. Construction boundaries were not adequately posted to ensure that workers,

security guards, and others in the area were aware of the boundary of the construction activity. At the Maintenance Relocation Construction Project, the MSDS for a vinyl patching compound that was in use could not be readily located. Fall protection safety harnesses were poorly stored in gang boxes and subject to wear and tear. The company's safety plan was not available at the job site, and construction boundaries were improperly posted. The construction subcontractor corrected these deficiencies in a timely manner.

A number of the above examples are related to previously identified findings. For example, the development of an activity-level hazards analysis in which hazard controls are documented and linked to work activities could have defined the need to post construction boundaries and established requirements for protective eyewear, and workers would not have been performing work outside expected safety requirements. Safety training in hearing protection and the hazards of excessive noise could have sensitized workers to the importance of wearing hearing protectors. An effective hazard communication program could have alerted workers to the health hazards associated with silica, and resulted in workers stopping work when pulverizing concrete without the appropriate hazard controls. In some cases, however, workers failed to follow established requirements in contract documents (e.g., KCP Construction Safety Handbook) or requirements established in safety postings or hazards analyses. Increased vigilance by construction line managers is needed to address these concerns.

Summary. Construction work activities are generally performed safely, as indicated by OSHA recordable injury rates that are below commercial construction industry averages. KCP construction safety engineers have been effective in assisting subcontractors, who are sometimes not familiar with expectations for working at a DOE construction site, and aggressive in issuing warnings and citations when work is not performed safely or within established requirements. However, some subcontractors have not followed the requirements of their work control documents, and a number of safety deficiencies were observed during walkthroughs of construction job sites.

C.2.4 Environmental Protection

OA's inspection of the first four core functions of ISM for environmental protection activities at KCP focused on the adequacy of environmental compliance and environmental operations. OA also evaluated progress and corrections made for select items identified during the last OA inspection in December 2001. In performing this inspection, the OA team evaluated the effectiveness and implementation of policy and procedures, conducted inspections of selected facilities and operations, evaluated field monitoring and operation of environmental processes, and interviewed environmental, operations, construction, and maintenance personnel. Specific technical areas that were evaluated included groundwater monitoring and remediation using a pump and treat system, surface water monitoring and protection, effluent treatment and monitoring, and the generation, collection, and storage of waste for offsite disposal.

Core Function #1: Define the Scope of Work

KCP must comply with applicable Federal, state, and local environmental regulations and permits as well as contractually specified DOE orders. These external and internal requirements define the technical and management expectations for environmental compliance and environmental operations at KCP. As reported in the 2001 OA inspection, the KCSO and FM&T have effectively defined the site environmental protection programs consistent with the applicable requirements. The results of this OA inspection indicate that KCP continues to effectively define and implement environmental requirements. Within the plant and surrounding areas, FM&T processes adequately define the scope of work for new and existing operations, construction activities, and maintenance work so that requirements for environmental compliance and waste management can be effectively identified.

FM&T has maintained an environmental management system (EMS) based on International Organization for Standardization (ISO) 14001 that effectively defines environmental compliance and operations consistent with applicable requirements. FM&T has effectively established the elements of ISO 14001 in its Quality Manual 20.00, ES&H Management System. Through this Manual, FM&T acknowledges its responsibility for the EMS and establishes environmental management policy, delineates individual management responsibilities, appoints an ISO 14001 Management Representative, and provides for management system reviews. The Manual provides linkages to lower-tier documents that appropriately define associated requirements, policies, procedures, practices, and implementation methods.

FM&T has maintained third-party ISO 14001 certification since 1997. As part of the ISO 14001 continuous improvement approach, FM&T continues to make improvements that reduce impacts to the public and the environment, and continues to receive six-month reviews by a third-party ISO 14001 certification company. Significant actions taken in the past three years include changing the chemical process used in the industrial wastewater pretreatment plant that reduces the generation of hazardous waste sludge and installing new chillers that use a more environmentally friendly coolant. Also, as discussed in Appendix E, KCSO and FM&T continue to aggressively pursue actions to mitigate environmental impacts from legacy releases and spills of fuels, solvents, and PCBs.

Summary. KCSO and FM&T have adequate processes for defining applicable requirements and defining the scope of work. The EMS is mature, and enhancements that further reduce waste generation are being made through the continuous improvement portion of the EMS.

Core Function #2: Analyze the Hazards

FM&T has effectively implemented a process for a systematic analysis of waste streams. This process identifies the waste management aspects of operations, maintenance, and construction activities. New processes and projects are reviewed during the PHA process to determine the need for review by the Environmental Operations Department. These reviews help ensure that waste streams are identified and managed in accordance with regulatory requirements. For operations and maintenance, this department works with the organization submitting the PHA to develop a JHA for waste management that assigns waste acceptance criteria for each waste stream to be generated by the project or process. For construction projects, the Environmental Operations Department develops a waste identification table or provides specific waste management guidance to be included in the work package for the waste to be generated. These processes provide a means to analyze the work to determine what wastes will be generated so that effective waste management controls can be implemented.

Within the FM&T Environmental Operations Department, safety has been enhanced during the performance of waste management activities. In addition to JHAs, this department has taken the additional step of applying ISM to routine job assignments (RJAs) in order to more specifically identify associated hazards and hazard controls for work activities performed by departmental personnel. The hazards and controls are documented in the RJAs and are also incorporated into the department's training sessions.

Although reasonably comprehensive, the RJAs do not specifically link each hazard to a control. Instead, the RJA lists all the hazards in one section and all the controls in the next section. The RJA shows the steps that must be completed for the assignment, but often does not specify when controls should be applied. For example, the RJA that encompasses working with trash buggies lists one of the hazards as overhead activities and one of the controls as a hardhat, but there is no linkage between the hazard and the control, and no clear instruction on when a hardhat would be required. Based on this document and conduct-of-operations standard practices, a hardhat should always be worn. However, the actual intent and normal practice as implemented is that hardhats are worn only for one specific activity (i.e., working on an elevated buggy during a cleaning operation). While RJAs are an effective tool for enhancing safety, more detailed instructions on use of the controls could further improve their effectiveness.

The OA team identified one hazardous waste container that was properly labeled with respect to environmental regulatory requirements but was not labeled as required by OSHA. As discussed in Section C.2.3, during the Area 1 NNSA/GSA Space Exchange construction project performed by a captive construction contractor, cadmium was not identified as a hazard that needed to be managed in accordance with OSHA 1926.1127 - Cadmium. The captive construction contractor used waste bins provided by the FM&T Environmental Operations Department to collect cadmium-contaminated sludge. These bins were emptied into a large roll-off container, which was labeled as hazardous waste in accordance with Resource Conservation and Recovery Act (RCRA) requirements (i.e., Alkaline - S1). However, OSHA has specific requirements for cadmium labeling, including a label that alerts people to the danger and cancer hazard, and cautions against creating dust. The roll-off container did not have these OSHA-required labels.

Summary. FM&T has established effective processes for analyzing waste streams for operations, maintenance, and construction activities. With one exception (improper labeling of cadmium waste per OSHA), these processes were effectively implemented in the areas reviewed by OA. The FM&T

Environmental Operations Department has also enhanced safety by analyzing routine environmental work activities to identify safety controls. Additional details on implementing the controls would further enhance the value of this process.

Core Function #3: Identify and Implement Controls

FM&T continues to have appropriate administrative controls for environmental protection. These controls use a computer-based command media system for performing environmental compliance activities and managing environmental operations. This computer-based system uses a systematic flowdown process to provide work instructions and process description documents that guide associates in performing environmental functions. For example, the work instruction entitled How to Generate Radioactive Waste provides appropriate background information and instructions for use, as well as specific actions for each step and supporting information. These steps and supporting information contain links that include work instructions for How to Request a Waste Container and How to Certify Waste for Nevada Test Site. Although some concerns about the command media were identified in other areas (see Appendix D), the command media in the environmental area are clear and effectively applied.

Environmental activities for legacy hazards also have appropriate controls. The FM&T Process Description for Environmental Restoration provides clear guidance, including step-by-step instructions, "what if" decision points, and imbedded links to environmental administrative controls. It also incorporates steps performed by KCSO. This process description covers the roles and responsibilities of line and support organizations, and it delineates regulatory requirements and state notifications using readily understandable format. More specific requirements are established in work instructions. The combination of process description and embedded work instructions provides a comprehensive process for meeting regulatory environmental requirements at the KCP.

FM&T continues to effectively maintain their groundwater monitoring well network, which provides a high degree of confidence that contaminants from legacy operations have been defined. Permanent monitoring wells are clearly marked with yellow paint, labeled with identification signs, and protected by standpipes. Each year, 20 percent of the wells are inspected to ensure that they are functioning properly and have not experienced silt buildup that impacts sample collection. A concern about unsecured phytoremediation well tubes, identified on the 2001 OA inspection, was initially corrected by placing locked caps on the tubes and was subsequently eliminated by removing the tubes.

FM&T adequately performs sampling on sediments and inflow water in the storm water line, which has exceeded PCB limits under the National Pollutant Discharge Elimination System (NPDES) permits (see Appendix E). As samples were taken, a photographic record was made of sediment and lateral lines into the main storm water line. Surgical gloves were worn during collection of the sediment and water samples to prevent contamination. The samples were collected in the upstream direction so that disturbances from the personnel collecting the samples did not impact what was collected. Jars for the samples were numbered, and a written log was maintained of the location where the sample was taken.

FM&T has received state agreement to remove the chlorine residual limit requirement based on their effective actions to reduce residual chlorine in the storm water discharge to meet the pending NPDES permit limit. The existing NPDES permit for KCP calls for a 50 parts per billion chlorine residual limit, which was to go into effect in November 2004. A flow study identified ways to reduce the introduction of potable water, which is chlorinated, into the storm water discharge. Controls identified by the study, such as the removal of cooling water from the storm drains, were implemented, and subsequent monitoring showed that the residual chlorine had significantly decreased. In coordination with FM&T, the GSA, which is located in the same Federal complex, also took actions within their spaces to reduce the introduction of potable water into the storm lines.

The FM&T subcontractor that operates the industrial wastewater pretreatment facility (IWPF) and the pump and treat groundwater facilities established several controls to ensure that hazardous materials and hazardous waste are managed in accordance with plant and external regulatory requirements. Controls to ensure proper management include using yellow painted lines to maintain the required spacing of pallets, using only metal pallets, distinguishing material areas from waste areas using different shades of paint, installing collection trenches around the areas to provide secondary containment, and placing a solid wall between the acid and alkaline storage areas.

FM&T manages waste by using centrally issued pre-labeled containers, which is a noteworthy practice as implemented by FM&T. After the JHA or waste identification table has been developed for a project or process, the waste generator can request a waste container from the Environmental Operations Department. The generator is then provided a container that is properly labeled for the approved waste stream; a request for a waste container for a waste stream not on that shop's JHA or the project's waste identification table will be flagged. This process of providing labeled containers helps ensure effective management because labels are clearly marked, the type of waste is clearly shown on the label, and the Environmental Operations Department tracks the issuance of the container to ensure that regulatory time limits are not exceeded. For example, an Environmental Operations Department report from the waste-tracking database identifies the hazardous waste containers that are approaching the one-year allowable storage limit and users of those containers are contacted to remind them of the limit. If actions are not taken as the limit date approaches, the notification is elevated to the user's management to ensure that action is taken before time limits are exceeded. This waste tracking program and monitoring by the Environmental Operations Department, which is facilitated by the noteworthy practices for central control of containers, provide an effective means for ensuring proper waste management.

As an additional control, FM&T provides hazardous waste training using a computer-based program and associated test. This training effectively covers the basic requirements of both external regulations and internal plant command media, and a link to a Hazardous Waste Satellite Accumulation brochure lists the work instructions and phone numbers.

FM&T has established a process for managing a certain mixed waste, which was noted as a concern during the 2001 OA inspection**.** For mixed wastes, KCP must meet the requirements of DOE Order 435.1, *Radioactive Waste Management,* and RCRA. As noted in 2001, FM&T used a liquid scintillation counter to sample waste from a process that produced a known hazardous waste to determine whether the waste was also radioactive; however, this analysis was not sensitive enough to make a definitive determination. FM&T has changed this procedure to treat the waste as mixed (hazardous and radioactive) waste until an offsite laboratory makes a more sensitive measurement.

Although FM&T has programs for labeling special, regulated, and non-regulated waste containers, these programs do not extend to trash containers. Systemic labeling of trash containers in shop and laboratory areas, where improper disposal may occur, can help ensure that regulated waste does not enter the sanitary waste stream. For example, labeling the trash containers provides an additional control to remind the worker that aerosol cans need to be disposed of as regulated waste.

In the IWPF, one minor concern was identified with the collection trenches that do not have sumps. These trenches retain a layer of rinse water because the pump filter screens preclude drawing liquid from the bottom-most part of the trench. Standard practice for a trench would include a small sump that collects liquid below the main trench level so that only a small amount of liquid remains in the sump, rather than covering the entire bottom of the trench. Standing liquid in a trench could mask a leak, and in the event of a spill of hazardous material or waste, the standing liquid in the trench would also require disposal.

Summary. With one minor exception (lack of a sump in some collection trenches), KCSO and FM&T have established effective controls for ensuring that environmental requirements are met. Some of the controls, such as the processes for issuing and monitoring containers, are particularly effective.

Core Function #4: Perform Work Within Controls

Waste management activities were generally found to comply with KCP and external regulatory requirements:

- FM&T personnel in shops areas generally manage hazardous waste in accordance with external and internal requirements. The containers are kept closed, moved to disposal before one year, and clearly labeled. Generators demonstrated awareness of regulatory requirements and their points of contact in the Environmental Operations Department.

