Volume I

Inspection of Environment, Safety, and Health Management at the

Pantex Plant

November 2002

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

INDEPENDENT OVERSIGHT
INSPECTION OF
ENVIRONMENT, SAFETY, AND HEALTH MANAGEMENT
AT THE
PANTEX PLANT

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Acronyms

AAAHC	Accreditation Association for Ambulatory Health Care
AB	Authorization Basis
ACGIH	American Conference of Governmental Industrial Hygienist
AHA	Activity Hazards Analysis
AL	Albuquerque Operations Office
ALARA	As Low As Reasonably Achievable
ASME	American Society of Mechanical Engineers
BWXT	BWXT Pantex, LLC
CFR	Code of Federal Regulations
CM	Corrective Maintenance
cm	Centimeter
CY	Calendar Year
DMS	Dimethyl Sulfide
DMSO	Dimethyl Sulfoxide
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DPOC	Divisional Point of Contact
EM	DOE Headquarters Office of Environmental Management
EMS	Environmental Management System
ES&H	Environment, Safety, and Health
FADB	Field Activity Data Base
FR	Facility Representative
FRAM	Functions, Responsibilities, and Authorities Manual
FSAR	Final Safety Analysis Report
FY	Fiscal Year
HESF	High Explosives Synthesis Facility
HEVR	High Explosives Violent Reaction
HPFL	High Pressure Fire Loop
H&S	Health and Safety
ISM	Integrated Safety Management
ISO	International Standards Organization
JSHA	Job Safety Hazards Analysis
LO/TO	Lockout/Tagout
M&O	Management and Operating
mrem	Millirem
MSDS	Material Safety Data Sheet
NCR	Non-conformance Report
NDE	Non-destructive Examination
NEOP	Nuclear Explosives Operations Procedure
NNSA	National Nuclear Security Administration
NQA	Nuclear Quality Assurance
OA	Office of Independent Oversight and Performance Assurance
OASO	Office of Amarillo Site Operations
ORPS	Occurrence Reporting and Processing System
OSH	BWXT Office of Safety and Health
OSHA	Occupational Safety and Health Administration
PAAA	Price-Anderson Amendments Act
PAM	Performance Assessment Matrix

Acronyms (continued)

PHA	Process Hazards Analysis
PIF	Process Information Form
PM	Preventive Maintenance
PPE	Personal Protective Equipment
PSM	Process Safety Management
QA	Quality Assurance
rpm	Revolutions Per Minute
RSD	Radiation Safety Department
SBRT	Safety Basis Review Team
SGT	Safeguards Transport
S/RID	Standards/Requirements Identification Document
SST	Safe Secure Trailer
SVE	Soil Vapor Extraction
SWP	Safety Work Permit
TCEQ	Texas Commission on Environmental Quality
TLV	Threshold Limit Value
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
WOD	Waste Operations Department

INDEPENDENT OVERSIGHT INSPECTION OF ENVIRONMENT, SAFETY, AND HEALTH MANAGEMENT AT THE PANTEX PLANT

VOLUME I

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) and emergency management programs at the National Nuclear Security Administration (NNSA) Pantex Plant in October and November 2002. The inspection was performed as a joint effort by the OA Office of Environment, Safety and Health Evaluations and the Office of Emergency Management Oversight. This volume discusses the results of the review of the Pantex Plant ES&H program. The results of the review of the Pantex Plant emergency management program are discussed in Volume II of this report, and the combined results are discussed in a summary report.

The Pantex Plant is located in the Texas Panhandle, approximately 17 miles northeast of Amarillo, Texas. The site encompasses approximately 9,000 acres of U.S. Department of Energy (DOE)-owned property, about 2,000 of which are used to conduct the programmatic operations.

The primary mission of the Pantex Plant is the assembly, disassembly, testing, and evaluation of nuclear weapons in support of the NNSA stockpile stewardship program. The Pantex Plant also performs research and development in conventional high explosives, and serves as an interim storage site for plutonium pits removed from dismantled weapons.

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

The NNSA Office of the Deputy Administrator for Defense Programs is the lead program secretarial office for the Pantex Plant. As such, it has overall Headquarters responsibility for programmatic direction, funding of activities, and ES&H at the site. At the site level, line management responsibility for Pantex operations and safety falls under the Director of the Office of Amarillo Site Operations (OASO). The Pantex Plant is managed and operated by BWXT Pantex, LLC (BWXT), under contract to NNSA.

Throughout the evaluation of ES&H programs, OA reviews the role of NNSA organizations in providing direction to contractors and conducting line management oversight of contractor activities. OA is placing more emphasis on the review of contractor self-assessments and NNSA line management oversight in ensuring effective ES&H programs. In reviewing NNSA line management oversight, OA focused on the effectiveness of NNSA and OASO in managing the Pantex Plant contractor, including such management functions as setting expectations, providing implementation guidance, allocating resources, monitoring

and assessing contractor performance, and monitoring/evaluating contractor self-assessments. Similarly, OA focuses on the effectiveness of the contractor self-assessment programs. DOE orders require that contractors establish self-assessment programs that review all aspects of ES&H performance.

The purpose of the ES&H portion of this inspection was to assess the effectiveness of selected aspects of ES&H management as implemented by BWXT, under the direction of OASO. The ES&H portion of the inspection was organized to evaluate three related aspects of the integrated safety management (ISM) program:

- Implementation of selected guiding principles of ISM by OASO and BWXT
- OASO and BWXT contractor feedback and continuous improvement systems
- Implementation of the core functions of safety management for various work activities at the Pantex Plant.

The OA inspection team used a selective sampling approach to determine the effectiveness of OASO and BWXT in implementing DOE requirements. The approach involved examining selected institutional programs that support the ISM program, such as OASO and BWXT assessment programs. To determine the effectiveness of the institutional programs, the OA team examined implementation of requirements at selected Pantex Plant organizations and facilities. Specific activities reviewed by OA included selected aspects of nuclear explosives operations, high explosives operations, facility maintenance, subcontractor activities (construction and environmental remediation), waste management, and groundwater protection. Selected engineered safety-related systems were also reviewed, including the fire protection systems and containment systems at the Pantex Plant bays and cells, which are used for such nuclear explosives operations as disassembly and maintenance of nuclear weapons.

As discussed throughout this report, many aspects of the Pantex Plant ISM program are effective. Hazards analysis and controls for the highest hazard operations at the Pantex Plant (i.e., nuclear explosives operations) are particularly rigorous and effective. OASO and BWXT line management have made substantial progress in improving ISM at the Pantex Plant in recent years and have a number of ongoing initiatives. However, weaknesses were identified in certain aspects of ISM implementation, including responsibilities for safety of subcontracted activities, BWXT feedback and improvement programs, and certain aspects of hazards analysis and controls. Although OASO and BWXT have addressed some of the identified deficiencies and have plans to address others, continued senior management attention is needed to address subcontractor requirements and monitoring programs and to ensure that the management assessment and corrective action management processes are improved.

Section 2 of this volume provides an overall discussion of the results of the review of the Pantex Plant ES&H programs, including positive aspects and weaknesses. Section 3 provides OA's conclusions regarding the overall effectiveness of OASO and BWXT 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 presents the results of the review of selected guiding principles of ISM. Appendix D presents the results of the review of the OASO and BWXT feedback and continuous improvement processes. The results of the review of the application of the core functions of ISM for the selected Pantex Plant activities are discussed in Appendix E.

2.0 RESULTS

2.1 Positive Attributes

Several positive attributes were identified in the Pantex Plant institutional ISM program. Many aspects of ISM implementation at the facility and activity level were also effective.

OASO senior management has established appropriate priorities and is focusing its limited resources on those priorities. Completion of the safety basis documentation necessary to meet the milestones in the Integrated Weapons Activity Plan is appropriately identified as a high-priority item. To support this goal, the OASO has created a number of safety basis review teams to support and monitor BWXT's efforts to complete authorization basis documents in accordance with established milestones. These teams implement the mechanism for reviewing and approving safety basis documents and are responsible for ensuring that accurate and complete information on the effectiveness of Pantex Plant safety systems is provided to the OASO Director so that informed decisions on the acceptability of residual risks can be made on a timely basis. OASO senior management has analyzed the impacts of this project on other line management oversight activities and has appropriately established priorities and allocated OASO ES&H personnel resources accordingly.

BWXT management has an effective system in place for establishing and implementing roles and responsibilities and assigning organizational and individual accountability for safety performance. A comprehensive policy directive formally assigns roles and responsibilities to each BWXT division. Roles and responsibilities established at the institutional level provide an effective framework for further flowdown and implementation for such functions as planning and work authorization for manufacturing activities. Accountability for safety performance is evident within divisions and is communicated effectively through division-level documents that flow down to lower levels of the organization. BWXT senior management maintains a "Top 25" list of management expectations, including those related to safety, which have been assigned to specific division managers and incorporated into their individual performance expectations. Recently, BWXT initiated its "Goal Deployment" as a process for the flowdown of these "Top 25" performance objectives to all levels of the organization, where they will be tailored and incorporated into individual exempt employee performance expectations to strengthen accountability for safety performance throughout the organization. In addition, safety performance is a major component of individual performance appraisals.