- The Environmental Operations Department manages central waste management areas in accordance with internal and external requirements. Waste storage areas, including the RCRA less-than-90-day areas, PCB storage areas, and other miscellaneous areas, operate within regulatory requirements. In the RCRA areas, the aisle space was being maintained, labels were facing out, and containers were closed and in good condition. Controls in the special waste area for beryllium are performed adequately.

- Subcontractors are knowledgeable of waste management requirements, have the required containers for the expected waste streams, and know their FM&T Environmental Operations Department points of contact. FM&T has provided labeled containers for the approved waste streams.

The FM&T subcontractor that operates the pump and treat groundwater facility was knowledgeable about notification requirements for a non-operating well. During the 2001 OA review, a groundwater well used to pump out contaminated water for treatment was discovered to be out of operation, but FM&T had not been informed. To correct this situation, additional training was provided on General Instruction 28, *Groundwater General Information*, focusing on the need to provide notification if a well is not within the recommended flow range. In addition, operating information for the wells is now available electronically and is accessible by FM&T Environmental Compliance personnel.

The same FM&T subcontractor also effectively operates the co-located IWPF and the pump and treat groundwater facilities. The effluents from these facilities are combined and discharged to the city sewer. The sludge from the facility is de-watered and sent to disposal as a hazardous waste. These waste disposal paths are within regulatory limits. Housekeeping in the operation and storage areas of the facility is excellent, indicating of a well-operated facility.

FM&T also effectively stores low-level waste as required by DOE Order 435.1. KCP generates a small amount of low-level waste, which is managed in accordance with DOE Order 435.1 for container integrity. In January 2001, DOE (i.e., the former Albuquerque Operations Office, which had DOE line management responsibility at that time) approved the storage of low-level waste (about 22 55-gallon drums) for a time period longer than the DOE Order 435.1 one-year limit. This approval allows KCP to accumulate drums for disposal in a more efficient manner (i.e., shipments are made when enough material is accumulated for a reasonably full shipment rather than shipping a few drums at a time). The low-level waste is stored inside the main building in labeled drums in a locked and controlled area. Although low-level waste is effectively managed, the approval for storage beyond a year was issued by the former Albuquerque Operations Office, which no longer has line management responsibility for KCP. KCSO needs to re-evaluate the approval and determine whether to approve the current practice. In addition, several drums of low-level waste are stored in B-25 boxes because of concerns about moist waste, which could deteriorate the drums. The B-25 boxes are not labeled, and the expected deterioration indicates an incompatible container. A change to the JHA is planned to require the use of a plastic drum.

In a few cases, waste management activities in operating facilities and at a construction project were not being adequately performed:

- In several facilities, regulated waste containers were not turned so that the label was visible. One container also had a “flammable” label that was turned such that neither the “hazardous” nor the “flammable” label was visible.

- Several trash drums adjacent to a construction project area were not under the control of the construction projects in the area. The drums contained trash and construction wastes, but ownership of the drums was not clear. The presence of these uncontrolled and available containers creates the potential for improper disposal.

Summary. With a few exceptions, environmental controls are effectively implemented during the performance of work for waste management activities and operation of environmental facilities. More rigorous implementation of requirements for storing and controlling drums could further improve the implementation of controls.

C.3 Conclusions

The four areas reviewed (production, maintenance, construction, and environmental protection) have different work control processes, and different organizations within FM&T have line management responsibility. As discussed below, effectiveness in implementing the core functions of ISM varies across the four activities.

KCP production operations are characterized by generally strong mechanisms for implementing the core functions, and most of these mechanisms are effective. Work scopes are adequately defined, hazard identification and analysis processes have significantly improved since the 2001 OA review and generally result in effective controls, and observed work was generally performed in accordance with the controls. However, isolated problems are evident in integrating controls

unique to specific activities into work documents. Management attention is needed to ensure that these problems are promptly resolved.

For maintenance activities, FM&T has established processes, work instructions, and tools that, in general, effectively support maintenance planning and control so that work can be performed safely in accordance with the core functions of ISM. In particular, the high voltage work processes (including pre- and post-job briefs, development and review of switching instructions, and quarterly high voltage team meetings) are well designed and implemented to enhance the safety of these higher-risk operations. Further, maintenance personnel observed by OA during work activities were competent and knowledgeable of potential hazards and necessary PPE. However, FM&T has not rigorously implemented its work control process to provide maintenance work packages that clearly define the scope of work and identify all hazards and controls. Furthermore, several weaknesses were identified in implementation of important controls, including insufficient adherence to controls for lockout/tagout, excavations, and energized electrical work; inadequate adherence to instructions for performing a high voltage test; and failure to rigorously follow protocols for revising high voltage switching instructions. These weaknesses reduce the level of safety in performing some maintenance activities and are similar to the root causes (e.g., not rigorously following safety permits) of the recent electrical intrusion event.

In the area of construction, work scopes are adequately defined and administrative controls, such as the KCP Construction Safety Handbook and construction pre-qualification and orientation training programs, have been effective in communicating safety requirements and expectations to subcontractors. The recent initiatives of the Construction Safety Improvement Team have already yielded improvements in the consstruction safety programs for the captive subcontractors. However, a number of weaknesses remain, particularly in the areas of activity-level hazards analyses for fixed-price and service subcontractors, definition and verification of safety training requirements, implementaiton of safety programs required by OSHA and DOE, clarification of some safety permitting processes (such as the CSWP), and construction subcontractors' greater adherence to safety requirements. Management attention is needed to ensure that these concerns are promptly resolved.

KCSO and FM&T continue to implement a rigorous and effective environmental protection program. With few exceptions, the environmental compliance and waste management program elements reviewed on this OA inspection meet applicable requirements and are effectively implemented. The deficiencies identified on the 2001 OA review have been adequately addressed. The few identified weaknesses need to be addressed but are isolated instances within an overall effective system.

Overall, KCSO and FM&T have devoted significant attention to production and environmental protection and have effective programs in these areas, with few weaknesses. However, a number of weaknsses persist in maintenance and construction activities.

C.5 Opportunities for Improvement

This OA review identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are offered to the site to be

C.4 Ratings

	CORE FUNCTION RATING			
	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**
Production	Effective Performance	Effective Performance	Effective Performance	Effective Performance
Maintenance	Needs Improvement	Needs Improvement	Effective Performance	Needs Improvement
Construction	Effective Performance	Needs Improvement	Needs Improvement	Needs Improvement
Environmental Protection	Effective Performance	Effective Performance	Effective Performance	Effective Performance

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

FM&T

1. **Enhance processes for communicating information about hazards and instructions for implementing hazard controls to FM&T personnel at the working level.** Specific actions to consider include:

   - Implement a process to establish line management accountability for ensuring that activity- or part-specific controls identified in PHAs and JHAs are implemented in the appropriate work documents, such as work instructions, process engineering specifications, and general process instructions.

2. **Enhance the computerized work order system (MAXIMO) to support clear definition of scope of work and hazard identification and controls.** Specific actions to consider include:

   - Develop a section entitled "scope of work" that clearly defines the limits of the work to be performed so that hazards and controls can be readily identified.

   - Define or rename MAXIMO "precautions" as controls to be utilized to protect against the hazards the precaution is associated with.

3. **Enhance work instructions for maintenance work planning and hazard identification and control.** Specific actions to consider include:

   - Provide directions on linking of hazards and precautions in MAXIMO work orders to enhance craft personnel's use of controls.

   - Review work instructions with craft personnel to ensure mutual understanding of application of MAXIMO precautions.

   - Revise work instructions for lifting and rigging to clarify the definition of a critical lift and make it consistent with the definitions used in the Construction Safety Handbook.

4. **Review and enhance the FM&T confined space program to ensure that a process description and/or work instruction(s) provides clear direction and criteria for identification of confined spaces and maintenance of data on locations identified as confined spaces.** Specific actions to consider include:

   - Establish a formal process for maintenance team leaders or planners to request evaluation of potential confined spaces.

   - Include clear criteria consistent with OSHA requirements, including criteria and responsibilities for determining whether confined spaces will be marked, whether confined spaces will be treated as a permitted-confined space, and what specific controls will be established given the category of confined space.

   - Establish a process for maintaining the confined spaces database.

5. **Review the lockout/tagout program for enhancements.** Specific actions to consider include:

   - Review and enhance the database for equipment-specific lockout/tagout. As new equipment is installed or old equipment is removed, ensure that the database is updated.

   - Consider periodically including subcontractors who perform high voltage lockout/tagout in the quarterly high voltage briefings to facilitate clear communication of requirements and expectations and to identify interface issues, such as application of grounds and grounding reminder tags.

6. **Re-enforce FM&T expectations for rigorous implementation of controls for maintenance work.** Specific actions to consider include:

   - Solicit craft feedback on the effectiveness of the hazard control process and barriers to rigorous implementation of controls.

- Re-enforce the need to follow all switching instruction protocols and ensure that maintenance craft and supervisor post-job comments are appropriately considered for improving the process or switching instructions.

- Re-enforce FM&Ts expectation that all craft personnel and supervisors are responsible for ensuring proper use of PPE, not only their own but also that of their co-workers.

- Continue efforts to improve high voltage PPE to improve ease of use and appropriately balance the safety benefits of the PPE against the potential for accidents resulting from limitations of vision, hearing, or mobility caused by the PPE.

7. **Tailor the activity-level hazards analysis processes developed by the Construction Safety Improvement Team for the captive construction contractors for application to fixed-price and service contractors.** Specific actions to consider include:

   - Develop processes comparable to the PAHA for fixed-price and service contractors.

   - Develop comparable Daily Task Assignment processes for fixed-price and service contractors

   - Implement such processes for fixed-price and service contractors through a graded approach.

   - Periodically evaluate the effectiveness of implementation though performance-based assessments at contruction worksites.

8. **Ensure that construction and service contractors have developed and implemented the appropriate safety programs (e.g., hazard communications, respiratory protection), tailored to their site-specific work activities, as required by OSHA, DOE, and their KCP contracts.** Specific actions to consider include:

   - Use such tools as the safety orientation and the KCP Construction Safety Handbook to emphasize the type of written safety programs that may be required based on the hazards encountered in the workplace.

   - Periodically audit construction and service contractors to verify that safety programs have been developed commensurate with the hazards to which workers are exposed, that such safety programs have been tailored to site work practices, and that they are implemented effectively.

9. **Establish well-defined criteria and expectations for construction and service contractors working in beryllium-contaminated areas.** Specific actions to consider include:

   - Provide explicit guidance in PHAs concerning expectations for analyzing hazards and establishing hazard controls when conducting work in beryllium legacy areas.

   - Assist contractors in determining which elements, if any, of the DOE Beryllium Rule (10 CFR 850) apply to their activities.

   - If construction contractors are expected to follow the KCP Chronic Beryllium Disease Prevention Program, document such requirements in the contractor's terms and conditions, and provide contractors with clear expectations and instruction on how the beryllium program, or elements thereof, are to be implemented for their contracts.

10. **Ensure that service and construction contractors provide their workers with safety training commensurate with the hazards to which they are exposed.** Specific actions to consider include:

    - Through pre-proposal, pre-construction, and monthly construction superintendent meetings, and safety orientations, communicate the types of service and construction activities (e.g., respirator use, fall protection, lockout/tagout) that require safety training.

    - Require service and construction contractors to identify and address site-specific training

requirements and training record-keeping programs in their safety plans.

- Require service and construction contractors to describe in their safety plans the process by which they will verify the completion of training prior to performing work for which such training is required.

- Periodically audit the contractor's safety training programs and worker training records to verify that workers are appropriately trained for the work to which they have been assigned.

11. **Evaluate the existing construction safety permitting system (e.g., hot work, confined space, lockout/tagout, beryllium) for compliance with requirements, and evaluate the effectiveness of the permitting process.** Specific actions to consider include:

    - Determine, based on requirements and/or good practices, whether the types of safety permits in use for construction and service contractors are appropriate.

    - Review the current instructions for construction-related permits (such as the CSWP) to ensure that the level of instruction is sufficient for contractors to understand the purpose and intent of the permit, how the permit is to be completed, limitations of the permit, and the process for approving and revising the permit.

    - Periodically audit the contractor's use of safety permits.

12. **Further improve environmental protection.** Specific actions to consider include:

    - Provide more detailed instructions on use of the controls in RJAs to further improve their effectiveness.

    - Ensure that containers used for managing cadmium waste are also labeled in accordance with OSHA 1926.1127 - Cadmium.

    - Consider systemically labeling trash containers in shop and laboratory areas to help ensure that regulated waste does not enter the sanitary waste stream.

    - In the IWPF, consider following standard practices for a trench by adding a small sump that collects liquid below the main trench level so that only a small amount of liquid remains in the sump, rather than covering the entire bottom of the trench.

    - Improve management of low-level waste by labeling B-25 boxes and changing the JHA to require use of a plastic drum for storing moist low-level waste that may deteriorate a metal drum.

    - Ensure that waste containers are turned so that labels are visible and that uncontrolled and available containers are quickly identified and moved into proper storage in order to reduce the potential for improper disposal.

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APPENDIX D
FEEDBACK AND CONTINUOUS IMPROVEMENT (CORE FUNCTION #5)

D.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluated feedback and improvement programs at the Kansas City Plant (KCP). The organizations that were reviewed included the National Nuclear Security Administration (NNSA), NNSA's Kansas City Site Office (KCSO), and Honeywell Federal Manufacturing and Technologies (FM&T).