OASO and BWXT safety initiatives are improving the safety of nuclear explosives operations, other nuclear operations, and high explosives activities. The SS21 initiative (a major ongoing effort to reengineer nuclear explosives operations to increase efficiency and enhance safety) has resulted in improved procedures, better tools, and a safer methodology for activities in weapons programs. Workers and supervisors have accepted the SS21 processes and view them as genuine improvements in safety. In addition, the high level of management priority and attention placed on procedure compliance has resulted in a significant reduction in procedure violations. The increased management attention has also resulted in other enhancements in safety processes, such as a more coordinated approach to nuclear explosive movements between buildings, and improved methodologies for implementing procedures for the highest hazard nuclear activities, such as pit repackaging and disassembly, and inspection of nuclear weapons. BWXT has also rigorously implemented Occupational Safety and Health Administration (OSHA) process safety management regulations. In the absence of clear regulatory guidance for developing an authorization basis for non-nuclear facilities, BWXT has effectively used the process safety management principles to establish a safety basis for non-nuclear facilities, and has integrated process safety management requirements with ISM principles. The process safety management requirements are applied to all explosive manufacturing processes and have resulted in a more robust safety and health program for explosives operations, particularly in areas of employee participation, process hazards

analysis, operating procedures, training, compliance audits, change management, and mechanical integrity.

The Pantex Plant radiation safety program is well documented and characterizes radiation hazards effectively. The program is well documented and has effective implementing manuals, which appropriately flowdown DOE requirements (with one exception related to high-radiation areas). For example, the Pantex Plant Radiation Safety Department Workplace Monitoring and Control Manual and the Operations Control Manual are comprehensive and provide a high level of detail regarding radiation safety practices to be followed in support of occupational and environmental radiation protection regulations and DOE orders. BWXT has implemented a rigorous program for characterizing radiation levels and contamination potential of the various nuclear components handled at Pantex and has assimilated a vast amount of radiological characterization data. Radiological information gathered as part of this program is used as a basis for establishing appropriate radiological controls and is included in training and various operator aids for all production technicians working near nuclear components. The radiation program and SS21 process have focused extensively on radiation dose reduction. In this area, the Pantex Plant has had significant success as evidenced by their ability to hold cumulative radiation doses near previous levels during a period where they essentially doubled their radioactive work activities (i.e., throughput of pit repackaging).

In coordination with OASO, BWXT has implemented several effective and aggressive environmental initiatives. The waste management program effectively characterizes the waste streams that will be generated at operational facilities in a manner that facilitates consideration of pollution prevention opportunities. It also ensures effective waste management because each waste stream is identified, and specific containers are provided for each type of waste. In addition, the weapons programs and high explosives operations have included waste management provisions into operating procedures. Overall, waste management is an integral part of the Pantex Plant mission and operations. OASO and BWXT have also been aggressive in addressing legacy environmental concerns. They have implemented two groundwater interim remediation actions, and significantly reduced legacy wastes. BWXT has also initiated actions to enhance the Pantex Plant environmental management system in anticipation of the new DOE order for environmental protection, which will establish a requirement for a systematic approach to environmental management.

The BWXT occupational medical program has achieved reaccreditation. The Pantex occupational medical program successfully upheld their ambulatory health care certification following a site visit by the Accreditation Association for Ambulatory Health Care (AAAHC) in May 2002. The accreditation program promotes feedback and quality improvement principles through the successful application of nationally recognized standards and criteria. Originally accredited in 1998, BWXT is the second DOE contractor medical program to renew their national certification. The AAAHC surveyor recognized the BWXT medical staff for excellence in record keeping, overall documentation of medical program delivery, and medical intervention activities. Several written procedures, patient handouts, clinical forms, and statistical documents were identified as innovative and particularly thorough and clear.

2.2 Program Weaknesses

Although the framework for the Pantex Plant ISM program is sound, weaknesses were identified in certain aspects of requirements implementation for some types of work activities. In addition, certain aspects of OASO and BWXT feedback and improvement systems need additional improvement.

ES&H requirements established in the DOE/BWXT contract have not been fully conveyed to or implemented by BWXT subcontractors. While safety performance indicators demonstrate improvements in the safety performance of BWXT employees over the past two years, the indicators for

subcontractor employees have not shown significant improvement. In accordance with the DOE/BWXT contract, BWXT is responsible for compliance with the contractual ES&H requirements, regardless of whether the work is performed by BWXT employees or by BWXT subcontractors. However, the ES&H provisions in contracts awarded by BWXT have not always been sufficiently specific to communicate expectations. Some DOE ES&H requirements are not clearly imposed through subcontracts to BWXT or consistently included in safe work permits or other ES&H documents. Areas where DOE ES&H requirements were not addressed include exposure limits, medical programs, and operating procedures. In some cases, subcontractors and BWXT employees could be working in the same facilities, performing similar work activities, and encountering the same hazards, but be subject to different requirements, providing different levels of protection. In addition, training requirements were not documented or implemented in some cases. Further, BWXT monitoring of subcontractors has not always been effective in ensuring that ES&H requirements are incorporated in procedures and implemented by subcontractors. The roles and responsibilities for the safety engineers who are responsible for monitoring subcontractors are not well defined, and the engineers were not aware of the requirement to assure compliance with the ES&H requirements specified in the contract. OASO has not focused on subcontractor performance, and the BWXT contractual performance metric, approved by OASO, for reducing injury and illness rates at the Pantex Plant accounts for BWXT employees only and does not include subcontractor employees. Similar weaknesses in this area were identified through previous BWXT self-assessments, but were not fully and effectively addressed.

BWXT management assessment and issue management processes and their implementation do not ensure that deficiencies in ES&H and emergency management programs are identified, documented, evaluated, and resolved and that recurrence controls are implemented in a consistently appropriate and timely fashion. BWXT has implemented many mechanisms to provide feedback and improvement in safety performance at the Pantex Plant. However, there are continuing process and implementation weaknesses in the BWXT management assessment and issue management processes that have hindered the effectiveness of these mechanisms in driving consistent, continuous improvement, especially in reporting and managing the evaluation and resolution of safety deficiencies. Management assessment programs are not always scheduled and performed as required, and assessment results are not always entered into deficiency tracking systems. ES&H incidents and deficiencies were not properly documented and investigated in some cases; adverse trends and repetitive incidents were not always analyzed; the extent of condition and causes were not always assessed; recurrence controls were not always properly established; and implementation of actions was not always timely and effective. Further, corrective actions for significant, systemic issues have not always been effectively coordinated, with established milestones, clear acceptance criteria, and timely monitoring to verify completion and effectiveness of the corrective action.

Pantex Plant line management has not ensured that all potential high-radiation areas are properly identified, designated, and controlled, in accordance with site and DOE requirements. The controls for nuclear explosives and pit repackaging procedures were not sufficiently defined or implemented to ensure that DOE-defined high-radiation areas (i.e., areas where the dose could exceed 100 millirem in one hour at 30 centimeters) are properly identified and controlled. Nuclear explosives operations and pit repackaging efforts routinely expose sources of radiation with dose rates greater than 100 millirem per hour at 30 centimeters. Because of the potential for a higher dose, DOE requires that areas with high-radiation fields be designated as high-radiation areas and that more rigorous controls be implemented. Although unlikely to occur with current practices, there are currently no positive procedural restrictions (e.g., time limits/logging) or other controls that would ensure that the radiation source is not exposed long enough for an individual to receive a dose of 100 millirem in a one-hour period.

3.0 CONCLUSIONS

OASO. Within the current operational alignment, OASO roles, responsibilities, and authorities are clearly assigned, understood, and implemented. OASO line management is overseeing site operations effectively and using contract mechanisms effectively to achieve accountability for ES&H performance. OASO has determined that they are understaffed in some ES&H areas and have scaled back some operational awareness activities while OASO ES&H staff focus on the high-priority authorization basis efforts. However, OASO appropriately uses and prioritizes existing resources to implement ES&H responsibilities.

NNSA and OASO are implementing the NNSA reengineering initiative, which is designed to increase responsibility at the site offices. NNSA also plans to increase its reliance on the operating contractor's self-assessment program to evaluate ES&H performance. As a result, some of the current OASO line management oversight processes will be reevaluated and possibly modified or eliminated. OASO ES&H staffing levels need to be periodically reevaluated as the NNSA reengineering effort evolves.

BWXT. BWXT senior management are actively involved in ES&H and are implementing important safety functions. With few exceptions, roles and responsibilities for ES&H are defined and understood. A strong working relationship with environmental regulators has been established, and the regulators understand that current management is committed to proactively addressing legacy problems.

Since the transition to BWXT in 2000, there have been significant improvements in ES&H programs, and BWXT has implemented a number of key initiatives to improve ES&H at the Pantex Plant. Safety professionals have been better integrated into work activities. BWXT has made progress in developing and approving authorization basis documents for nuclear facilities and operations. Significant management priority and attention has been given to improving hazard controls for nuclear explosives and other nuclear operations and associated maintenance activities. Preventive maintenance procedures have improved significantly in response to OASO observations.

These initiatives have contributed to improvements in ES&H programs, particularly in the areas of greatest potential hazards (i.e., nuclear explosives operation), and the improvements are evident in the performance indicators. There have been significant reductions in workplace injuries and illnesses among BWXT employees. Performance indicators for nuclear explosives operations procedures and procedural adherence, and observations during this inspection, indicate a marked improvement. The positive trend in recordable and lost time case rates is partly attributable to the implementation of the behavior-based safety program. The doses for pit repackaging have been reduced significantly, as evidenced by a twofold increase in the total pit repackaging throughput without a corresponding increase in worker dose.

Enhancements are needed in some aspects of BWXT feedback and improvement systems. BWXT has established and implemented processes for feedback and continuous improvement. Some of these processes, such as the BWXT independent assessment process, are working well, and senior management actively seeks and utilizes performance information for improvement. Several new processes to facilitate improvement have been established, including a behavior-based safety program. However, some required management assessments are not being performed and the implementation of issues management processes needs further improvement. Improvements in BWXT feedback and improvement processes are particularly important in light of the NNSA reengineering effort and the associated increased reliance on contractor self-assessments.

Also, BWXT processes do not ensure that applicable ES&H requirements are clearly communicated to subcontractors in contracts or other ES&H documents. Hazard controls for subcontracted work were different than those for work performed by BWXT employees. OASO and BWXT monitoring of

subcontractors has not been sufficient to ensure that ES&H objectives are met in some areas, such as training. The injury and illness rates for subcontractor employees have remained relatively constant over the past few years, while BWXT injury and illness rates have improved considerably. OASO and BWXT management involvement will be needed to determine an appropriate set of corrective actions for tailoring and conveying requirements to subcontractors and ensuring effective implementation of those requirements.

Pantex Plant Work Activities. Nuclear explosives operations, sealed insert operations, high explosives operations, maintenance, waste management, subcontracted work, and groundwater protection activities observed by the OA team were implemented safely and in accordance with ES&H requirements, with few exceptions. Processes for defining the scope of work for these activities are defined and effectively implemented. Except for some aspects of subcontracted work, the processes for identifying and analyzing hazards are well established and documented. Most hazards associated with observed work were adequately identified, analyzed, and/or documented. In most respects, the authorization basis for nuclear operations provides appropriate analysis for the hazards and engineered systems that were evaluated (i.e., confinement and fire protection).

Although most aspects of ISM at the Pantex Plant are effective and the institutional processes are well designed, a few aspects of implementation need additional improvement. For example, sufficient procedural controls designed to ensure that high-radiation areas are properly identified and controlled for nuclear explosives and sealed insert operations were not in place. Also, some hazards associated with high explosives operations were not sufficiently analyzed and/or documented.

Summary. Many aspects of the Pantex Plant ISM program are effective. Hazards analysis and controls for the highest hazard operations at the Pantex Plant (i.e., nuclear explosives operations) are particularly rigorous and effective. OASO and BWXT line management have substantially improved ISM at the Pantex Plant in recent years and continue to make improvements. The OASO Manager has effectively prioritized resources and is ensuring that an effective oversight program is implemented. OA observations indicate that work is being conducted safely, with few deficiencies.

However, weaknesses were identified in certain aspects of ISM implementation, including processes for ensuring subcontractor flowdown and implementation of requirements, BWXT management assessment and corrective action processes, and controls for high-radiation areas. Although OASO and BWXT have addressed some of the identified deficiencies and have plans to address others, continued senior management attention is needed to address subcontractor requirements and monitoring programs and to ensure that BWXT management assessment and issues management processes improve.

4.0 RATINGS

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

Safety Management System Ratings

Guiding Principle #2 – Clear Roles and Responsibilities ..... EFFECTIVE PERFORMANCE
Guiding Principle #5 – Identification of Standards and Requirements ..... EFFECTIVE PERFORMANCE

Feedback and Improvement

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

Pantex Plant Implementation of Core Functions for Selected Work Activities

Core Function #1 – Define the Scope of Work ..... EFFECTIVE PERFORMA NCE
Core Function #2 – Analyze the Hazards ..... EFFECTIVE PERFORMANCE
Core Function #3 – Develop and Implement Hazard Controls ..... EFFECTIVE PERFORMANCE
Core Function #4 – Perform Work Within Controls ..... EFFECTIVE PERFORMANCE

APPENDIX A

Supplemental Information

A.1 Dates of Review

Scoping Visit	August 27-29, 2002
Onsite Inspection Visit	October 28 – November 7, 2002
Report Validation and Closeout	November 19-21, 2002

A.2 Review Team Composition

A.2.1 Management

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

A.2.2 Quality Review Board

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

A.2.3 Review Team

Thomas Staker, Deputy Director, Office of Environment, Safety and Health Evaluations (Team Leader)

Safety Management Systems
Ali Ghovanlou (Topic Lead)
Al Gibson
Bernie Kokenge
Bob Compton (Feedback and Improvement)

Technical Team
Robert Freeman (Topic Lead)
Victor Crawford
Mark Good
Bo Kim (Oakland Operations Office)
Jim Lockridge
Don Prevatte
Edward Stafford
Mario Vigliani
Thomas Watson

A.2.4 Administrative Support

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 PAGES
1. BWXT has not established sufficient measures to ensure that ES&H requirements in its contract with DOE are appropriately tailored and communicated to subcontractors and fully and effectively implemented by subcontractors.	22
2. BWXT management assessment and issue management processes and their implementation do not ensure that deficiencies in ES&H and emergency management programs are identified, documented, evaluated, and resolved and that recurrence controls are implemented in a consistently appropriate and timely fashion.	33
3. NNSA and BWXT have not ensured that all potential high-radiation areas are properly identified, designated, and controlled, in accordance with site and DOE requirements.	53

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APPENDIX C

Guiding Principles of Safety Management Implementation

C.1 INTRODUCTION

The Office of Independent Oversight and Performance Assurance (OA) evaluation of safety management systems focused on selected guiding principles of integrated safety management (ISM) as applied at the Pantex Plant. OA examined Guiding Principle #2 (Clear Roles and Responsibilities) and Guiding Principle #5 (Identification of Standards and Requirements).

The OA team reviewed various documents and records, including the Pantex ISM system description; associated procedures; Functions, Responsibilities, and Authorities Manuals (FRAMs); standards/requirements identification documents (S/RIDs); and various Pantex plans and initiatives. In the evaluation of the guiding principles, OA considered the results of the OA review of the core functions. National Nuclear Security Administration (NNSA), Office of Amarillo Site Operations (OASO), BWXT Pantex, LLC (BWXT), and subcontractor personnel were interviewed to determine their understanding of the ISM program and their responsibilities, as well as the status of ongoing initiatives and corrective actions. OA observed work activities to confirm the effectiveness of implementing roles and responsibilities. The review of requirements management processes focused primarily on the Pantex Plant S/RIDs and the flowdown of requirements to the working level.

C.2 RESULTS

C.2.1 Clear Roles and Responsibilities

Guiding Principle #2: Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the Department and its contractors.

NNSA Headquarters Roles and Responsibilities

Within NNSA, the current roles and responsibilities for safety management, program execution, and funding authority for OASO and Pantex Plant activities are understood. The Deputy Administrator for Defense Programs provides programmatic direction to OASO and is responsible for Pantex Plant activities. The environment, safety, and health (ES&H) organization, within the NNSA Associate Administrator for Facility and Operations organization, provides technical support to line managers on ES&H issues.

NNSA is in the process of implementing strategies developed in the past year as part of its reengineering process. These strategies were developed after significant deliberation and have the potential to streamline management communication and accountability. A major aspect of NNSA's strategy is an increase in the level of empowerment and responsibilities of OASO and other NNSA site offices. As part of these changes, OASO will soon report directly to NNSA rather than to the Albuquerque Operations Office (AL); and AL, in coordination with other NNSA operations offices, is being reorganized to function as a support center for the site offices. The NNSA reengineering effort will result in organizational and strategic changes that will significantly impact the assignment and implementation of NNSA individual and organizational roles and responsibilities. Continued management attention is needed to ensure that the revised roles are effectively communicated and understood and that applicable

directives, the FRAM, and program documents are revised to reflect the revised organization and approaches.

OASO Roles and Responsibilities

The OASO Director has been actively involved in the NNSA reengineering process and has been proactive in positioning OASO to implement the anticipated organizational and strategic changes associated with the NNSA reengineering effort. As a result, some of the changes have already been put in place. However, significant work remains to fully implement the changes within OASO and coordinate the interfaces with NNSA support centers.

Within OASO, current roles and responsibilities are well established and understood in most cases. The flowdown of roles and responsibilities from NNSA and AL to the OASO senior managers (i.e., the OASO Director, Deputy Director, and Associate Directors) is well defined and adequately described in many documents. For example, the recently published ISM description document establishes an appropriate connection between ISM core functions and OASO procedures, including a clear definition and assignment of organizational roles and responsibilities. In addition, responsibilities for specific work assignments for each fiscal year (FY) flow from NNSA and AL to OASO through an appropriate set of strategic and operational plans (e.g., the NNSA Strategic Plan, the AL FY 2002 Performance Plan, and the OASO FY 2002 Operational Plan). With few exceptions, roles and responsibilities of lower-level OASO organizations and individual positions (e.g., Facility Representatives [FRs] and health and safety [H&S] staff) have been adequately defined, documented, and understood.

OASO has appropriate mechanisms (e.g., position descriptions and annual appraisals) for communicating expectations to the staff and for holding the staff accountable for their performance. These processes are functioning adequately for most OASO personnel, although the processes are more effective for the OASO technical positions that were converted to the Excepted Service positions during FY 2002. As part of that conversion, OASO established and documented clear management expectations for developing comprehensive annual appraisal standards and developed meaningful standards for Associate Directors, second-level managers, team leaders, and many technical staff positions. For example, the annual appraisal standards for Associate Directors are comprehensive and incorporate a number of important mission and ES&H elements, including the OASO Director's "Top Ten" focus areas (which include ES&H elements) as described in the FY 2002 Operating Plan. A few OASO positions have not been converted to Excepted Service positions. For these positions, OASO continues to use a "360" performance appraisal process that does not clearly flowdown expectations from managers to subordinates.