The OA review focused on feedback and improvement programs as they are applied to environment, safety, and health (ES&H) programs at the production, maintenance, construction, and environmental remediation activities selected for review on this inspection. The OA team examined the KCSO line management oversight of integrated safety management (ISM) processes and implementation of selected line management oversight functions, including ES&H assessments, operational awareness activities, self-assessments, training and qualification programs for oversight personnel, and the employee concerns program. The OA team reviewed FM&T processes for feedback and continuous improvement and implementation of those processes, including assessment processes, corrective action/issues management, injury and illness investigations, lessons learned, employee concerns, and feedback and improvement command media.

D.2 Results

D.2.1 KCSO Line Management Oversight

The 2001 OA review identified some positive aspects of the KCSO line management oversight processes, such as the decision to implement a Facility Representative (FR) program even though an FR program is not required for a non-nuclear facility. However, the KCSO program had a number of process and performance weaknesses that hindered its effectiveness, including processes that were not well documented and performance assessments that were insufficient (e.g., most assessments focused on documentation or physical conditions).

Since 2001, there have been a number of important changes in the NNSA and KCSO approach to line management oversight. NNSA has implemented its reengineering approach, which altered the line management responsibilities; KCSO now has additional and increased responsibilities for safety management and reports directly to NNSA Headquarters. (In 2001, KCSO reported to the Albuquerque Operations Office, which has been dissolved and many of its personnel have transitioned to the recently established NNSA Service Center, located in Albuquerque, New Mexico). In addition, based on NNSA draft guidance and NNSA staffing plans, KCSO dissolved the FR program in January 2004 because it was not mandatory at a non-nuclear facility such as KCP). Further, NNSA has developed a draft NNSA policy letter, *NNSA Line Oversight and Contractors' Assurance System Policy (Draft)*, which defines NNSA expectations for line management oversight and contractor assurance systems (LOCAS).

KCSO has taken some actions to document and enhance its line management oversight program and to develop processes to meet the pending NNSA LOCAS expectations. In September 2003, KCSO issued its *Line Oversight Plan*, which describes the overall approach to KCSO line management oversight. The KCSO approach is appropriately based on the draft NNSA policy letter on the LOCAS, which will establish NNSA expectations when formally issued. In addition, KCSO has issued or drafted a number of subordinate documents, process descriptions, or work instructions, to further define expectations and processes for specific aspects of the KCSO line management oversight program.

However, many aspects of KCSO line management oversight processes are not yet being implemented or are in the early stages of implementation. Several process descriptions are in draft form and thus not yet implemented. Several other processes have been recently issued, through process descriptions or work instructions, but are in the early

stages of implementation with few tangible results to date. In addition, there are weaknesses in some aspects of the new processes that could hinder their effectiveness as they are implemented and, in a number of areas, KCSO has not met established expectations for completing assessments or other oversight activities. Further, the KCSO *Line Oversight Plan*, and the numerous new planned or recently issued processes constitute a significant increase in the workload in a number of areas (e.g., the planned self-assessment program calls for significantly more self-assessments than have been performed in past years). KCSO has not issued an implementation plan or other document that describes how resources will be applied to accomplish the new and expanded activities.

Finding #7. KCSO does not currently implement processes for line oversight of environment, safety, and health that meet the requirements of DOE Policy 450.5.

As discussed in the following subsections, the most significant deficiencies contributing to Finding #7 are in the areas of assessments, operational awareness activities, and self-assessments. KCSO has a number of new or planned processes that could address some of the current deficiencies, but these processes are not yet implemented and have some weaknesses that could hinder effective implementation.

KCSO Assessments and For-Cause Reviews

The KCSO *Line Oversight Plan*, consistent with the NNSA LOCAS, requires KCSO to conduct formal oversight activities and, where appropriate, for-cause reviews. KCSO has issued process descriptions and work instructions to further define the expectations and processes for scheduling and performing assessments and reviews including: WI 03-34-03, *How to Develop the KCSO Annual Assessment Schedule;* KCSO WI 03-34-06, *How to Perform ES&H Reviews*; and WI 03-34-02, *For Cause Reviews (Assessments)*.

In many cases, these new processes provide appropriate direction and guidance. The *Line Oversight Plan* describes a workable risk-based approach (e.g., high, medium, and low risk designation of process descriptions with three control levels) for meeting the LOCAS expectations for a risk-based graded approach to prioritizing assessment resources on the areas requiring more rigorous assessments or improvement. The process descriptions and work instructions assign ES&H line oversight responsibilities to appropriate line managers (e.g., KCSO Assistant Managers are assigned responsibility for ensuring adequate assessment of ES&H functional areas). Important terms, such as observations and findings, are defined; work instructions include a system for categorizing findings into four levels (critical, major, marginal, and minor). The work instruction also appropriately requires the contractor to respond to findings within the FM&T Corrective Action Tracking system (CATS), and requires KCSO ES&H personnel to track the findings to closure and re-validate the adequacy of closure actions after 6 and 12 months. The processes appropriately require KCSO to develop an annual assessment schedule, which identifies the assessments planned for that year. The *Line Oversight Plan* requires for-cause reviews to be conducted when major weaknesses are identified and delineates a set of appropriate requirements, such as assembling a team of subject matter experts (SMEs), developing the review scope and criteria, and producing a report that identifies contractor and Federal weaknesses.

However, some of these processes are new and have not yet been fully implemented (e.g., the work instruction for performing ES&H reviews was issued in April 2004). In addition, there are weaknesses in the new processes that could hinder their effectiveness:

- The KCSO work instruction, *How to Develop the KCSO Annual Assessment Schedule,* does not provide adequate guidance for ensuring the adequate assessment of ES&H functional areas (e.g., the minimum required set of formal assessments is not defined, and there are no instructions on how managers are to ensure adequacy of the oversight activities in the functional areas). It also requires SMEs to prepare a report for each assessment in accordance with a process description that does not currently exist (PD #18).

- The Annual Assessment Schedule does not provide sufficient detail to facilitate effective management of assessment activities. The Annual Assessment Schedule does not provide detailed schedule information and does not specify when during the year the assessments are to be complete. The lack of such information hinders scheduling and utilization (e.g., "load leveling" to distribute the workload) of KCSO SME resources and NNSA Service Center SME support. In addition, the Plan and Schedule provide no detail about the scope or functional areas to be reviewed for the ES&H areas.

- The work instruction, *For Cause Reviews (Assessments)*, requires the use of process description, *KCSO Assessments & Surveys of M&O Contractor Activities*, but should reference the work instruction, *How to Perform ES&H Reviews*, which is more current and more specific to the task.

In addition, the KCSO Annual Activity Plan lists three ES&H Topical/Facility Reviews (no additional detail is provided) to be conducted in fiscal year (FY) 2004. As of six months into the fiscal year, none of the ES&H formal assessments is complete. As a result, the adequacy of FY 2004 ES&H assessments cannot be evaluated. In addition, the Plan does not call for any for-cause assessments to be performed in FY 2004 (although for-cause assessments could be added if KCSO identifies a need).

A review of the FY 2003 activities against the Annual Assessment Plan indicates inconsistent performance in the area of scheduling and conducting formal assessments. KCSO completed only one of seven scheduled ES&H assessments identified on the Plan. KCSO also completed only five of eight scheduled FR assessments (the FR program was dissolved in January 2004). However, KCSO completed three other facility reviews, a conduct of operations review, and a fire protection review (supported by the NNSA Service Center) that were not on the Annual Activity Plan.

The technical quality of the FY 2003 reviews was generally adequate, and the reviews identified significant observations and areas for improvement. However, the reviews varied significantly in scope and format, and there is no documentation to verify that the reports were formally transmitted to the contractor for action. No findings were identified in any of the assessments, although a number of the reported observations and conclusions would meet the current definition of findings.

KCSO Operational Awareness and Other Activities for Monitoring Contractor Performance

In addition to formal assessments, the NNSA LOCAS and the KCSO *Line Oversight Plan* require KCSO to monitor the effectiveness of the contactor assurance system, review the contractor's internal audits and external assessment results, monitor contractor corrective action programs, and monitor contractor and contract performance. The NNSA and KCSO approach relies heavily on these operational awareness activities and devotes most line management oversight resources to operational awareness and review of the contractor assurance systems and performance. Correspondingly fewer resources are devoted to formal KCSO assessments (as discussed above). The concept is that resources used for operational awareness and reviewing the contractor assurance system and contractor assessment results can be more efficient and effective in driving ES&H improvements than performing formal assessments.

KCSO has mature processes for evaluating contractor performance through the Annual Performance Evaluation Plan (PEP) and associated Performance Objectives and Incentives. The *Line Oversight Plan* describes some other operational awareness and review activities (e.g., requires KCSO to review FM&T internal assessments to ensure thorough and comprehensive self-assessment). In addition, KCSO has drafted a new process, Draft Work Instruction 03-36-XX, *How to Perform Review of Contractor Assurance System*, for reviewing the contractor assurance systems. KCSO also recently issued WI 03-34-04, *How to Perform ES&H Oversight of Contractor Activities*, dated March 5, 2004, to define the operational awareness process and implement LOCAS requirements.

The KCSO process for evaluating contract performance through the PEP is mature and provides an appropriate evaluation methodology. It is based on well documented and mature processes including PD 03-31, *KCSO Performance Evaluation Plan Development Process*; PD 03-32, *KCSO Incentive Validations*; and PD 03-33, *KCSO Award Fee Performance Evaluation Report*. OA's review of recent performance evaluation plans, FM&T comprehensive performance objectives input, KCSO quarterly input on comprehensive performance objectives, performance evaluation reports, and final performance evaluation reports indicates that the processes are effectively implemented and include consideration of ES&H performance. However, the quality of the KCSO evaluation of contractor ES&H performance and KCSO's ability to independently evaluate ES&H input provided by the contractor relative to the PEP and performance objectives depends on the adequacy of the KCSO line oversight program. As discussed throughout this section, KCSO's line oversight program (including assessments and operational awareness activities) has a number of weaknesses.

The *Line Oversight Plan*, the draft Work Instruction, *How to Perform Review of Contractor Assurance System*, and the new work instruction, *How to Perform ES&H Oversight of Contractor Activities*, have a number of positive aspects. For example, the new work instruction is generally adequate, with the exception of some documentation requirements. The Line Oversight Plan commits KCSO to review the contractor assurance system annually, review the extent and effectiveness of contractor corrective actions, and to periodically review the effectiveness of the CATS. Results of these reviews will be used by KCSO to focus operational awareness and could result in for-cause reviews if major weaknesses are identified.

However, for the most part, these processes have not yet been implemented or are recently implemented such that there is no performance data to verify their effectiveness. The Site Office expects implementation of Work Instruction, *How to Perform Review of Contractor Assurance System*, by the end of the fiscal year. In addition, there are a number of weaknesses that hinder effective implementation of the current and planned operational awareness processes:

- The FY 2004 KCSO Annual Assessment Schedule does not list the annual review of the contractor assurance system as a required assessment, although the *Line Oversight Plan* requires such an annual review.

- There was no documentation indicating that KCSO SMEs had routinely reviewed the FM&T contractor assurance system. No training on the contractor assurance system has been provided to the KCSO personnel.

- KCSO SMEs were not systematically monitoring contractor corrective actions or reviewing the database. Few KCSO personnel were familiar with the contactor corrective action database structure or routinely accessed the system.

- During the course of interviews and document reviews, there was no evidence of KCSO SME review of the contractor's internal or external assessments.

- The new work instruction, *How to Perform ES&H Oversight of Contractor Activities*, does not specify requirements for documenting operational awareness activities (other than formal findings). Based on interviews, a few people are maintaining Operational Awareness Logs (spiral notebook, or dedicated e-mail directories). However, these mechanisms do not support trend analysis, search capability, or sharing of operational awareness information with other KCSO staff. A staff member has been assigned to develop a documentation system (using a database), but a process description or a work instruction for this KCSO documentation process has not been developed.

- KCSO ES&H operational awareness and/or assessments of remote operations are not being performed. FM&T has operations at several remote locations including facilities that perform potentially hazardous activities (e.g., two facilities in Albuquerque, New Mexico, one of which is located at Sandia National Laboratories). Documented reviews of the remote facilities have not been performed for several years and ES&H assessments and internal audit results performed by FM&T-New Mexico do not show up on the FM&T contractor assurance system (FM&T reports that they will be integrating this data in the near future). KCSO does not have current memoranda of agreement with the responsible NNSA sites offices; the latest agreement between KCSO and the Sandia Site Office (responsible for activities at Sandia National Laboratories) was established in 1997 and does not reflect current organizations, facilities, or managers.

In addition, there are a number of weaknesses in the draft Work Instruction, *How to Perform Review of Contractor Assurance System*, which could hinder its effectiveness if not addressed before its implementation:

- Required frequency of reviews is not definitive (i.e., it states "generally reviews are conducted at least quarterly").

- The draft process description does not define the "hierarchy" of weaknesses (i.e., finding, observation, opportunity for improvement).

- Instructions are not clear with regard to what results are to be documented, where they are to be documented, or how to transmit them to the contractor.

- The draft process does not address criteria or processes for performing the annual review of contractor assurance program, as required by the *Line Oversight Plan*.

KCSO Self-Assessment Program

NNSA has drafted Site Office Self-Assessment Programs policy and guidance, and expects the Site Offices to develop and implement self-assessment programs by the end of FY04. To meet this expectation, KCSO plans to build on their current self-assessment program as documented in PD 01-10, *KCSO Internal Audit Process*, and PD 01-14, *Process for Management Review*. In addition, KCSO recently established a process description PD 01-12, *KCSO Process for Internal Corrective and Preventative Action*, to define requirements for corrective action tracking for internal findings (e.g., from internal audits or management reviews). KCSO also issued PD 01-13, *KCSO Process for Issues Management*, which will be used for tracking various issues (including issues related to self-assessments).

These process descriptions are generally adequate for the described activities. KCSO intends to review all KCSO internal processes on a three-year cycle. A schedule, including KCSO personnel assigned, has been drafted. However, the *KCSO Internal Audit Process* description does not have sufficient information on documentation requirements.

Although the process descriptions are adequate for the most part, KCSO has not fully implemented the processes. KCSO has recently completed ten internal audits and is working to insert the resultant findings in the corrective action database. Management reviews have not been conducted yet; the Assistant Manager for the KCSO Office of Quality Assurance advised that the management reviews should start later this month. The KCSO *Process for Internal Corrective and Preventative Action* and the KCSO *Process for Issues Management* are not yet implemented, although test data has been entered to facilitate testing the systems.

In addition, over the past few years, KCSO has not established and maintained an effective self-assessment process and has not performed systematic and rigorous self-assessments (a weakness noted in the 2001 OA review). KCSO performed one self-assessment in FY 2002 and one in FY 2003. The transition to a formal program, with an aggressive schedule of self-assessments (three-year cycle), will therefore require sustained management attention.

Training and Qualification Program for Oversight Personnel

KCSO does not have clearly defined program for training and qualification of personnel who perform line management oversight activities. There is no KCSO process description or work instruction that describes training and qualification of KCSO personnel who perform line oversight functions (or other KCSO functions). KCSO does not have a current training plan (latest available is for FY 2002) or needs assessment, as required by DOE Order 360.1B, *Federal Employee Training*. Although it addresses some training support requirements, the Service Level Agreement between KCSO and the NNSA Service Center related to training and development at KCSO is not current or comprehensive. In addition, KCSO plans to implement some aspects of the draft NNSA Technical Qualification Program Plan. As a non-nuclear facility, some of the NNSA technical qualification program requirements are not applicable to KCSO personnel; however, KCSO has not clearly documented the differences between their planned implementation and the baseline NNSA program.

Finding #8. KCSO and the NNSA Service Center have not established a program for training KCSO personnel that meets requirements of DOE Order 360.1B, *Federal Employee Training*.

KCSO Employee Concerns Program

In accordance with a recent (2003) service agreement, KCSO and FM&T personnel may use the employee concerns program managed by the NNSA Service Center. The NNSA Service Center is currently revising its web site and employee concern procedure. Although the web site is not currently available for filing a concern, concerns may still be filed with the NNSA Service Center employee concerns manager via email or phone. The employee concerns manager indicated that a new Service Center Supplemental Directive will be completed by the end of May 2004.

Although available, data for the past few years indicates that KCSO and KCP contractor personnel rarely use the NNSA employee concerns program. No employee concerns program cases were initiated in FY 2003, and only one case has been initiated in FY 2004 (which was subsequently closed).

D.2.2 FM&T Feedback and Improvement

Assessments

FM&T conducts a variety of assessment and inspection activities that evaluate ES&H processes and implementation and plant physical conditions. These assessment and inspection activities are identifying process, work environment, and performance deficiencies and are resulting in improvements in ES&H performance.

The FM&T Office of Quality Assurance system audit program is the cornerstone of the FM&T self-assessment program. Topical ES&H areas to be audited are reviewed and scheduled annually with input from ES&H and line management. Approximately 10 of these independent evaluations are conducted for ES&H related processes each quarter. Auditors are trained and qualified and have well structured work instructions to define expectations. The formal reports identify conforming attributes, non-compliant processes and performance, and opportunities for improvement. All results of audits are input to a database used for trending and planning, and findings requiring action are input to the CATS database for tracking to completion. Management at all levels relies on the results of these assessments to monitor and judge safety performance.

Periodic corporate and third party audits assess the adequacy of ES&H-related processes and implementation. These include annual third-party audits by FM&T's insurance carrier and semiannual reviews and audits (every three years) for continuance of quality assurance and environmental management system certifications under International Organization for Standardization (ISO) standards 9001 and 14001. Internal Six Sigma team assessments have been used to improve ES&H processes in such areas as ES&H metrics, construction safety, the hazard identification and control system, and accident/incident investigations.

Several line and ES&H SME inspection and assessment programs that were not being effectively implemented during the 2001 OA review have been combined into a single inspection program called Safety and Housekeeping Implementation Needs Everyone (SHINE). The SHINE program involves routine, scheduled inspections of the physical conditions of workspaces in all areas of the facility, with involvement of managers and associates (FM&T personnel are referred to as associates at KCP) as well as ES&H SMEs. Managers are successfully encouraged to participate and support the SHINE program by publishing data on personal participation and department/division performance.

Exposure assessments, beryllium contamination characterization studies, medical surveillance examinations, voluntary ergonomic self-assessments, and noise surveys evaluate work areas and working conditions for hazards and the need for controls. Routine environmental monitoring assures compliance with regulations. Programs with regulatory or DOE-order-driven assessment requirements, such as radiological protection, environmental compliance, employee concerns, and Occupational Safety and Health Administration (OSHA) lockout/tagout, are being completed as required.

Construction safety specialists conduct routine, documented inspections of contractor activities and safety programs. Deficient performance identified during these inspections is communicated to subcontractors via warning tickets and, for repeated or more serious infractions, as citations that require written responses that include causal analysis and preventive actions. A monetary incentive program has been initiated based on a system of scores from safety, fire protection, and waste management inspections of subcontractors' work and worksites. A recently instituted requirement that the three "captive" subcontractors (those with an ongoing presence at KCP, working under time and material contracts) retain a full time safety professional has resulted in improvements and formalization of subcontractor self-assessment of working conditions and field compliance with OSHA requirements. Of particular note is the inspection, analysis, and reporting performed by one of these "captive" construction subcontractors since January 2004. Inspection reports are well documented, with detailed explanations of positive observations and deficiencies and the corrective actions taken. Monthly reports to the FM&T construction safety staff include an analysis of performance in each of 18 safety elements, as well as the percentage of inspections with satisfactory performance computed for each area and collectively. This formal data collection and analysis provides a valuable tool in focusing resources on areas of weakness and identifying the poor performance or adverse trends that are precursors to accidents.

FM&T management reviews are conducted semiannually and include summary evaluations of quality and environmental performance in support of ISO 14001 certification and management evaluations of overall ES&H performance. The Voluntary Protection Program steering committee also conducts

annual evaluations of the overall safety and health program that support maintenance of STAR status.

FM&T and the KCSO are establishing a formal contractor assurance system to implement the performance monitoring requirements delineated in the draft DOE and NNSA policies and orders that outline expectations for establishing contractor assurance systems (encompassing assessments, issues management, and other feedback systems) and DOE oversight of contractor activities. If fully and effectively implemented, the formal contractor assurance system being developed at KCP can provide a useful tool for demonstrating that FM&T ES&H processes adequately protect the public, workers, and the environment.

A published manual describes the FM&T contractor assurance system, and an implementation guide defines the expectations for data input from business function and process owners. ES&H (as a business function) and its processes were evaluated and ranked according to risks, with levels of control mechanisms assigned on a graded basis. The ES&H process is classified as a low-risk process with the lowest control function, but some individual ES&H processes are ranked as high risk (chemical carcinogen control, hoisting and rigging, lockout/tagout, electrical safety, respiratory protection, and confined spaces) with high control requirements. Control requirements include such mechanisms as performance metrics, third-party assessments, self-assessments, and benchmarking.

Although FM&T performs a variety of assessment activities, functional and line managers are not "ensuring that associates operate in strict compliance with the policies and applicable procedural requirements in command media" as specified in the FY 2004 ES&H Management Plan. Continuous improvement in ES&H performance is hindered by a lack of routine, formal self-assessment by line management and ES&H SMEs. Assessment activities that are performed often do not sufficiently focus on the adequacy of implementation and observation of work, and they are not conducted in sufficient depth to clearly establish the effectiveness of safety and health processes.

With very few exceptions, there are no work instructions, defined requirements, or formal management expectations directing line management or ES&H process and subject area owners to conduct structured, planned, and comprehensive evaluations of the implementation of those ES&H program elements. Correspondingly, self-assessments have not been performed of most management systems (e.g., corrective action, injury and illness reporting, and lessons learned) or production, construction, and maintenance work activities. The exceptions include the regulatory driven topics of confined space and lockout/tagout, environmental inspections, reactions to significant events, and efforts directed at cost savings and efficiency through a Six Sigma team analysis.

Although FM&T Office of Quality Assurance system audits evaluate the adequacy of performance for individual corrective actions, the adequacy and effectiveness of the implementation of the process of managing ES&H issues has not been rigorously and comprehensively assessed. The Office of Quality Assurance ES&H system audits are generally comprehensive but do not provide sufficient depth and focus on observation of work activities to fully evaluate the implementation of safety and health processes. For example, almost all audits address whether there are compliant work instructions and process descriptions for the functional area, but they typically do not evaluate the adequacy or effectiveness of those documents. Most audits ensure that the high percentage of associates who are required to receive specific training have been trained, but they do not normally evaluate the quality of the training. Roles and responsibilities specified in process and work instruction documents are discussed with responsible personnel, and in some cases the resulting activities or products are verified as performed or issued; however, there is no evaluation of how well those roles and responsibilities are implemented or the quality of the resulting products. For example, for an audit of scaffolding safety, the only field observation was of a scaffold erection activity, and addressed limited aspects of ES&H (i.e., that the installing workers wore proper personal protective equipment and performed work safely). The audit did not address whether the erected scaffold and previously erected scaffolds were in compliance with requirements or whether work activities on scaffolds were performed safely. Similarly, an audit of the hoisting and rigging process involved observation of some crane activities, but the auditors did not evaluate any hoisting or rigging use or associated activities (e.g., lift plans or pre-lift briefings) or inspect any hoisting or rigging gear. Also, a recent audit of the accident/incident investigation and reporting program did not identify any of the deficiencies noted by this OA inspection of this program and did not evaluate the adequacy of implementation of key program elements, such as classification, investigation, and documentation of accidents and incidents.

Although the SHINE program serves effectively to identify physical condition and housekeeping deficiencies, this assessment process does not result in the evaluation of work activities. The work instruction for SHINE encourages an effort to observe associates' work practices for safety considerations, with observations to be documented on the checklist; however, it does not include a specific checklist item for work observation. Over 25 departmental SHINE inspection checklists conducted during the first quarter of calendar year (CY) 2004 that were reviewed by the OA team reflected no documented observations of work or workers.

The initial information submitted to date for inclusion in the contractor assurance systems database for the safety and health business function and its subordinate processes does not reflect a robust self-assessment process, and the cited self-assessments do not conform to the expectations delineated in the FM&T contractor assurance system guidance, which is based on the draft NNSA LOCAS policy. The self-assessments identified in the database are references to performance metrics, not comprehensive or performance-based evaluations of the adequacy of the process or its implementation in the field. Further, the current metrics are too limited in breadth or scope to adequately reflect performance. The contractor assurance project personnel's review of ES&H management's submittal of information to the contractor assurance system database did not identify that the self-assessment element did not comply with the requirements and guidance. In addition, an important safety and health process has not been included in the contractor assurance system risk ranking and assurance database. Because the construction safety program lacks a command media governing document system (process description/work instruction) and the contractor assurance system is based on the identified numerical designations from command media, construction safety has not been risk ranked and included in the contractor assurance system.

The third-party reports of ES&H performance evaluations sponsored by the FM&T insurance company lack sufficient detail to support their determination of performance adequacy. The most recent assessment conducted in February 2004 reported no findings and stated that "excellent procedures were in place." The report cited the construction safety program as a strength and a "best practice," and recommended that it be submitted to the Honeywell Best Practices System. However, as discussed in Appendix C and later in this section, there are deficiencies in construction safety and maintenance, and many procedures do not adequately identify hazards and controls.

Although FM&T construction safety specialists routinely inspect and monitor workplace conditions and subcontractor performance in the field, the construction safety inspection process is not defined in command media and is only obliquely addressed in the Construction Safety Manual. Further, there is a "strong suggestion" but no clear requirement in the construction safety manual for subcontractors to conduct self-inspections using a checklist attached to the manual. Other than the initial review of subcontractors' site-specific safety plans, there is no documented expectation or requirement that FM&T safety specialists conduct documented evaluations of required subcontractor safety programs such as hazards communication, inspection, injury and illness reporting, and respiratory protection programs.

Finding #9. FM&T has not established and implemented a fully effective assessment program that rigorously and consistently evaluates the implementation of individual safety and health program elements and safety management processes, and accurately evaluates overall safety and health performance.

Issues Management

FM&T uses formal processes to screen events, injuries, ES&H concerns, and other identified ES&H related issues; determine causal factors; establish corrective and preventive actions; and track actions to closure. New and revised work instructions and other recent initiatives have improved ES&H issues management processes and performance at KCP. A new procedure requires a review of internal and external audits to ensure that all issues are captured and input to the ES&H corrective action process. This procedure also provides a mechanism for binning and trending findings, remarks, observations, and comments from these reports; initiating further review by SMEs; and taking additional action if deemed necessary. The data is binned into a matrix of ISO 9001 and ISO 14001 elements and process descriptions, with action required when ten or more issues are identified in any of these bins. FM&T recently hired a consultant to conduct causal analysis training for ES&H personnel involved in investigation of events and the evaluation and dispositioning of corrective action requests (CARs). Since the 2001 OA review, FM&T has often assigned

to line management single points of contact the overall responsibility for managing CARs written for ES&H issues directly related to the line activities.