OASA has adequate processes for holding BWXT accountable for its ES&H performance and has used those processes effectively to drive improvements. OASO holds BWXT accountable for ES&H performance through a number of mechanisms, including a formal process involving development of a Performance Evaluation Management Process report and preparation of a detailed Performance Evaluation Report, which formally documents the contractor's performance against OASO expectations. The FY 2002 evaluation was based on a large number of performance expectations. The performance evaluation planning process for FY 2003 is being significantly revised to focus on the "critical few" performance expectations (i.e., the BWXT Business Health Indicators) and to reduce administrative burdens on NNSA contractors. In addition, OASO senior management intends to continue to hold monthly feedback meetings to improve communications between OASO and BWXT.

OASO senior management has established priorities and has focused resources on those priorities. Execution of Directed Stockpile Work (encompassing quality assurance of nuclear weapons, nuclear weapon system production, and related operations) is one of the most crucial aspects of the OASO

mission. The roles and responsibilities for this program are well defined and effectively implemented. For example, the OASO Weapons Quality Assurance program is a rigorous program that has received considerable OASO senior management attention and leadership, which has resulted in a number of improvements (e.g., clarifying and streamlining the responsibilities and interfaces between the Federal staff and the contractor for such activities as weapons certification). Another effort receiving considerable attention within OASO is the DOE response to Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2002-2, which called for a Federal Technical Capability Panel to identify system expertise needed at the Federal level and to survey the availability and sufficiency of personnel. OASO is currently supporting NNSA in the development of an implementation plan that will improve design agencies' (i.e., NNSA weapons design national laboratories) interactions with the Pantex Plant, which is responsible for meeting the milestones for preparing authorization basis documents in accordance with the 10 CFR 830 rule.

OASO has made completion of the safety basis documents a high priority. To meet the milestones in the Integrated Weapons Activity Plan, BWXT needs to satisfy the 10 CFR 830 requirements for developing and approving a number of safety basis documents by April 2003. To support this goal, the OASO safety basis staff within the Associate Director for Nuclear Engineering organization has created a number of safety basis review teams (SBRTs) to support and monitor the BWXT process. These teams implement the mechanism for reviewing and approving safety basis documents and are responsible for ensuring that accurate and complete information on the effectiveness of Pantex Plant safety systems is provided to the OASO Director so that informed decisions on the acceptability of residual risks can be made. Because of the importance of this effort to the Pantex Plant mission and the long-term safety of the Pantex Plant, OASO has decided to devote significant resources to ensuring the timely and effective completion and review of the required safety basis documents. OASO FRs, H&S staff, and system engineers have been assigned to support the OASO authorization basis specialists as members of SBRTs.

Because of the allocation of staff resources to safety basis support and review efforts, certain ES&H line management oversight activities have been scaled back. For example, the systems engineering team has scaled back certain line management oversight activities (e.g., periodic evaluations of the vital safety systems) until the safety basis activities are complete (April 2003). Similarly, several FRs and H&S staff have been assigned to the SBRTs and thus OASO is not able to perform the historical level of operational awareness activities and program assessments (see Appendix D). Although some of the efforts associated with SBRTs will be completed in the next year, other efforts (e.g., validation and implementation of authorization basis documents, associated technical surveillance requirements, and implementing procedures) will necessitate a longer-term effort by OASO staff.

The temporary scaling back of OASO line management oversight activities in certain areas to focus on the support for and review of safety basis documents is a senior management decision that appropriately reflects current priorities and available OASO resources. Further, the allocation of personnel resources to safety basis documents efforts is designed to lead to long-term improvements in safety, because the FRs and H&S staff have significant expertise with nuclear facility operations and thus are best qualified to provide useful insights and constructive reviews of the safety basis documents.

However, shortages in OASO staffing are exacerbating the impact of this shift in priorities on line operational awareness activities and assessments. In its most recent analysis (September 2002), OASO determined that they needed 7.7 additional full-time equivalents to ensure effective oversight of the 67 safety-related systems at the Pantex Plant. OASO's determination is based on the results of the DOE response to DNFSB Recommendation 2000-2. Although staff shortages are a potential concern, OA's review indicates that OASO is performing its roles and responsibilities adequately in most cases, and that OASO senior management has a good understanding of ES&H priorities and needs. Nevertheless, the adequacy of staffing levels needs continued management attention as the NNSA reengineering efforts

evolve and the expected workloads and resources are better defined (considering efforts to streamline management functions and levels of technical support from NNSA service centers).

Although OASO roles and responsibilities for line management oversight of subcontractor activities are well defined in most respects, they are not sufficiently defined, communicated, and implemented. The OASO site support staff is responsible for overseeing construction and environmental restoration operations performed at the Pantex Plant, many of which are performed by subcontractors to BWXT. The site support staff focus primarily on project scope, schedule, and cost, and perform only limited reviews of ES&H performance. As discussed under Guiding Principle #5 and in Appendix E, a number of deficiencies and weaknesses have been observed in relation to the subcontractors' ES&H performance and the flowdown of requirements to subcontractors (see Finding #1).

OASO is taking action to ensure that BWXT enhances its employee concerns program. Specifically, OASO identified weaknesses in the BWXT employee concerns program in the May 2002 mid-term performance assessment, which led to management changes and several improvements in the program (e.g., preparation of a procedure, and advertisement of the program). However, this OA inspection revealed some additional weaknesses in resolution of employee concerns (see Appendix D). Although a formal assessment of the effectiveness of the BWXT employee concerns program is not scheduled for FY 2003, the OASO program manager indicated that they plan to perform one after allowing time for the contractor to make and implement further improvements.

BWXT Roles and Responsibilities

Institutional Roles and Responsibilities. BWXT senior management at the Pantex Plant plays an active role in safety, is engaged in implementing important safety functions, and has established effective mechanisms for communicating the status of safety performance to corporate BWXT. The BWXT Pantex Plant General Manager is actively involved in various safety initiatives. For example, for the past year, he served as chairman of a panel on the contribution of operating experience to ISM. Monthly reports summarizing key safety performance indicators are provided to BWXT for comparative analysis and corporate review. In support of performing the DOE/BWXT contract, BWXT established a Board of Managers, comprised of senior BWXT and Honeywell corporate managers and the Pantex Plant General Manager, to regularly monitor Pantex Plant activities, including safety performance. Upon assuming the management and operating (M&O) contract for the Pantex Plant, BWXT determined that the number of safety incidents and injuries was relatively high when compared to other DOE sites. This prompted the Board to introduce the behavior-based safety program at the Pantex Plant, along with other safety initiatives. These efforts have contributed to the improving safety record, as measured by injury rates and other performance indicators. Although the Board regularly reviews and provides corporate oversight of Pantex Plant safety, their specific role has not been formalized in a Board resolution or other similar document.

With the support of OSAO, BWXT has continued to provide management support to the Pantex Plant occupational medical program. This program successfully upheld their ambulatory health care certification following a site visit by the Accreditation Association for Ambulatory Health Care (AAAHC) in May 2002. The accreditation program promotes feedback and quality improvement principles through the successful application of nationally recognized standards and criteria. Originally accredited in 1998, BWXT is the second DOE contractor medical program to renew their national certification. The AAAHC surveyor recognized the BWXT medical staff for excellence in record keeping, overall documentation of medical program delivery, and medical intervention activities. Several written procedures, patient handouts, clinical forms, and statistical documents were identified as innovative and particularly thorough and clear.

OASO and BWXT have established systems to flowdown roles and responsibilities from the DOE/BWTX contract through the S/RID to a policy directive (DIR-0001, *Roles and Responsibilities for the Management and Operation of Pantex Plant*), which clearly assigns key safety roles and responsibilities to each of the BWXT divisions. Flowdown of roles and responsibilities within divisions has been accomplished through different mechanisms (e.g., manuals) by each division; in all instances, the roles and responsibilities for safety are clearly defined, well documented, and consistent with the current BWXT organization. The defined roles and responsibilities address important safety functions, including ES&H line management oversight, ES&H support of weapons manufacturing operations, development of authorization basis documentation, and nuclear explosives safety studies.

Although mechanisms are in place for defining roles and responsibilities, the OA team identified some errors in lower-tier documents. For example, a Manufacturing Division manual (MNL-00078) incorrectly references a standard (STD-7401) that had been replaced (by IOP-729). In addition, outdated or incorrect versions of flowdown documents were still in use. For example, incorrect versions of important documents (e.g., STD-2537, *Performance Appraisal*, and STD-5011, *Nuclear Facility Transfer*) were being used by the Human Resources and Infrastructure divisions. BWXT corrected most of these errors during this inspection.

Roles and responsibilities for safety have been assigned at the institutional level and are implemented effectively in most cases. However, some weaknesses were found in the implementation of responsibilities for assessments and issues management (see Appendix D).