Although management of ES&H issues is within the scope of the site corrective action program, separate work instructions detail the processes for evaluating and resolving the various types of safety issues, including findings from assessments, operational events, near misses, occupational injuries and illnesses, and employee concerns related to ES&H. Safety issues are classified for risk to drive a graded management process using two matrices and a numerical scale risk ranking system – from 1 (minor) to 4 (significant). The two matrices include criteria related to the actual event in various areas (e.g., safety and health, environment, structure and equipment damage costs, compliance and business) and to potential consequences (e.g., impact and probability of occurrence). The issue is categorized at the higher of the two ratings. Most issues are classified by a team of ES&H personnel. Another team of ES&H and line personnel conducts causal analysis and determines corrective and preventive actions for issues classified as 2 or higher. Formal documentation on CARs and causal analysis is performed for all issues classified above the 1 or "minor" threshold – approximately 115 issues since CY 2001 (e.g., findings and events, including all OSHA recordable injuries). The corrective actions and closure of issues documented on CARs are tracked in CATS.

Although often informally processed and documented, corrective actions are implemented for many lower-level ES&H program and performance deficiencies, such as those identified during SHINE inspection tours. An existing web-based tracking system used by the FM&T Office of Quality Assurance has been revised and made available to the rest of the KCP associates to increase the ability to capture and track additional issues (i.e., those not documented on CARs) and provide a broad-based set of data for trend analysis. The regular meetings of the Corrective Action Board, composed of the quality assurance process owner and the corrective action points of contact, provide a regular forum for communicating process issues and promoting improvement and consistency in issues management.

Notwithstanding these improvements in issues management processes, tracking tools, and performance, effective management of this essential feedback mechanism is being hindered by weaknesses in processes and implementation. Many ES&H-related CARs had errors or weaknesses in accurately describing the issue, citing the requirements violated, and classifying the risk category as required by procedure; accurately identifying direct, contributing, and root causes; establishing preventive actions that address contributing and root causes; and, in several cases, closing the CAR when specified corrective actions had not been verified as complete. In many cases, the evaluations do not address deficiencies in the core functions of ISM such as work scope definition, hazard identification, specified controls, or adherence to specified controls. The effectiveness of the management of safety issues is impaired by the number, complexity, and lack of clarity of process descriptions and work instructions that govern documenting, evaluating, and dispositioning ES&H issues and events. Examples of the weaknesses in the corrective action program include the following:

- **Numerous instances were identified where CARs did not document the specific requirement violated; where the safety issue was not clearly delineated; where the causal analysis did not address ISM elements, such as defining the work, identifying hazards and controls, and performing work using the specified controls; where preventive actions were inadequate to address the root and contributing causes; and where closure statements on the CAR did not reflect that required actions were implemented.** As an example, a CAR was written describing the purchase of quantities of nitric acid in quantities larger than specified in the site hazards assessment. The requirement violated was cited as the hazards assessment, but not the allowable quantity. The finding was not clear in describing how an unspecified larger quantity of acid was received and held at the chemical stores acid pad, with indications that the larger quantity was procured because the previous 15-gallon containers were prone to leaks. A contributing cause was also unclearly stated, but appeared to allude to management directing the procurement to address the leakage problem. The root cause was determined to be unclear expectations for ordering new sizes of containers in the work instructions for processing a preliminary hazards analysis. The team evaluating this CAR evaluation could not reach consensus on a final resolution, so that 14 months after the issue was identified and despite the CAR specification thar work instructions and process descriptions be revised, the issue was closed when ES&H finally put up a link to the

information on the their web site and noted on the CAR that the team was no longer a valid element of that CAR. The initial problem that led to the CAR—leaky acid containers and the purchase of acid in different containers—was never addressed.

- **Operational events may not be properly evaluated in accordance with work instructions or properly screened for Occurrence Reporting and Processing System (ORPS) requirements.** In a December 30, 2003, event, a 1000-pound section of ductwork fell while it was being removed because of non-conservative assumptions and improper restraints, damaging light fixtures and the conduit below (which retained the falling ducting). This event was not documented or evaluated as required by FM&T instructions, and was only identified on a communication alert posted to the ES&H web site. No accident investigation team was convened, no CAR was written, no documented screening against ORPS criteria was conducted, and no formal corrective/preventive actions were written (except as referred to in the alert, which has no tracking mechanism). Further, the communications alert did not describe or address any shortcomings in the ISM and work control aspects of this event (e.g., work planning, pre-job briefing, or oversight). This was a significant near-miss event that received a minimal and non-compliant response by FM&T and inadequate monitoring and evaluation by ES&H management.

- **The work instructions governing reporting and evaluation of events and emergencies contain conflicts and deficiencies that contribute to performance lapses.** For example, the instruction for event notification and reporting refers to reporting the event in accordance with another instruction for reporting and responding to emergencies. However, this second instruction is written to address emergencies, not operational or other events where there is no ongoing emergency condition. Associates are directed by this second instruction to report emergencies to the security patrol headquarters. Site instructions for screening events for ORPS reportability do not assign any final responsibility for the screening decision or require documentation of the decision. A group pager alert is sent to 13 assigned facility managers when an event occurs, and these managers are directed to categorize and classify the event in accordance with ORPS criteria and initiate action if the event is deemed reportable. However, this process results in diffused responsibility and accountability and does not document negative determinations. The patrol headquarters logs were reviewed for two recent events (the falling ductwork cited above, and the collapse of a suspended ceiling in an office area). These logs did not include documentation that the events had been communicated to facility managers. Patrol personnel indicated that the written log would not necessarily contain notations for non-security events.

- **The system of requirements documents is complex and not well coordinated.** At least four process descriptions and seven work instructions are used to describe processes to manage ES&H issues—not counting injury, illness, and operational events, which involve two other process descriptions and six other work instructions. Although frequently cross linked in work instructions, there are two primary processes for evaluating ES&H concerns: one owned by the Office of Quality Assurance and one by the ES&H organization. Because these processes are not fully compatible, different classifications and management of ES&H issues are used, depending on the source identifying the issue rather than the significance and risk aspects of issues. The corrective action process description lists 23 different CAR types and 7 different work instructions to use in managing these issues.

- **Many work instructions for issues management contain errors and omissions, and they often do not clearly define or use common terminology and references, or delineate all the steps required to effectively manage ES&H issues and events.** The primary ES&H issues management instruction does not address uncontrolled forms and tools being used by review teams or specify that issue classification decisions be documented and retained. When CARs are issued, the ES&H risk classification is usually, but not always, recorded on the CAR form in a block titled "Event Code," a block that the Office of Quality Assurance also uses to record a *different* risk classification designation that is used for audit findings. Therefore, it is not clear how CARs classified by the Office of Quality Assurance are to be managed using the ES&H

instruction that contains a different classification system. The work instruction specifies the use of classification information before it directs ES&H to conduct the classification. The procedure does not explain how ES&H is to use the two risk matrices that are appended to this instruction to classify ES&H issues.

- **The criteria specified in the new procedure for capturing external and internal audit report issues and trending the issues are insufficient to effectively identify adverse trends.** The procedure specifies that ten issues identified in any one ISO standard section or in one ES&H process area prompts further management review. The initial use of this procedure, where issues from several years of audit reports were collected and categorized, resulted in several areas that met the threshold. However, the review periods are now being limited to one fiscal year, without changing the threshold criteria. For most of the processes, audits occur only once a year or less frequently, and it is unlikely that any thresholds will be met. In addition, administrative staff are relied on to capture issues from audit reports, and issues are not reviewed by technically qualified SMEs to determine whether the information should be screened for classification and issuance of a CAR. The work instruction states that if the threshold of ten issues is met, a "weekly" report (stated by personnel to be a graphical presentation of issues) is to be issued to management for review. This graph does not provide the information needed to identify an adverse trend. Further, although issue data is entered into the matrix as reports are received, totals are generated only when requested by management. Thus, management may not know when an adverse trend crosses the threshold.

- **FM&T construction safety records for citations and warnings to subcontractors were not adequately maintained.** Four of approximately 15 citations issued in CY 2003 and 2004 were not in the logbook. Five citations did not have written responses from the subcontractor in the construction safety files. Responses were located in the purchasing files, indicating that the construction safety specialists had not reviewed the responses for adequacy of causal analysis and preventive actions. Several citations did not contain sufficient detail to fully describe the conditions and actions that constituted the citation. In at least two cases, the response from the subcontractor failed to provide the required causal analysis and preventive action or incorrectly identified the root cause. For example, a warning ticket was issued for an incorrectly constructed scaffold, but FM&T safety specialists allowed continued use of the scaffolding if workers were tied off with fall protection. When workers were observed the following day working off the scaffold without fall protection, a citation was issued. The subcontractor's response incorrectly cited the root cause as the failure to properly construct the scaffold and the preventive action was to modify the scaffold. In fact, the issue for the citation was the failure to follow the requirement to employ fall protection when using the deficient scaffold, and the preventive action should have addressed the work control elements of this issue (e.g., training, pre-job briefings, and tagging/signage).

- **The FM&T issues management process and ES&H management did not adequately respond to indications of issues and trends in hazardous chemical lists and hazard communications.** FM&T experienced repetitive issues involving the failure of line departments to develop and maintain hazardous chemical lists in each department, as required by a work instruction. This requirement was specified to meet OSHA hazard communication requirements that workers be aware of hazardous materials in their workspace and how to find information on the hazards and controls for these chemicals. Between September 2002 and April 2003, Office of Quality Assurance audits identified 13 findings, involving at least 12 different departments, where chemical lists did not exist or were deficient. However, these common findings were not identified as indicative of a trend or systemic issue. The new procedure for capturing and trending ES&H audit findings appropriately flagged the fact that the threshold of ten issues for the area of hazard communication had been met. The SME stated that an issue related to chemical lists had already been addressed by a CAR issued in November 2003. However, that CAR was written against only one Quality Assurance audit finding, issued seven months earlier in April 2003, against one production department. Therefore, the statement of the issue in the CAR issued by ES&H did not reflect the systemic nature of this issue. Further, ES&H was assigned the responsibility for addressing this

deficiency, rather than the line organization that did not adequately implement site safety requirements. In responding to this issue, ES&H included a systemic corrective action but incorrectly determined that the root cause was unclear work instructions. As a result, a significant root cause (lin management's failure to implement a safety requirement, formally identify difficulties with implementing the requirement, or seek relief or change) was not addressed.

- **The SHINE work instruction allows the line to address issues without use of a formal corrective action process.** The work instruction indicates that only "significant" or "systemic" issues need to be addressed via a formal corrective action process. These terms are not defined and are not the same terms used in classifying issues in the ES&H corrective action work instruction. Level 2 and 3 issues identified during SHINE inspections are not required to be input to the corrective actions system via a CAR unless corrective actions have not been taken by the time of the next quarterly inspection. Thus, identified issues that would be classified as level 2 (marginal) or level 3 (major) safety issues would not be documented as CARs and therefore would not be subject to the attendant documented causal analysis and development and tracking of preventive actions. Further, it is possible that three to six months could elapse before uncorrected level 2 and 3 safety issues would be identified and documented into the corrective action tracking system.

- **FM&T has not adequately defined or communicated to subcontractors the expectations for correcting deficient conditions, processes, or performance.** The Construction Safety Handbook specifies that safety plans include documented bi-weekly inspections, but it does not address evaluation of deficiencies and establishment, documentation, and tracking of corrective and preventive actions. The application of lessons learned is also not addressed in subcontractor-related documents.

Although some incremental progress has been made in corrective action, lessons-learned, and employee concerns processes at KCP, many of the feedback and improvement program-related weaknesses that were identified during the 2001 OA review still exist. The CAR written to address the feedback and improvement finding from the 2001 OA review did not address many of the individual deficiencies in the areas of lessons learned and self-assessments by line management and ES&H SMEs. Although a KCP team performed an extensive review of corrective action processes and issued a report recommending several approaches and recommendations for improving processes and performance, the CAR was closed without identifying the specific actions that were taken.

Finding #10. FM&T has not established and implemented a fully effective issues management process that consistently and rigorously categorizes, documents, and manages events and issues, evaluates causes, establishes effective preventive actions, and verifies that corrective and preventive actions have been implemented.

Injury and Illness Investigations and Reporting

Injury and illness statistics for FM&T at KCP reflect that recordable and lost workday case rates are among the lowest in the DOE complex. Workers are directed to report all injuries and illnesses to supervision and are evaluated and treated by the site medical clinic. Subcontractors are required to report OSHA recordable injuries and illnesses to FM&T.

A convenient and comprehensive computerized reporting system is used to record summary treatment information provided by the occupational medicine personnel at the KCP clinic and classification and evaluation results from the accident investigation team. The site Accident Review Team, composed of ES&H and occupational medicine personnel, categorizes each FM&T occupational injury and illness for reportability to OSHA and the DOE Computerized Accident/ Incident Reporting System (CAIRS). Another team, composed of line and ES&H personnel, conducts the causal analysis and determines corrective and preventive actions for all recordable injuries and illnesses. The synergistic nature of using teams for these decision-making processes provides additional confidence in the accuracy and completeness of the results.

The team evaluations for recordable injuries and illnesses and first aid cases have, until recently, been documented on the DOE individual accident/incident report Form 5484.3. Recently, a new KCP incident/ investigation report form has been used; it clearly identifies the severity/reportability determination and

issue significance/risk classification, as well as the details of the investigation and corrective/preventive actions.

In most cases, the review teams provide significant and appropriate details describing the event and the causal analysis and preventive actions for injury and illness investigations, including for those cases classified as non-reportable (first aid cases). This notable application of rigorous evaluations to first aid cases reflects a lessons-learned approach to injury prevention. With the reservations noted below, the documentation reviewed by the OA team indicated that classifications were appropriate and properly reported to CAIRS and OSHA.