Work Authorization Roles and Responsibilities. Institutional roles and responsibilities provide the flowdown framework for planning and authorizing manufacturing activities. They have been clearly documented and effectively implemented, and are understood by managers and workers. For example, an operating procedure (IOP-729, *Functions of the Directed Stockpile Workload Program Management Division*) defines the role of the Weapons Program Manager in leading multidisciplinary weapons project teams. These multidisciplinary teams are an effective mechanism for integrating safety into the planning of weapons manufacturing activities. In addition, BWXT has mechanisms for documenting the roles and responsibilities for authorizing and implementing facility and manufacturing operations. For example, various manuals clearly define the role of the Manufacturing Section Manager, FR, and production technicians in authorizing facility and manufacturing activities, and establish the roles and responsibilities for preparing hazards analysis documents and operating procedures. Although manuals clearly assign the roles and responsibilities to individual departments within the Engineering Division, the flowdown of the more detailed roles and responsibilities into subordinate department manual sections had not been completed.

Mechanisms are in place to obtain worker involvement in identifying hazards and controls prior to authorizing work. Weapons project teams are used to obtain worker input in developing procedures and tooling used for weapons operations. Production technicians provide input into hazard identification and control processes and work planning through direct interaction with process engineers.

The roles, responsibilities, and authority for stopping work are clearly documented and communicated. Interviews with production technicians and engineering technicians confirmed that they understood their stop-work authority, and exercised that authority without retribution from management.

Observation of activities, inspection of daily logs, and interviews with supervisors and workers confirmed that documented safety-related roles and responsibilities were properly implemented for W-87 manufacturing activities. The production technicians performed the shift pre-operational checklist to confirm readiness to proceed; they properly interfaced with the FR to confirm operations readiness; the facility mode (operational versus maintenance) was communicated properly; the Facility Status Board

was used effectively to track the status of safety systems; and the Manufacturing Shift Manager authorized commencement of shift operations.

BWXT has made significant improvements in the quality and clarity of Pantex Plant administrative documents since taking over as the M&O contractor in 2001. This improvement has been accomplished through a series of evolutionary initiatives that have been directed toward streamlining and improving overall document quality and clearly defining the functions, roles, responsibilities, and authorities for safely managing activities at the Pantex Plant. BWXT senior management expects to have all of its administrative documents converted to a consistent format and in electronic form by the end of calendar year 2003 and all of its work instruction procedures similarly converted within the next two years.

Accountability. BWXT recognizes the importance of accountability for safety, and further emphasizes accountability for safety performance for both exempt and non-exempt employees through division flowdown documents. These documents are effective mechanisms for the flowdown of accountability to all levels of the organization. Accountability for safety is further emphasized through the individual performance appraisal process, which specifically includes an evaluation of safety performance that considers factors such as ISM, participation in safety improvement initiatives, and the removal of barriers to safe work behavior. BWXT Standard 2537, *Performance Appraisal*, requires weapons program managers to provide input to performance expectations and performance appraisals of weapons project team members as a means for holding individuals accountable for overall performance, including safety performance. However, the W-87 Program Manager had not made such input to the performance appraisal process. Although BWXT has good systems for holding individuals accountable and there are a number of instances where actions have been taken to hold individuals accountable, these systems have not ensured that all BWXT organizations complete their management assessments as required (see Appendix D).

BWXT Pantex senior management maintains a "Top 25" list of management expectations, including expectations related to safety. For example, the 2003 "Top 25" list contains an objective to improve all safety indicators by 50 percent from the 2001 baseline. These "Top 25" performance objectives are assigned to specific division managers using an assignment matrix and have been incorporated into their individual performance expectations. Beginning with the 2003 performance year, these "Top 25" performance objectives will flow down to all levels of the organization and be tailored and incorporated into exempt employee performance expectations. This goal deployment initiative is designed to further strengthen accountability for safety performance and will be documented in the applicable Pantex Plant standard (STD-2537).

Subcontractor Roles and Responsibilities. Subcontractors are used for certain activities at Pantex, primarily in the areas of environmental restoration and construction. Subcontractors represent a small fraction of the Pantex Plant workforce (typically 50 to 100 subcontractors out of a Pantex Plant workforce of several thousand).

The roles and responsibilities for positions involving safety oversight of subcontractors have not been sufficiently defined, contributing to continued weaknesses in subcontractor performance (see Appendix E). A BWXT quality assurance team reviewed incident reports in April 2001 to identify deficiencies and potential enhancements. That team concluded that "roles and responsibilities for oversight of subcontractor and non-BWXT work are not adequate." In November 2001, a subsequent assessment (a "Black Belt" Team Assessment of the Subcontract Technical Representative Program) identified the need to better define the roles and responsibilities of the subcontract technical representative, who has important subcontractor safety oversight responsibilities. However, the roles and responsibilities for this function have not yet been updated. In addition, some BWXT procedures and manuals do not adequately define subcontract technical representative roles and responsibilities. The

roles and responsibilities for construction safety inspectors and construction safety engineers/subject matter experts have not been revised, and existing documents do not clearly define these functions relative to monitoring subcontractor safety performance.

The BWXT Construction Manager has been assigned the responsibility to clearly define the roles and responsibilities of the subcontract technical representative by January 31, 2003. As a result of discussions during this OA inspection, the roles and responsibilities of the other two positions will also be revised and/or defined. Recent incidents with subcontractors involving excavation (see Appendix D) and the lack of clearly defined responsibilities for labeling chemical tanks at the Pump and Treat Facility (see Appendix E) emphasize the need for management to focus attention on clearly defining and implementing the roles and responsibilities for these positions (see Finding #1 under Guiding Principle #5).

Summary of Guiding Principle #2

Current OASO roles and responsibilities are well established. With the exception of certain aspects of roles and responsibilities for line management oversight of subcontractors, OASO roles and responsibilities are well understood and effectively implemented. Recent OASO efforts associated with the conversion to Excepted Service positions has clarified expectations and strengthened individual accountability. For the most part, OASO has effectively implemented its ES&H responsibilities and judiciously used its staff to focus on management priorities, considering near-term and long-term mission and ES&H priorities. However, the focus on higher priorities has resulted in the scaling back of certain ES&H operational awareness activities and assessments. Although continued attention is needed to address OASO staffing shortages and line management oversight of subcontractors, OASO management has effectively used its available resources to implement its ES&H line management oversight responsibilities.

With a few exceptions, BWXT Pantex has clearly defined institutional roles, responsibilities, and authorities and has effectively used them as a framework for communicating and implementing roles and responsibilities related to the authorization of manufacturing operations consistent with ISM principles. Individuals are held accountable for safety performance through an effective performance appraisal process. However, weaknesses in certain roles and responsibilities for positions involving safety monitoring of subcontractors are contributing to the observed deficiencies in communication of requirements to subcontractors and subcontractor implementation of requirements.

C.2.2 Identification of Standards and Requirements

Guiding Principle #5: Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards shall be established that, if properly implemented, will provide adequate assurance that the public, the workers and the environment are protected from adverse consequences.

NNSA and OASO

OASO and the previous Pantex Plant M&O contractor worked together during the late 1990s to establish an agreed-upon set of ES&H requirements in a S/RID, which are included by reference in the current DOE/BWXT contract. The Pantex Plant S/RID includes a document that applies to all activities at the site, and ten additional S/RID documents that are tailored to specific functional areas and performance criteria. With few exceptions, the S/RID contains an appropriate set of ES&H requirements for controlling hazards at the Pantex Plant.

One exception was the requirement to flowdown ES&H requirements to subcontractors as specified in DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, Attachment 2, paragraph 13 (discussed later in this section). In addition, the performance measures (e.g., injury and illness rates) used to evaluate BWXT performance include only BWXT employees and do not encompass employees of subcontractors to BWXT (see Appendix E).

AL and OASO have established an adequate, formal process for maintaining and updating the S/RID to ensure that new and revised ES&H requirements are evaluated for impact and incorporated in the Pantex Plant S/RID, as appropriate. Initial screening of new and revised DOE directives for applicability, performed by AL, has been appropriate and, in most cases, has been timely. An additional assessment of applicability is performed by OASO, and DOE directives that are determined to be applicable are provided to BWXT for impact assessment. BWXT may propose changes to ES&H requirements to incorporate changes in laws, regulations, and industry standards. Overall, the process for maintaining and updating the Pantex Plant S/RID has been effective. With few exceptions, the S/RID has been changed in a timely manner to adopt appropriate agreed-upon ES&H requirements.

NNSA recently established an appropriate policy for a requirements management program in an October 2002 NNSA policy letter (NAP-5, *Policy Letter for Standards Management*). The policy establishes an appropriate set of principles for standards management and assigns responsibility for implementation. The requirements management program at the Pantex Plant is generally consistent with this new policy, although the Pantex Plant program will need to be expanded to include tailoring of standards to work performed by Federal employees to meet a provision of the new policy.

Although adequate in most respects, the S/RID can be difficult to use, in part because of the high degree of tailoring and the lack of a listing of specific requirements/directives in the DOE/BWXT contract. The DOE/BWXT contract requires compliance with the Pantex Plant S/RID, but many ES&H requirements/directives contained in the S/RID are not specifically listed in the contract. Development of such a list is specified in the OASO ISM system description, but a list has not yet been developed, and BWXT does not have this action scheduled.