Although injury and illness investigation and reporting processes and tools have been improved in recent months, several weaknesses in processes and performance were identified. A large number of work instructions and several process descriptions collectively describe the processes and actions needed to manage injury and illness evaluations and reporting and case management, including at least a dozen work instructions and several process descriptions, as well as the Construction Safety Handbook. These numerous instructions do not present a logical, complete, or adequately detailed delineation of how these activities are to be performed. This myriad of cross-referenced instructions is unnecessarily complex and inefficient. For example:

- Action steps are duplicated in work instructions 22.02.02.04.01 and 22.02.02.04.02.

- Many activities are identified as the responsibility of "ES&H," without any assignment of specific positions or qualifications.

- Several forms and reports used are not official controlled command media (e.g., the new reporting form and case management record forms are not within the command media controls as required by site procedures).

- Responsibilities for the completion of injury and illness reports for subcontractors are not clear, and actual practice differs from written instructions.

- The appointment of teams and investigators is not identified in the instructions. Team investigation reports and categorization documents are not signed by team members or any approval authority.

- Follow-up visits to the clinic are not formally communicated by occupational medicine to ensure that ES&H staff members are aware of changes in treatment or work restrictions that could affect previous categorizations of injuries and illnesses, and ES&H staff do not document telephone or email communication of such information to ensure a complete record.

- Treatment statements in the computer database are sometimes cryptic and do not clearly communicate dosage of over-the-counter medicines that could make a case OSHA recordable if given at prescription strength.

- Unsigned and undated updates to the number of lost and restricted workdays are made to completed Forms 5484.3 by the ES&H case manager.

No assessments have been conducted to evaluate the level of compliance of subcontractors in reporting injuries and illnesses as required, or to ensure that follow-up treatment and recurrences that could affect prior OSHA recordability decisions and CAIRS reporting are forwarded to FM&T. Also, self-assessments have not determined whether follow-up clinic visits are properly communicated by occupational medicine staff for FM&T personnel suffering occupational injuries and illnesses. Considering these weaknesses in process and documentation and the lack of implementation assessments, the existing process controls do not provide sufficient assurance that reported occupational injury and illness data is complete and accurate.

Some injuries and exposures during the past two years were not consistently evaluated rigorously enough to clearly identify root and contributing causes and drive effective recurrence controls (see following subsection for another example of inadequate analysis and preventive actions for an injury event). Many reported individual injury and exposure incidents are uncomplicated results of routine work activities; these include bumps, cuts, slips, strains, and ergonomic complications. However, a smaller set of incidents that are more complicated and involve more complex work activities can be affected by work planning and control mechanisms. CARs have not been initiated to track corrective actions for accidents classified as significance level 2 as required by procedure, and in several cases, there was no documentation that corrective and preventive actions were taken. In

addition, investigations did not typically address the core functions of ISM. For example, in the 2003 isocyanate exposure case cited in Appendix C, the investigative report did not address the existence of a preliminary hazards assessment or other document specifying required personal protective equipment or the fact that the latex gloves worn in these events were incorrect personal protective equipment. In the 2002 case cited in Appendix C, the cause was attributed to sensitization, without discussion of the possibility that the reactions were caused by absorption as a result of wearing incorrect personal protective equipment. The adequacy of training, specified controls, and supervision was not addressed when a newly hired summer intern suffered effects of exposure to hazardous chemicals and was not wearing the proper personal protective equipment. (See another example regarding injured craftsmen in the following section on lessons learned.)

Repeated instances were identified where associates did not report injuries or incidents when they occurred as required by FM&T policies, work instructions, the Construction Safety Handbook, and training. These instances have not been identified (acknowledged and reported) as a systemic issue and addressed by FM&T management.

These deficiencies in event, injury, and illness investigation and reporting are additional examples of inadequate issues management, as cited in Finding #10 above.

Lessons Learned

FM&T continues to identify and communicate and implement various lessons learned to site associates from external lessons-learned sources, including DOE list servers, Honeywell corporate, and consumer awareness sources, as well as lessons learned from KCP incidents and activities. For example, FM&T, in coordination with KCSO, held a safety meeting that was well attended and effectively used to communicate management expectations and share lessons learned. FM&T has used informal and formal benchmarking at other industrial and DOE facilities to identify effective processes being used by others for application at KCP, including beryllium programs, electrical safety, and performance metrics. Safety alerts and lessons learned are communicated via the site intranet; emailed to managers, supervisors, and technical staff; posted on bulletin boards and the in-plant television service; or presented at safety meetings and at line safety and ES&H Executive Committee meetings. Many of the published lessons learned and safety alert notices are detailed and often contain photographs that clearly show the event scene and results.

Work instructions for ES&H issues management and accident investigations specify consideration of developing lessons learned from issues and events. The lessons-learned work instruction has been updated to require the use of the CAR form to document and control required actions from lessons learned.

Although some lessons learned are being identified and communicated, weaknesses in the established processes and in the implementation of existing requirements inhibit this program's effectiveness in driving continuous improvement. The lessons-learned process is poorly detailed in the governing FM&T work instruction. Important terms (e.g., safety alerts) are not defined, some required actions are not specified or are not clearly delineated, numerous formatting errors result in confusing instructions, and a color-coded priority scheme in an appendix is not addressed elsewhere in the text. Although the work instruction indicates that the purpose of the lessons-learned program includes sharing good work practices with others, the only criteria for generating internal lessons learned and reviewing external sources relate to a risk categorization of the events or issues, with no reference to good practices. A table of lessons-learned types also only refers to adverse events. No positive lessons learned were reflected on the internal web site at the time of this inspection. The responsibility for reviewing external sources for applicability to KCP is not clearly detailed in the work instruction (i.e., all SMEs are tasked with reviewing any or all sources). There is no formal documentation or tracking of what external lessons are reviewed or their applicability determinations, and documentation of these reviews or any resulting actions consists at best of email. There was little evidence that DOE urgent or "red" lessons learned had been formally reviewed for applicability to KCP. FM&T located email indicating a review of only one of three "red" lessons learned issued in CY 2003. This email indicated that the reported conditions might apply to one of their captive subcontractors and that further evaluation would be done; however, there was no final disposition on applicability or actions.

There are no procedural drivers for work planners or trainers to review and incorporate lessons-learned data into their products. Planners do not typically consider lessons learned during project planning. Many subcontractors do not have ready access to lessons learned and are not on general distribution for most lessons learned. There are no procedural drivers, consistent expectations, or convenient vehicles for

workers to document feedback at the completion of work activities. There is little documentation of any worker feedback on individual tasks, either positive or negative.

The internal web site is not used effectively as a tool for identifying and applying lessons learned. There are no search capabilities for internally generated lessons learned, and the web site posts few lessons learned (about 15 different lessons dating back to September 2002 were posted as of May 2004). There is no archival capability or process for accessing lessons learned postings from the web site once they are removed.

In addition to the structural and process deficiencies identified above, many published lessons learned inadequately identify and communicate essential elements of the lessons to be learned. Many published lessons learned do not address the core functions or guiding principles of ISM (e.g., obvious work planning and control issues are not addressed), and preventive actions are not always comprehensive or appropriate. For example, an October 2003 event involved a millwright being injured when he and another worker observed that an overhead door was not functioning properly and attempted a repair without work planning. The associated lesson learned stated that the workers were "attempting to do the right thing by repairing the door" and the lesson to be learned was that associates need to take a step back to look at the work area, identify potential hazards of the job, and take precautions to protect themselves. A second identified lesson learned was to have a pair of cut-resistant gloves handy to use when performing these types of maintenance activities. This lessons-learned document, including the cited causes, the corrective actions, and the lessons learned, never indicated that KCP work instructions and management expectations are that work should be done under a formal work order addressing the hazards and controls. This document communicated incorrect expectations for worker action when malfunctioning equipment is identified.

In another case, a lesson learned on a battery charger recall that could have broad applicability was only distributed to maintenance managers. In addition, the direct action statements cited in the lesson learned (as posted on the internal web site) were deleted from the version forwarded to maintenance managers by email. In another case, four of six events/lessons learned published for and about the maintenance organization in October and December 2003 reflected that associates who had been injured did not report the event/injury immediately or report to site medical services as required by site work instructions, but reported the incident/injury the next day (in one case three days later) or after seeing a private doctor. Although site ES&H personnel indicated this was a known, recurring issue, it was not identified as a systemic problem or even addressed individually in two of the four cited instances.

With the exception of injuries or ORPS events, few lessons learned are shared interdepartmentally or with the DOE complex. In the last two years, only four lessons learned have been forwarded to the NNSA lessons learned database and the DOE list server.

Finding #11. FM&T has not established and implemented an effective lessons-learned process that consistently and formally identifies potential lessons from internal and external events and activities, evaluates them for applicability, determines needed actions, and applies those lessons to prevent accidents and operational events at KCP.

Employee Concerns Programs

FM&T associates can use any of several methods available to express concerns related to ES&H matters and get responses and resolutions. A program called "Comments Please" administered by the Communications Department provides a confidential telephone number and email address to express comments, questions, or concerns with anonymity if requested. When a response is requested, questions related to ES&H issues are directed to appropriate SMEs for resolution, and responses are posted to an internal web site. The ES&H organization administers an updated ES&H concerns line program with capabilities to call or enter concerns and read all concerns and dispositions directly on the internal web site. Placing the concerns line on the internal web site has greatly increased the visibility of the program and broadened the communication of resolutions to associates. Associates actively use this program to report ES&H concerns and near misses, which are promptly addressed by the ES&H staff. The process is delineated in a work instruction that requires classification and evaluation of concerns in accordance with the ES&H corrective action process.

Although most issues identified via the ES&H concerns line are adequately evaluated and resolved, many issues have not been fully addressed, documented, or managed in accordance with work instruction requirements. Of the approximately 80 concerns reported and closed in the first four months

of CY2004, approximately 15 percent were improperly managed or dispositioned. One was not classified for risk in accordance with the ES&H corrective action instruction, and for three concerns that were classified as category 3 ("major") issues, no CARs or incident investigation reports were initiated to document the resolution as required by instructions. One concern involving a splice around a disconnect switch on a piece of electrical equipment was non-conservatively classified as a minor (level 1) issue and was closed with evaluations and actions pending. In six cases, the disposition was incomplete or the investigation was superficial and inadequate. For example, a concern involving damaged pipe insulation that could contain asbestos was closed by stating that the abatement contractor had been requested to assess the insulation. In another case, involving concerns with air quality and dirty ducting, the "action taken" statement was "This falls under Industrial Hygiene." These deficiencies are further examples of the lack of rigor in the documentation, evaluation, and resolution of ES&H issues cited in Finding #10.

Feedback and Improvement Command Media

In general, the FM&T command media system can adequately serve to delineate processes and procedures to manage programs and activities at KCP. However, as described above, weaknesses in the process descriptions and work instructions for safety issues management, investigations of occupational injuries and illnesses and operational events, and lessons-learned programs have contributed to inconsistencies and deficiencies in program implementation. These deficiencies include an excessive number and complexity of work instructions, non-specific assignment of responsibility and accountability, unclear and missing action steps, and outdated terminology and references. In a limited evaluation of site command media processes to identify systemic causes for the weaknesses identified in feedback and improvement process descriptions and work instructions noted above, the OA team found that the review and approval process for new command media and revisions is very limited; the assigned process owner is responsible for issuing command media, and changes can be issued without further review for technical or administrative elements.

In addition, training requirements for command media are not always completed in a timely manner. The process owner specifies the training requirements for new or revised command media on the transmittal sheet by selecting one of three choices: (1) read only – by associates when used to accomplish an activity, (2) information sharing – informal communication in meetings or briefings, or (3) training required – formal training with assigned course numbers. However, only the formal training results in a documented record of completion of the training. Further, the population that should be trained is not identified. The read only selection, a frequent choice, relies on an associate to take the initiative to research whether a process description or work instruction had been revised before performing an administrative task – an unlikely action for someone performing frequent activities, such as participating in the management of issues or lessons learned. For example, training for the latest revision of the lessons-learned work instruction was designated as "information sharing," but several months after issuance the changes had only been discussed with one group in the ES&H organization. Other instances of overly complex and deficient work instructions are discussed in the issues management and injury and illness investigation and reporting sections of Section D.2.2.

Finding #12. Deficiencies in the command media providing the descriptions and implementation instructions for many feedback and improvement processes adversely affect the implementation and effectiveness of these programs.

ES&H Executive Committee

Monthly ES&H Executive Committee meetings provide an effective forum for communicating information about ES&H processes, initiatives, and performance and for sharing lessons learned. These well attended, interactive meetings involve senior FM&T management, KCSO staff, ES&H professionals, bargaining unit leadership, and subcontractor management.

D.3 Conclusions

KCSO has made some progress in developing formal line management oversight processes since the 2001 OA review. Many aspects of the recently issued and draft processes are adequate to address current weaknesses, if effectively implemented. However, few of these processes have been fully implemented, and most of the deficiencies (insufficient review of contractor implementation of ES&H requirements in the facilities, insufficient KCSO self-assessments, and

inadequate issues management processes) are still evident. In addition, KCSO, based on NNSA guidance, dissolved the FR program, which was not required for a non-nuclear facility but was a mature and generally effective KCSO ES&H line management oversight process, before the new processes were fully implemented. Further, weaknesses in some aspects of the new processes could hinder their effectiveness. Finally, the KCSO *Line Management Oversight Plan* and the numerous new planned or recently issued processes constitute a significant increase in the workload in a number of areas (e.g., the planned self-assessment program call for significantly more self-assessments than have been performed in past years). KCSO has not issued an implementation plan or other document that describes how resources will be applied to accomplish the new and expanded activities.

FM&T has established and implemented many mechanisms that provide feedback on safety performance and conditions in work areas. Implementation of these mechanisms has resulted in improvements in safety at the KCP. The ES&H staff is conscientious and is actively and extensively involved in managing ES&H feedback and improvement processes. An extensive internal quality assurance audit program routinely evaluates ES&H-related management systems, identifies deficient processes and performance, and initiates corrective action. A formal and comprehensive plant condition inspection process routinely identifies housekeeping deficiencies and unsafe working conditions. ES&H issues, including events and injuries/illnesses, are formally evaluated using a graded approach; team evaluations of causes are performed; and corrective and preventive actions are identified, implemented, and tracked to closure. Lessons learned are shared, and preventive actions are taken.

However, the adequacy and effectiveness of these programs in driving continuous improvement and preventing operational events and injuries are adversely impacted by overly complex and deficient process instructions, a lack of rigor and formality in the implementation of these processes, and insufficient line accountability for assuring implementation of ISM and ES&H requirements. Safety performance, including the adequacy and implementation of management systems, is not sufficiently assessed by line management, and ES&H SMEs and assessment activities lack sufficient focus on implementation and observation of work activities in the field. Lessons learned data is not effectively evaluated and applied to prevent similar adverse events and conditions at KCP. The core functions and guiding principles of ISM are often inadequately addressed in the evaluation of safety issues, events, and occupational injuries and illnesses and in the development of corrective and preventive actions. Lack of rigor in compliance with management system requirements adversely affects their effectiveness. The accuracy and completeness of feedback process results are not supported by consistent and rigorous documentation of process actions and corrective/preventive actions. Line management needs to take a more direct role in assuring safety program implementation, and site management needs to increase safety monitoring to ensure that safety management systems are well defined and effectively implemented.

D.4 Rating

Core Function #5 – Feedback and Continuous Improvement ..... NEEDS IMPROVEMENT

D.5 Opportunities for Improvement

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

KCSO

1. **Ensure that draft and recently issued processes are effectively implemented in the areas of assessments, operational awareness, self-assessments, corrective action tracking, and issues management.** Specific actions to consider include:

   - Review draft processes and recently issued processes to address specific concerns identified in Section D.2 of this report.

   - Set priorities and establish milestones for implementation, including evaluating workloads and available resources.

- Hold managers and staff accountable for timely completion of processes and effective implementation of requirements and expectations.

2. **Enhance and formalize KCSO training and qualification programs as they relate to line management oversight.** Specific actions to consider include:

   - Systematically analyze and document training and qualification requirements for personnel who perform line management oversight activities.

   - Document the basis for any differences between the NNSA technical qualification program and KCSO's partial implementation of that program.

   - Train personnel with responsibilities associated with the KCSO *Line Oversight Plan* on plan contents and commitments, and on management performance expectations with regard to implementation.

   - Coordinate with the NNSA Service Center to ensure that evidence of implementation of Federal training and qualification requirements can be readily produced.

3. **Review and enhance processes for documenting the results of operational awareness processes (other than findings).** Specific actions to consider include:

   - Review draft and recently issued processes to ensure that documentation requirements are clearly established and communicated.

   - Strengthen processes to include expectations for observation of work activities.

   - Accelerate and formalize efforts to develop a database that is user friendly, readily available on appropriate desktops, and searchable and retrievable to support trend and root cause analysis.

   - Provide training to personnel on management expectations and use of the database.

4. **Enhance processes for scheduling assessments and managing resources for supporting assessments.** Specific actions to consider include:

   - Incorporate scheduling information (i.e., Gantt charting) that facilitates efforts to determine workloads and better utilize SMEs and other ES&H personnel.

   - Determine and document the minimum set of formal assessments, internal audits, and management assessments required by rules, directives (orders, manuals, policies, and notices), and KCSO process descriptions and work instructions.

   - Ensure that the year-end assessment is conducted as required by the process, *How to Develop the KCSO Annual Assessment Schedule*.

   - Reevaluate and renegotiate, as appropriate, service level agreements with the NNSA Service Center to include periodic efficacy assessments on supported processes.

FM&T

1. **Strengthen assessment processes and performance to better determine the adequacy of implementation.** Specific actions to consider include:

   - Establish requirements and written processes for and conduct planned, scheduled, formal assessments of the adequacy of safety process elements and the implementation of ISM by line management and ES&H process owners and SMEs.

   - Focus Office of Quality Assurance audits and assessments on the observation of work and the adequacy of implementation of management systems. Ensure evaluations are rigorous, and clearly document the adequacy of processes and resulting data.

2. **Strengthen issues management processes and performance to ensure that issues are effectively analyzed, evaluated, and resolved, including evaluation of extent of condition and recurrence controls.** Specific actions to consider include:

   - Review the relationship between Office of Quality Assurance/site corrective action process and instructions and the ES&H work instructions for issues management and make revisions to ensure compatibility and consistent classification of all safety-related issues.

   - Define the process for conducting significance and risk classifications of ES&H issues and provide clear instructions for documenting the results, including level 1 ("minor") issues. Ensure that the names of the person or persons conducting the classification are documented.

   - Ensure that the core functions and guiding principles of ISM are considered as evaluations are conducted for issues and incidents. Consider including linkage to or documentation of pertinent ISM elements on the CAR form to facilitate visibility and support trend analysis.

   - Strengthen accountability for making ORPS reportability determinations by requiring documentation of patrol notification actions and the screening results by facility managers. Formalize and assign responsibility for final decision making on reportability to one individual or management position rather than a group of facility managers.

   - Review and revise existing procedures for reviewing audit reports and performing trending to strengthen the trending function and include review of issues by technical staff. Consider developing a separate work instruction for trend analysis utilizing data from the new database, and include the capture of ES&H findings from external assessments as part of the basic ES&H issues management procedure.

   - Improve the rigor of causal analysis and establishment of preventive actions for CARs and incident investigation reports. Consider establishing a mechanism for conducting mentoring and rigorous independent review of these processes until a high level of performance is achieved.

3. **Strengthen injury and illness investigation and reporting processes to ensure accurate and complete records.** Specific actions to consider include:

   - Ensure that the implementation of the core functions of ISM are addressed for all events, injuries, and illnesses. Include the core functions in the standard question set for the incident investigation report.

   - Establish a more rigorous method of documenting follow-up medical clinic visits and treatment for individuals who have had prior occupational injuries or illnesses, including first-aid-only cases, to provide assurance and evidence that reported categorizations, lost workdays, or work restrictions do not require revision.

   - Establish a formal method of documenting revisions to lost or restricted workdays that includes the signature of the person making the change and the date of the change.

   - Put incident and investigation report and case management forms and related tools under the formal configuration control of the site forms program.

   - To foster better accountability, establish clear requirements and mechanisms for written and/or electronic signatures for team members conducting injury and illness categorizations and incident investigation reports. Assign overall responsibility for the adequacy of categorizations and incident evaluations to team leaders. Consider requiring ES&H management review and approval of incident reports.

4. **Strengthen the lessons-learned process to make it a more effective tool for preventing operational events and occupational injuries and illnesses.** Specific actions to consider include:

- Increase management attention to the lessons-learned program. Clearly establish responsibilities for ownership and management of the program and the adequacy of implementation and published products.

- Review and revise the work instruction for lessons learned to provide clearly defined process steps and correct errors and omissions.

- Establish clear responsibilities for SMEs to conduct reviews of specific lessons-learned sources for applicability to KCP.

- Improve the capabilities and usefulness of the lessons-learned web site, including increasing the number of posted lessons and retention times and providing archival access and search capabilities.

- Establish requirements to document the results of applicability reviews of externally generated lessons learned and the implementation of specified corrective and preventive actions and responses to DOE and Honeywell corporate where required.

5. **Strengthen construction safety processes to formalize inspection and oversight activities.** Specific actions to consider include:

    - Issue work instructions defining the responsibilities and processes for FM&T inspection and oversight of construction subcontractors.

    - Conduct formal assessments of construction subcontractors' safety program elements such as inspection and corrective actions, injury and illness reporting, respiratory protection, and hazard communications.

    - Evaluate administrative functions and process instruction development with regard to adequacy and timeliness.

    - Expedite and continue the transition of formal safety assurance responsibilities to all FM&T subcontractors so that safety professionals can concentrate on monitoring and verifying subcontractor safety programs and performance.

    - Improve documentation of safety warning tickets and citations and ensure that FM&T safety specialists formally review subcontractor responses to citations for adequacy.

6. **Improve the quality of command media for feedback and improvement processes to ensure clear direction and expectations for implementing safety programs.** Specific actions to consider include:

    - Review and consolidate the various work instructions used to delineate the requirements for managing injury and illness investigation and reporting activities and ES&H issues management to simplify these processes.

    - Consider a detailed flowcharting of these processes to facilitate revision of work instructions to provide clear, concise, complete, chronological work steps that are assigned to specifically designated individuals and teams.

    - Provide more detail for training requirements for new and revised command media, including designation of the population that requires training, time limits for completing training, expectations that training will be completed before documents become effective when appropriate, and documentation of the completion of "information sharing" training.

    - Improve the rigor of review and approval of revisions to command media to ensure administrative and technical quality. Consider another level of management review and approval for process and work instruction revisions.

APPENDIX E
MANAGEMENT OF SELECTED FOCUS AREAS

E.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) inspection included an evaluation of the effectiveness of the Kansas City Site Office (KCSO) and Honeywell Federal Manufacturing and Technologies (FM&T) in managing selected focus areas. Based on previous assessment results, OA identified a number of focus areas that warrant increased management attention because of a number of performance problems at several sites. During the planning phase of each inspection, OA selects applicable focus areas for review based on the site mission, activities, and past environment, safety, and health (ES&H) performance.

Focus areas selected for review at the Kansas City Plant (KCP) were:

- **Management of Legacy Hazards.** OA identified management of legacy hazards as a focus area across the complex because a number of sites have a number of legacy hazards that have not been addressed in a timely manner (e.g., unneeded hazardous materials in long-term storage, with no plan for disposition). At KCP, the legacy hazards typically result from past use of hazardous materials, such as beryllium, volatile organic compounds, and polychlorinated biphenyls (PCBs). Some of these materials are present in the soil because of past disposal activities and are being addressed through environmental remediation projects. OA reviewed the effectiveness of the beryllium project and environmental remediation projects, focusing on residual risks, progress on cleanup, and management interfaces.

- **Safety During Excavation and Blind Penetrations Activities.** OA identified safety during excavation and blind penetration activities as a focus area because a number of sites have experienced events and near misses, as evident from site occurrence reports and OA inspection results. Furthermore, OA identified some concerns with excavation and blind penetration permits at KCP during its 2001 review. OA reviewed excavation and blind penetration activities to evaluate whether adequate controls have been established to ensure that these activities can be performed safely.

KCSO, FM&T, and subcontractor personnel were interviewed to determine their understanding of the relevant ES&H program requirements and their responsibilities, as well as the status of ongoing initiatives and corrective actions. The OA team reviewed various documents and records, including project plans and program documents; ES&H procedures; functions, responsibilities, and authorities manuals; ES&H manuals; contract provisions related to safety; subcontract provisions; selected aspects of staffing, training, and qualifications of technical personnel; and various plans and initiatives.

The results of the review of these two focus areas – legacy hazards and excavation/blind penetration safety – are considered in the evaluation of maintenance and environmental protection, reported in Sections C.2.2 and C.2.4, respectively, of this report.

E.2 Results

E.2.1 Management of Legacy Hazards

KCSO and FM&T have proactive and systematic approaches for addressing the legacy hazards that resulted from over 50 years of industrial activities at the KCP complex, before and during DOE ownership. Historical activities have resulted in groundwater contamination from industrial solvents, fuels, and PCBs in the alluvial deposits beneath the plant site. In addition, several facilities within the plant have beryllium contamination from past activities.

KCSO and FM&T and their predecessor organizations have devoted significant management attention to identifying and implementing proactive and systematic approaches to controlling legacy hazards.

As discussed below, these efforts have been effective in characterizing and controlling beryllium exposures, preventing off-plant groundwater impacts, and reducing and monitoring the storm water exceedances for PCBs.

Beryllium legacy hazards at KCP are generally well characterized and documented. The KCP Chronic Beryllium Disease Prevention Program is adequately described in process descriptions and work instructions. Most areas of the plant are well characterized, and more than 20,000 beryllium samples have been analyzed to date. (See Appendix C.2.3 for discussion of the application of the KCP Chronic Beryllium Disease Prevention Program to subcontractors.)

Groundwater contamination is well characterized and has not exceeded regulatory limits off site. Past KCP operations used PCBs, fuels, and solvents under conditions that did not effectively prevent release to the ground in and around the plant facilities. As a result, several locations have been identified as having contaminated groundwater. However, because of the very slow movement of groundwater and the installation of a pump and treat system, FM&T sampling data and analysis indicate that contaminated groundwater has not moved beyond the plant boundaries at concentrations above regulatory limits.

Although groundwater concentrations at the site boundary are within limits, PCB contamination has resulted in exceedances of the KCP storm water National Pollutant Discharge Elimination System (NPDES) discharge limits. The storm water management system for plant roof drains has several lateral pipes that go under the plant buildings to transfer the collected rain water to permitted storm water surface discharge points. Because these aging pipes are no longer watertight, contaminated groundwater can enter the pipes, mix with rainwater, and reach the discharge point at concentrations above the discharge limit.