BWXT

BWXT has developed an effective process for assessing the impact of new requirements and for maintaining a current set of requirements in the Pantex Plant S/RID. Responsibilities are clearly assigned for reviewing changes to laws, regulations, industry standards, and DOE directives, and for proposing S/RID changes when appropriate. Most evaluations of the impact of new and revised DOE directives are timely, and when significant impacts are identified, OASO is informed of the cost of implementation and the impact of adoption on other contract obligations. Changes to the S/RID and implementing documents are also timely. The adequacy of the Pantex Plant S/RID and implementing documents is reassessed annually by BWXT.

For the most part, new and revised requirements in the Pantex Plant S/RID have been effectively incorporated into BWXT standards, procedures, and training. Examples of effective implementation include flowdown of requirements for criticality safety training, control of bloodborne pathogens, testing of fire dampers and doors, and radioactive waste management.

Soon after assuming responsibility for operation and maintenance of the Pantex Plant in early 2001, BWXT began several initiatives to improve the quality of the Pantex Plant procedures. Their initiatives included reducing the number of procedures by consolidating and eliminating those that were unnecessary or redundant, establishing an electronic database of procedures, and developing a new document hierarchy. Several initiatives are currently under way, such as the Business Requirements and

Instructions Network (BRAIN) for establishing a new policy for a business-based document hierarchy; an initiative directed to establishing a single change control process for all Pantex Plant procedures; and an improved document control system. Although some of these initiatives have been completed, additional improvements are needed. For example, the hierarchy of documents at the Pantex Plant is not always consistent with the document control system established in plant standards. Although the Pantex Plant initiatives are appropriate for achieving management expectations for improved procedures, they are all being carried out in parallel, with no formal integrated plan showing how these initiatives are linked, the criteria for successful completion of intermediate initiatives, or milestones for completion. A similar need for formally integrating various initiatives related to issues management is discussed in Appendix D.

BWXT is responsible for ensuring compliance with the contractual ES&H requirements, regardless of whether the work is performed by BWXT employees or by BWXT subcontractors. This responsibility is specified by the DOE/BWXT contract in Clause I-81, paragraph (h). BWXT carries out this responsibility by including ES&H requirements in subcontracts and by monitoring work performed by its subcontractors to ensure that these requirements are effectively implemented.

BWXT has integrated ES&H into its procurement process to ensure that contracts for hazardous work are awarded to qualified bidders and that appropriate ES&H requirements are included in these contracts. The process includes provisions for considering previous safety performance in award determinations, involving ES&H specialists in determining applicable requirements, requiring BWXT approval of H&S plans, and requiring safety work permits before performing hazardous work.

Although the above process includes appropriate steps for assuring that contracts contain applicable ES&H requirements, process implementation has not been fully effective. Contracts awarded by BWXT, and H&S plans approved by BWXT, include such general provisions as "The contractor shall comply with all applicable safety and health laws, regulations and standards." However, such statements are not sufficiently specific to communicate expectations for implementing ES&H requirements. The lack of specificity is problematic when ES&H requirements are only in DOE directives (not in Occupational Safety and Health Administration [OSHA] or other national standards), because BWXT contractors are often not familiar with DOE directives and thus may not comply with them.

A number of requirements, which are contained in the DOE/BWXT contract, have not been included in contracts issued by BWXT. Some examples include:

- **Exposure Limits.** The DOE/BWXT contract (Section 2.3.1.1.j of HC-2300) adopts the American Conference of Governmental Industrial Hygienists threshold limit values. Subcontracts issued by BWXT do not require compliance with these values, but instead refer to OSHA-permissible exposure levels, which are less comprehensive and, in some cases, less conservative.

- **Medical**. The DOE/BWXT contract (Sections 2.3.1.6.a and 2.3.3.10.a of HC-2300) adopts DOE Order 440.1A, CRD paragraphs 19e and 19f, which requires monitoring employees' health when certain work hazards are present.

- **Operating Procedures**. Some operating procedures used by a BWXT contractor for operation of the Pantex Plant Pump and Treat Facility were not consistent with procedural controls required in the BWXT/DOE contract (Management Integration and Controls S/RID 1.4.1.a).

BWXT monitors work performed by its contractors to ensure that ES&H requirements are implemented effectively. This monitoring includes routine safety inspections, review and approval of H&S plans before work is performed, and issuance of safety work permits as a prerequisite for performing hazardous work. BWXT safety engineers who are knowledgeable of ES&H requirements usually perform these

activities. Contractors are required to fully implement OSHA requirements, which are similar to DOE requirements related to worker safety, with some exceptions.

Although BWXT is responsible for ensuring ES&H compliance for work activities performed by BWXT subcontractors, some BWXT personnel with responsibility for directing and monitoring subcontractors were not aware of this provision, and BWXT did not provide clear direction on how it was to be implemented. Consequently, their monitoring has not always been effective in ensuring that ES&H requirements, which are imposed by contract on BWXT, are incorporated in procedures and implemented by BWXT subcontractors. Examples of deficiencies in subcontractor performance and/or BWXT monitoring of subcontractors are listed below (also see Appendix E of this report):

- **Activity Hazard Analyses**. BWXT requires its contractors to perform activity hazards analyses for identifying and documenting hazards and controls, but has not provided a documented process to ensure consistently effective performance in this area.

- **Lockout/Tagout Procedure** . The lockout/tagout program developed by an environmental contractor and approved by BWXT was not sufficiently detailed to enable workers to implement applicable requirements (29 CFR 1910.333(b)) or to enable the development of training requirements.

- **Hazard Communication Plan**. Although an environmental subcontractor had developed a corporate-level hazard communications plan, the plan had not been tailored to the Pantex Plant, had not been provided to BWXT, and had not been implemented at the Pantex Plant as required by contract. Further, training required by the plan had not been provided to the subcontractor staff at the Pantex Plant.

- **Fall Protection**. An environmental subcontractor had not established a fall protection program with sufficient detail to meet the requirements (29 CFR 1926), and did not provide fall protection training required by that regulation.

- **Training Requirements**. Some H&S training requirements for construction subcontractors were not adequately identified in work documents (e.g., activity hazards analyses, H&S plans, and safety work permits), and training records were not maintained.

Similar deficiencies have been self-identified by previous reviews but have not been adequately addressed. For example, a Pantex Plant quality assurance team (Blue Ribbon Panel) established in April 2001 to review several accident investigation reports determined that requests for proposals for subcontracted work did not establish expectations or requirements for safe work by non-BWXT personnel at the same level as BWXT operations. Although some corrective actions were taken to address this finding, the corrective actions were not sufficient, and ES&H requirements imposed on BWXT subcontractors continue to be less rigorous than those imposed on BWXT workers.

Finding #1: BWXT has not established sufficient measures to ensure that ES&H requirements in its contract with DOE are appropriately tailored and communicated to subcontractors and fully and effectively implemented by subcontractors.

Summary of Guiding Principle #5

OASO and AL have established an appropriate set of ES&H requirements in the DOE/BWXT contract, and OASO has worked effectively with BWXT to maintain and update these requirements commensurate

with the hazards at the Pantex Plant. Formal BWXT programs have been generally effective in ensuring that ES&H requirements in the Pantex Plant S/RID flow down to the BWXT workforce.

Many aspects of BWXT efforts to ensure subcontractor compliance with and effective performance of ES&H requirements are effective (e.g., work permits, and subcontractor qualification reviews). All subcontractors are required to comply with OSHA requirements. However, flowdown of requirements to subcontractors has not been fully effective for some DOE requirements that are not addressed as rigorously by OSHA. The ES&H requirements imposed by BWXT on its subcontractors, in some cases, have been less rigorous than those required by its contract with DOE. Also, BWXT did not adequately ensure that subcontractors fully and effectively implement some ES&H requirements. Previous self-assessment findings by BWXT in this area have not been fully addressed. Although flowdown of requirements to subcontractors needs improvement, the requirements management system is functioning effectively, has been effectively implemented in most cases, and is particularly effective for such high-potential hazard activities as nuclear explosives operations.

C.3 CONCLUSIONS

Overall, NNSA, OASO, and BWXT have adequately defined most aspects of their roles and responsibilities and have identified and implemented an appropriate set of requirements for BWXT employees, consistent with ISM requirements. Most aspects of the Pantex Plant ISM program, with respect to the evaluated guiding principles, are effective. However, OASO and BWXT have not been fully effective in ensuring that certain ES&H requirements flow down to subcontractors and are effectively implemented by subcontractor workers. Although increased management attention is warranted for subcontracted activities, the effective implementation of the guiding principles is contributing to improved ISM performance at the Pantex Plant, as evidenced by the improving trends in safety performance.

C.4 RATINGS

The ratings of the guiding principles reflect the status of the reviewed elements of the Pantex Plant ISM program.

Guiding Principle #2 – Clear Roles and Responsibilities.....EFFECTIVE PERFORMANCE
Guiding Principle #5 – Identification of Standards and Requirements .....EFFECTIVE PERFORMANCE

C.5 OPPORTUNITIES FOR IMPROVEMENT

This OA review identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible NNSA, OASO, and contractor line management, and prioritized and modified as appropriate, in accordance with site-specific programmatic objectives.

OASO

1. **Identify options to address imbalances between available staff and anticipated workloads, so that OASO line management oversight responsibilities can be performed effectively**. Specific actions to consider include:

    - Fill vacant FR and H&S positions. Examine incentives used by other NNSA sites to attract and retain FRs (e.g., retention bonuses).

- Explore near-term and longer-term options for obtaining technical support from other NNSA organizations (e.g., service centers).