The National Nuclear Security Administration (NNSA), the DOE Office of Environmental Management (EM), KCSO, and FM&T are well aware of the exceedances, and a number of actions have been taken to reduce NPDES permit exceedances. With EM funding, FM&T installed a liner in the main underground pipe (lateral pipes are not lined) that passes through a PCB-contaminated area and cleaned several roof areas where legacy PCB sealing compounds were used. These actions reduced the PCB concentrations in the storm water discharge from 2.5 parts per billion to an average near 0.13 parts per billion. This action brought the discharges to concentrations below the historically permitted monthly average of 1.0 part per billion.

Subsequently, in November 2002, a more restrictive standard was established, which changed the limit to 0.5 parts per billion based on a weekly sampling event. The changes in the permitted limit and sampling method, along with a reduction in the amount of potable water entering the storm water (see discussion in Appendix C on residual chlorine), have resulted in several subsequent instances where the new limits have been exceeded. In some cases, these exceedances occurred when activities, such as cleanup actions on the roof or inside the storm water piping system, disturbed the PCB-contaminated areas.

Although aggressive action has reduced the PCB levels in the storm water, exceedances still occur and need to be addressed. However, no funding is currently specified for additional mitigation actions. EM had funded several restoration projects and currently funds the pump and treat operation and required regulatory monitoring. However, EM has established a schedule to transition support for these continued activities to NNSA as a long-term stewardship responsibility. In addition, EM has stated that additional funds for mitigating the PCB exceedances are outside the scope of restoration and would not be funded.

NNSA does not concur with EM's position that mitigating the PCB exceedances is a stewardship (i.e., NNSA) responsibility. NNSA has initiated action to establish an office to manage legacy programs such as environmental remediation, but this office will not have funding until fiscal year (FY) 2006. KCSO has sent memoranda to NNSA-10 and EM-3 outlining a strategy for implementing corrective actions to maintain public and regulatory credibility and identifying the need for additional funding for these actions. In addition, KCSO has briefed this issue to senior management in both NNSA and EM.

Currently, legal actions by the Missouri Department of Natural Resources (MDNR) have resulted in two Notices of Violations and discussions between MDNR, the Department of Justice, and NNSA legal staffs on additional enforcement actions, including a proposed Consent Judgment under the Missouri Clean Water Act. These enforcement actions could expose DOE and the contractor to legal action before FY 2006 and may include fines and penalties, as well as adverse public relations.

Finding #13. NNSA Headquarters and EM Headquarters have not resolved responsibility for providing resources to ensure compliance with Missouri Clean Water Act requirements for storm water discharges at the KCP.

Summary. KCSO and FM&T have proactive and systematic approaches for addressing legacy hazards. These efforts have been effective in characterizing and controlling beryllium exposures, preventing off-plant groundwater impacts, and reducing and monitoring the storm water exceedances for PCBs. KCSO has identified actions to address the current storm water exceedances and brought the matter to the attention of EM and NNSA. However, EM and NNSA have not yet determined a path forward or responsibility for funding any additional actions.

E.2.2 Excavations and Blind Penetrations

Before 2001, KCP had established a permit for performing excavations and blind penetrations, but, as identified by OA during its 2001 review, had not established: (1) procedures or instructions on how to fill out the excavation permit; (2) procedures or instructions on how to perform the excavation, which incorporated applicable Occupational Safety and Health Administration (OSHA) requirements; (3) a specific permit for blind penetrations (workers utilize the excavation permit); or (4) specific criteria for penetration or excavation depths requiring permits. Since that time, FM&T has established a work instruction for filling out excavation permits. In addition, FM&T has formulated plans to develop a separate work instruction and permit for blind penetrations. These plans were, in part, a result of a FM&T construction safety benchmarking effort conducted in 2003 at Los Alamos National Laboratory, Idaho National Engineering and Environmental Laboratory, and Sandia National Laboratories and information obtained from Lawrence Livermore National Laboratory.

However, on April 1, 2004, FM&T experienced a significant electrical intrusion event (a buried 13 kV cable was penetrated during soil core drilling evolution). In response to this event, the KCSO Manager directed FM&T to stop work involving underground excavations, and FM&T conducted an investigation to determine the root cause and corrective actions to preclude reoccurrence. The FM&T investigation identified three root causes: (1) no one validated that a scan for buried utilities was performed, (2) the KCP drawings have inherent inaccuracies, and (3) the work order planning procedure and execution were not followed. OA reviewed numerous excavations permits processed in the first quarter of 2004, including the one for the job where the electrical intrusion event occurred, and found several to be incorrectly filled out (e.g., missing signatures, blocks not filled out), indicating that the actions taken to correct weaknesses identified by OA in 2001 were not fully effective.

After reviewing the corrective actions and restart plan, KCSO approved restart of excavations on April 29, 2004. The improvements in the excavation and blind penetration process made in response to the April 2004 electrical intrusion event included the following:

- FM&T clearly documented, in the Construction Safety Handbook, the requirement to obtain permits before performing excavations and blind penetrations.

- FM&T established a separate permit for blind penetrations (with a specific work instruction) that requires a utility scan for all blind penetrations. The new permits have some useful attributes, including a clear expiration date, well designed sections for defining the scope of work to be performed, a useful checklist, and appropriate signoffs.

- The work instruction for excavations was clarified and now requires a utility scan before any excavation is performed.

- FM&T procured a utility scanning device (Hilti PS 20 detector for blind penetrations) and provided training on its use.

- FM&T has designated an organization to perform utility scans for excavations and has provided some limited training to the individuals who perform the scans.

With these improvements, FM&T's current program includes most of the necessary controls to safely perform excavations and blind penetrations and preclude unplanned intrusion into electrical wires or other hazards. In addition, FM&T has an initiative under way to further improve its processes by evaluating alternative equipment and methods for locating underground utilities (including possibly contracting out location services to an expert) and developing a marking

program for underground utilities. However, weaknesses in the current program limit its effectiveness. Specifically:

- The permits do not refer back to the work instruction. Because proper implementation of the permit program was a root cause of the penetration event, it is important that users are made aware of and can readily obtain requirements for processing the permit.

- The permits include a section for identifying hazards but do not include a section for identifying controls (or for referring to other documents that specify the controls).

- KCP-specific instructions/procedures for performing blind penetration and excavation scans have not been developed. Furthermore, guidance provided in the vendor manual for one of the scanners being utilized is very limited and does not include important "rules of thumb" provided by the vendor during a training session. Thus, the effectiveness of the scans relies on the training and experience of the individual who performs the scan.

- Training and experience requirements have not been established for personnel who perform excavation and blind penetration scans. Training provided to KCP personnel has been very limited, consisting of one hour of vendor training on the utility locator for excavations and informal information exchanges on the utility locator for blind penetrations.

- The scanning equipment and process have not been benchmarked to provide assurance that the equipment will locate various buried utilities known to be located at KCP.

- Worker safety requirements for personnel performing utility scans have not been established and incorporated into the procedures for performing scans.

Further, as identified in the 2001 OA review, FM&T has not established a work instruction to ensure that excavations and blind penetrations are performed safely and in accordance with OSHA requirements; existing work instructions address preparing penetration/ excavation permits but not performing the activity. Although contractors perform the higher-risk excavations and are required, per the Construction Safety Handbook, to address OSHA requirements in construction safety plans, FM&T personnel regularly perform blind penetrations and would benefit from a work instruction on this activity.

To evaluate the effectiveness of implementation of the new program, OA reviewed numerous blind penetration permits and the one excavation permit that has been completed under the new program. OA also observed two utility location scans, one for a blind penetration and one for an excavation (which was also evaluated by a KCSO safety professional). In most cases, the permits were completed in accordance with the work instructions. However, some variability was seen in the completion of some sections, indicating a need for further clarification of work instructions. In particular, the hazards sections varied significantly in the permits that OA reviewed, even for very similar work activities. Further, some permits had certain checklist items hand-marked as "not applicable," whereas the work instruction and permit do not provide for this marking.

Concerns were also identified in the performance of scans for utilities. Although, persons performing the scan generally followed the vendor recommendations, some deviations were observed. Specifically, during the utility location scan for a blind penetration (drilling of a hole for installation of a 9-inch-deep anchor), the equipment that was utilized (Hilti PS 20) was not designed to identify utilities deeper than 4 inches. Furthermore, during the scan for an outside excavation for installing road signs, not all the guidance for the Ditch Witch utility locater device was followed, in particular the guidance regarding the appropriate distance from the transmitter device to the receiver device and the appropriate (semicircular) scanning pattern. Additionally, the individual performing the utility scan did not have appropriate protection from vehicles (e.g., high visibility vest or a second person assigned to watch for traffic) when performing part of the scan on the road.

Finding #14. FM&T has not established adequate controls to ensure that excavations and blind penetrations are performed safely.

Summary. KCSO and FM&T made some improvements in processes for performing excavations and blind penetrations following the 2001 OA review but did not adequately address some important aspects of permits and scanning. Following a recent electrical

penetration event, KCSO and FM&T made additional improvements that address most of the process weaknesses and have initiated efforts to further improve utility locating equipment and processes. However, some aspects of the instructions and requirements for completing permits and performing utility scans are not sufficiently documented in procedures or work instructions, and work instructions for performing excavations and blind penetrations have not been developed. Furthermore, OA observed weaknesses in implementing the new processes, in particular in performing utility scanning, indicating that all necessary controls have not been fully established.

E.3 Conclusions

KCSO and FM&T have demonstrated a strong commitment to addressing environmental hazards, as evidenced by the proactive and systematic approaches for addressing legacy hazards. KCSO and FM&T have also proactively brought one remaining issue (responsibility for funding actions to address current storm water PCB exceedences) to the attention of NNSA and EM management for their resolution.

KCSO and FM&T also took some actions to address weaknesses in controls for excavations and blind penetrations identified during the 2001 OA review. However, the actions did not fully address OA's concerns and were not sufficient to preclude an electrical penetration event that occurred on April 1, 2004, and could have resulted in serious injuries or fatalities. This event prompted KCSO and FM&T to take additional actions to enhance safety during excavations and blind penetrations. While significant improvements have been made, further improvements are still needed, particularly in the areas of permits and utility scans.

Continued senior management attention is needed in two areas: (1) NNSA and EM need to determine funding responsibility for further mitigating PCB releases in a timely manner to address the current exceedences of environmental requirements and work with KCSO and FM&T to implement a path forward in a timely manner; and (2) KCSO and FM&T need to ensure that recent enhancements in electrical safety during excavations and blind penetrations are effectively implemented and further improve the processes in some areas. KCSO and FM&T also need to analyze past efforts to establish and implement corrective actions in the area of electrical safety and determine what additional actions (e.g., better root cause analysis, increased oversight) are needed to ensure that corrective actions affecting worker safety are comprehensive and effective.

E.4 Opportunities for Improvement

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

NNSA and EM

1. **DOE Headquarters organizations (NNSA and EM) need to resolve conflicting positions for ensuring environmental compliance at KCP.** Specific actions to consider include:

   - Determine an NNSA/EM strategy for transitioning long-term stewardship at KCP for legacy environmental concerns.

   - Resolve NNSA/EM conflicts in responsibilities for providing timely resources necessary to ensure that KCP can meet Missouri Clean Water Act requirements for storm water discharges.

KCSO

1. **Sustain the increased line management oversight activities in the area of electrical safety, including observation of reviews of excavation and blind penetrations and verification and evaluation of the effectiveness of assessments.**

FM&T

1. **Review and revise the excavation and blind penetration permits and associated work instructions to improve usability.** Consider the following specific actions:

- Include reference to the work instruction for filling out the form on the form itself.

- Add instructions on the purpose of the section for identifying hazards. In particular, identify whether the section should include instructions for controls and how this information is to be captured and integrated with the hazards and precautions section of the MAXIMO work order (or other in-the-field work control documents).

- Revise the utility location permit to specify that all underground utilities in the vicinity of the excavation be marked in accordance with American Public Works Association guidelines, rather than just red marking 13 kV electric utilities.

- Review recently completed permits with users to identify improvement items.

- Evaluate whether defining the permit checklist as a job hazards analysis is appropriate and will not result in confusion with other FM&T hazards analysis processes.

- Revise the Utility Location and Excavation Permit to remove discussion of blind penetrations.

- Provide specific information regarding how utility location results should be documented.

- Improve instructions to specify when "not applicable" is an acceptable answer to some of the job hazards analysis checklist questions.

2. **Develop a work instruction or other guidance document that provides instructions for performing utility scans.** Consider including guidance in the following areas: equipment to be utilized; recommended settings and limitations; scanning methodology (speed, direction, etc.); equipment checks; and safety warnings and controls (e.g., appropriate controls for scanning in roadways).

3. **Develop a work instruction for performing blind penetrations.** Consider including the following recommended practices: using masonry bits for penetrating drywall; using drill stops to limit depth and electrical drill stops to cut power to drill if rebar, pipe, or conduit is hit; restricting drilling in a horizontal line with outlets and a vertical line with switches; and visually inspecting the other side of walls, floors, or ceilings being penetrated.

Abbreviations Used in This Report (Continued)

LLW	Low-Level Waste
LOCAS	Line Oversight and Contractor Assurance Systems
MDNR	Missouri Department of Natural Resources
MSDS	Material Safety Data Sheet
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
OA	Office of Independent Oversight and Performance Assurance
ORPS	Occurrence Reporting and Processing System
OSHA	Occupational Safety and Health Administration
PAHA	Project Activity Hazards Analysis
PCB	Polychlorinated Biphenyl
PEP	Performance Evaluation Plan
PHA	Preliminary Hazards Analysis
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
RJA	Routine Job Assignment
SHINE	Safety and Housekeeping Implementation Needs Everyone
SME	Subject Matter Expert