- Periodically reevaluate staffing needs as NNSA reengineering and streamlining initiatives are implemented and refined.

- As part of the OASO streamlining initiatives and NNSA reengineering efforts, evaluate the existing programs being considered for modification or elimination (e.g., performance assessment matrix and aspects of the current performance evaluation management process objectives) to ensure that the most useful aspects of these programs are retained or incorporated into the revised approaches, while eliminating activities that add little value.

2. **Increase the focus on subcontractor ES&H performance.** Specific actions to consider include:

   - Clarify expectations for OASO staff, and document those expectations in procedures, position descriptions, and performance appraisals.

   - Monitor BWXT efforts to flowdown requirements to subcontracts.

   - Evaluate BWXT efforts to improve monitoring of subcontractor performance, and clarify the responsibilities of BWXT personnel who perform that monitoring.

3. **Enhance the usefulness and scope of existing requirements management systems.** Specific actions to consider include:

   - Establish a schedule for adding a list of adopted standards to the DOE/BWXT contract.

   - Expand the OASO document management program to include tailoring standards to work performed by Federal employees to meet the new NNSA policy (NAP-5, *Policy Letter for Standards Management*).

   - In coordination with BWXT, identify appropriate changes to the Pantex S/RID to delete or limit applicability of the unnecessary requirements.

BWXT

1. **Enhance efforts to establish and communicate requirements for subcontractors, and clarify BWXT management expectations for those positions having responsibilities for monitoring subcontractor safety compliance and performance.**

   - Prepare roles, responsibilities, and authorities documents for subcontract technical representatives, construction safety inspectors, and construction safety engineers/subject matter experts.

   - Incorporate specific safety oversight responsibilities in these documents, including roles and responsibilities for safety engineers for ensuring adequate review of the terms and conditions of future subcontracts and adequate review of subcontractor work control documents.

   - Train personnel on any new subcontractor safety oversight roles, responsibilities, and authorities.

- Review the ES&H requirements in *Division 1 Specifications* for environmental and construction subcontracts as well as the ES&H provisions in the *Additional Terms and Conditions for Access to Pantex Plant* (PX-200STC-1). Revise these documents, as necessary, to incorporate appropriate ES&H requirements from the Pantex S/RID.

- Review and revise existing subcontracts, as necessary, to achieve consistency with the Pantex S/RID.

- Review procedures used by existing subcontractors to assure adequate flowdown of ES&H requirements to the subcontractor workforce. Review efforts by other DOE sites that have prepared packages of contractual requirements for subcontractors; some of these packages are designed to convey DOE requirements that differ from OSHA requirements to subcontractors that are not familiar with DOE requirements.

- Establish a mechanism to ensure that all Pantex workers (BWXT employees and subcontractors) are following the same or comparably effective H&S requirements, for the same type of work activity.

- Provide a roll-down of DOE worker H&S requirements (e.g. DOE Order 440.1A) to BWXT subcontractors.

- Establish a process for BWXT subcontractors to evaluate the impact of such requirements and, if needed, implement the requirements on a graded approach, consistent with the work activity and level of hazard.

2. Prepare and/or revise Pantex Plant plans, procedures, and other documents, with a focus on clarifying responsibilities and authorities, further strengthening the performance appraisal process, and refining the document control system.

- Ensure that only current division roles, responsibilities, and authorities documents are in use.

- Use the self-assessment process to ensure the effectiveness of improvements made to Pantex Plant documents and document control systems. Consider the results of the self-assessment in planning continued improvements in this area.

- Complete the departmental sub-sections of the Engineering Manual to formalize the flowdown of roles and responsibilities within the Engineering Division.

- Develop and implement a Board of Managers resolution or other similar document that describes the Board's safety roles and responsibilities.

- Incorporate a weapons program manager signature line on the performance appraisal form for use with weapons project team member evaluations.

- Revise the performance appraisal standard to clarify how goal deployment is used to establish individual performance expectations.

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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) evaluation of feedback and improvement at the Pantex Plant included an examination of the programs and performance of the Office of Amarillo Site Operations (OASO) and the management and operating (M&O) contractor, BWXT Pantex, LLC (BWXT). The OA team examined the Pantex Plant line management oversight of integrated safety management (ISM) processes and implementation, including the operational awareness program; environment, safety, and health (ES&H) program evaluations; and the performance evaluation and measurement process. The OA team reviewed OASO and BWXT institutional processes, such as assessments and inspections, lessons learned, corrective action/issues management, employee concerns, and activity-specific processes, such as post-job reviews.

D.2 RESULTS

D.2.1 OASO Line Management Oversight

OASO has established formal programs for conducting assessments, including self-assessment, and operational awareness activities. The programs are adequately described in a set of procedures that delineate the activities and responsibilities of Facility Representatives (FRs) and health and safety (H&S) staff. In most cases, the procedures reflect current OASO assessment practices.

Interviews with both H&S staff and FRs indicate they are knowledgeable of areas of responsibility, and are aware of current contractor performance issues and key ongoing corrective actions, which they are monitoring. Ten out of an approved 13 FR positions are filled; all FRs are Phase I-qualified, and approximately 70 percent are Phase II-qualified. FR staffing has been at this level for several years.

Day-to-day monitoring, formal assessments, and frequent communication with contractor management by the OASO FRs and H&S staff provide the contractor with ongoing feedback on safety performance. FR and H&S staff day-to-day oversight activities are captured in a weekly report, rolled up into a monthly report, and entered into the Field Activity Data Base (FADB). The FR team performs joint monthly assessments of selected areas, typically focusing on elements of the DOE Conduct of Operations Order. H&S staff oversight activities are documented in surveillance reports and assessment reports, as well as in reviews performed in conjunction with the contractor or other organizations.

FRs and H&S staff have established adequate assessment schedules and processes for keeping OASO management informed of the status of planned activities. Results from the OASO performance assessment matrix (PAM) program reviews are incorporated into the schedule. OA's review of OASO assessment reports and FADB documentation of operational awareness activities indicates that most of the planned activities scheduled for fiscal year (FY) 2002 were accomplished on schedule.

Most OASO FR and H&S staff operational awareness activities focus on monitoring known weak contractor performance areas. For example, FRs conducted focused monthly reviews in the areas of pre-operational and pre-shift checklists, procedural adherence, technical safety requirement (TSR) maintenance, training, and material movements. These areas were usually selected based on prior contractor performance problems and effectiveness of corrective actions. OA's review indicates the FR monthly reports provide valuable insights and performance data for OASO management to monitor

contractor performance. At OASO management's direction, the FR team has also conducted "for cause" reviews in response to declining performance and employee concerns. H&S staff oversight activities focus on compliance with contractual standards/requirements identification document (S/RID) requirements, and have identified issues within the industrial safety/industrial hygiene functional area, including insufficient BWXT self-assessments. OA's review of PAM reports and assessment schedules/reports confirms that assessment activities appropriately focus on previous deficiencies.

OASO has made a management decision to have the FRs devote a significant fraction of their efforts to supporting DOE readiness assessment and safety basis review team (SBRT) reviews of contractor safety basis documents. OASO determined that ensuring timely and effective implementation of Pantex Plant authorization basis upgrades is a high priority and that the FRs have the best experience and background to provide valuable operational insights that will improve the safety basis. However, the time spent by FRs supporting safety basis reviews has limited the amount of time they can spend on operational awareness activities.

Both FR and H&S staff weekly reports are provided to OASO and BWXT management. FR weekly reports consistently provide evaluative assessments of the operations/activities they observed and reported on follow-up/corrective action closure activities. H&S weekly reports typically do not provide judgments about the adequacy of the operations/activities observed, and thus were not as informative.

OASO has established processes for tracking and communicating identified issues from oversight activities to the contractor. OASO established and implemented an effective action tracking system (Optix) to track required OASO and BWXT actions. The OASO FADB provides a common database for documentation of operational awareness activities performed by FRs, H&S staff, and weapons quality assurance staff. The deficiencies in the FADB are categorized and compiled into consolidated reports issued to BWXT for information and/or corrective action where appropriate. The OASO Associate Director for Oversight and Assessment conducts monthly meetings with BWXT Manufacturing and ES&H Directors to go over trends and results from FR and H&S staff activities.

Although the FADB system could be an effective tool for oversight activities, it is not consistently used or kept current, limiting its effectiveness in tracking the disposition of deficiencies requiring contractor actions. Furthermore, many database entries do not clearly identify the contractor's actions to address deficiencies. However, on a case-by-case basis, OASO can demonstrate how concerns and findings from OASO oversight activities have been addressed. In addition, OA's review of FADB entries, H&S assessment reports, and transmittals of oversight activity reports to BWXT indicated some inconsistencies in terminology (e.g., findings, issues, recommendations, opportunities for improvement, and weaknesses) and insufficient clarity in the expected contractor actions.

OASO personnel actively perform follow-up actions to ensure that corrective actions are implemented and verified as closed by BWXT. Follow-up of corrective action effectiveness and closure was evident in OA's review of FADB entries, FR and H&S staff weekly reports, and H&S assessment reports and evidence files. However, OASO has not conducted a programmatic review of the contractor's corrective action processes to determine whether BWXT's efforts to address OASO findings are effective.

Corrective actions (both OASO and BWXT) are specifically tracked by an assigned FR and are reported weekly to OASO senior management. FRs indicated that the timeliness of contractor responses and completion of corrective actions has improved significantly. OA found no overdue actions by BWXT, and FRs have been effective in reviewing occurrences and corrective actions and ensuring the adequacy of corrective actions.

The OASO annual PAM assessments provide adequate trending and analysis of contractor ES&H performance information. The PAM process is also used to determine future DOE assessment priorities. OASO also uses the BWXT Business Health Indicators (the "critical few" performance indicators) to measure contractor performance against the annual contract performance evaluation plan provisions.

To ensure the quality and accuracy of data provided by the contractor, an OASO FR is assigned to independently verify progress in addressing procedural violation events, a key BWXT performance indicator, and independently evaluates Occurrence Reporting and Processing System (ORPS) reportable events to ensure that they are appropriately characterized and trended in the applicable performance indicator. OASO also uses trending charts to help analyze the effectiveness of corrective actions in reducing the occurrence of procedural violations. In addition, the OASO staff initiated the tracking of lower-threshold-level non-conformance reports (NCRs) to evaluate the cumulative total level of reportable and non-reportable procedural violation events; BWXT subsequently adopted this approach.

With the exception of the FR program, OASO is re-evaluating its assessment programs/procedures, and some may be revised or canceled to reflect changing conditions and OASO priorities (e.g., additional emphasis on contractor self-assessment programs, efforts to streamline internal OASO processes, the NNSA reengineering effort, a relatively new contractor organization, and a focus on the "critical few" performance objectives). For example, the PAM process and the OASO procedure for trending and analysis may be revised or canceled.

D.2.2 BWXT Feedback and Improvement Systems

BWXT uses a number of institutional inspection and assessment processes to provide feedback on the adequacy of ES&H processes and performance. Other feedback mechanisms, including ORPS, lessons learned, a behavior-based safety program, and several employee concerns processes provide additional institutional feedback vehicles for improving ES&H performance. These processes have undergone many changes in the two years since BWXT took over as the M&O contractor.

Assessments. A Pantex Plant standard requires BWXT managers to develop annual assessment schedules and conduct management assessments sufficient to assure that the core functions of ISM are evaluated. BWXT conducts numerous independent and management self-assessments and inspection/surveillance activities. Effective independent assessments are conducted by the Readiness and Assessments Department. ES&H program assessments are performed by the ES&H Division, and nuclear explosives, high explosives, and criticality safety program assessments are performed by the Engineering Division. These assessments were generally comprehensive, thorough examinations based on clearly defined criteria. ES&H Division industrial safety, industrial hygiene, and radiation safety inspections and surveys are conducted to evaluate working conditions in Pantex Plant facilities. The Waste Operations Department conducts audits of vendors that perform hazardous and mixed waste disposal activities. These audits use a checklist format that includes permit status, external inspection results, compliance actions, insurance, and technical operations status. Nuclear Safety Officers in the Manufacturing Division conduct inspections of operations in nuclear Category 2 facilities, including procedure adequacy and compliance, and compliance with authorization basis controls. These assessments and inspections identify and document facility conditions, safety processes, and performance deficiencies.

Formal as-low-as-reasonably-achievable (ALARA) reviews and dose reduction initiatives have been undertaken by the Radiation Safety Department, including observation of work to identify areas where radiological improvements may be made. A number of refinements and enhancements have been made to the pit repackaging and nuclear explosives operations processes to reduce worker doses during operations. Since the inception of the pit repackaging project, feedback and improvement mechanisms have identified

changes in operations and controls that have reduced doses significantly, as evidenced by a twofold increase in the total pit repackaging throughput without a corresponding increase in worker dose. A formal ALARA review of W-87 work processes resulted in a number of process improvements and recommendations to lower dose, some of which were implemented. All recommendations were considered, and justification was provided for those recommendations not incorporated.

Radiation doses received during the previous month and quarter are compiled by the Radiation Safety Department and forwarded to production supervisors for review against administrative control levels. Workers approaching limits are flagged, and actions are then taken to ensure that the limits will not be exceeded. In pit repackaging, supplemental dosimeters have been provided to workers and are read more frequently than the standard monthly cycle to keep a closer watch on accumulated doses and the need for any corrective action.

BWXT self-assessments conducted in November 2001 and January 2002 identified deficiencies in scheduling and conducting management assessments and other programmatic deficiencies, which resulted in a reportable Price-Anderson Amendments Act (PAAA) issue. Several corrective actions and quality assurance initiatives have been undertaken to address these deficiencies, including revising the pertinent plant standard, and conducting training for department managers. In addition, an item for improving management assessments was included in the BWXT Quality Improvement Plan. However, although some progress has been made in improving assessment schedules for FY 2003 and in conducting planned assessments, the root cause analysis and corrective actions for the PAAA issue were not sufficient to address the identified deficiencies effectively.

Although the framework for an effective BWXT self-assessment program is in place and many assessment activities are performed at the Pantex Plant, weaknesses in implementing the management assessment program continue to limit BWXT's effectiveness in evaluating safety performance and driving continuous improvement. The OA inspection team determined that most BWXT divisions did not schedule or conduct assessments addressing ISM core functions in FY 2002, as required by the applicable plant standard. Further, the scope and rigor of some management assessments have not been sufficient to effectively measure safety performance. For example, the safety-related Manufacturing Division's self-assessments for FY 2001 and FY 2002 were limited to procedure adherence/quality reviews. Waste Operations Department self-assessments were limited to Conduct of Operations reviews. Formal assessments of environmental topical areas are not performed, with the exception of storm water and air permitting assessments, which are required by regulations. Several FY 2002 assessments in Infrastructure and Applied Technology lacked substance, did not adequately address the assessment topic, or contained unsupported conclusions. Although deficiencies in root cause analysis and management assessments were identified as PAAA issues, no BWXT divisions conducted self-assessments of performance in these areas. Further, most divisions do not have procedures delineating how the Pantex Plant standard on management assessments is to be implemented.

The unsigned PAAA causal analysis did not clearly define the deficiencies to be analyzed or arrive at clear root and contributing causes. Further, the analysis and corrective actions did not specifically address the failure to conduct assessments of ISM (e.g., they did not require revised FY 2002 assessment schedules) or the quality of the assessments performed, and they did not address all aspects of the PAAA-identified deficiencies. Further, the corrective action plan did not provide for evaluation of the effectiveness of the revised procedure and training until over a year after the issue was first identified. Two corrective actions added to the PAAA action plan in September 2002 were of limited value (simply comparing scheduled versus completed assessments for the first quarter of FY 2003) and were unclear as to intent ("obtain a monthly management assessment report starting in October 2002"). Additional management attention is required to ensure that the causes of management assessment program deficiencies have been adequately identified and addressed and that monitoring is conducted to ensure

that line and support organizations are currently conducting appropriate and effective self-assessments of ISM processes and performance.

Issues and Corrective Action Management. BWXT has established formal systems for documenting and dispositioning safety issues identified from audits, assessments, or analyses. Pantex Plant standards require that appropriate safety issues be documented and their disposition tracked as part of the ORPS and PAAA reporting systems. For issues that do not meet the criteria for reporting in these two systems, the Pantex Plant standard requires deficient conditions and safety issues to be documented and processed as NCRs. Findings from independent assessments performed by the Assessments and Readiness Department and from explosives and criticality safety assessments performed by the Engineering Division are documented as NCRs by the assessing organizations.

In FY 2002, BWXT implemented several quality assurance initiatives that have addressed consolidating multiple deficiency reporting and tracking systems and improving the performance of root cause analyses. As the result of an internal quality assurance assessment (referred to as a "Black Belt" assessment at the Pantex Plant) in late calendar year (CY) 2001, the NCR process was established as the primary deficiency reporting and tracking system, with the objective of consolidating numerous company and BWXT division/department tracking systems. BWXT identified deficiencies in the root cause analysis process in December 2001 as a reportable PAAA issue. This issue was linked to contractor transition findings, repeated procedure adherence-related events, and an external quality review. Corrective actions included revising the plant standard for root cause analysis, training about 1,000 managers and staff in the new method, and developing a standard reporting form for causal analysis. Divisional points of contact (DPOCs) were appointed to provide subject matter expertise and consistent implementation of the issues management process. An Executive Issues Review Board was established in September 2002, comprised of the General Manager and nine division managers, to regularly review adverse and emerging performance trends and direct actions to improve performance. The Quality Assurance Division is providing this Board with trend analyses of issue data from ORPS, NCRs, the PAAA reporting system, and other sources.

The development and maintenance of safety-related performance indicators (i.e., the BWXT Business Health Indicators) and the active involvement of senior BWXT management in monitoring and acting on these indicators has provided an effective feedback and improvement tool for driving continuous safety improvement. Presentations are made to senior management each month, and senior management is actively engaged in efforts to improve performance as well as the indicator process.

Although processes are in place, safety deficiencies and work-related incidents are not being consistently documented, thoroughly analyzed for causes and extent of condition or adverse trends, or effectively resolved to prevent recurrence. The effectiveness of corrective actions for some significant issues is not being adequately monitored or evaluated as evidenced by the following examples:

- In numerous instances, line operational and support organizations did not document assessment findings and weaknesses on NCRs as required by the applicable standard. Several divisions still maintain deficiency databases outside the formally recognized plant processes. OASO-identified safety issues are not documented as NCRs. In some cases, corrective actions, such as recommended compensatory actions identified during a study of uninterruptible power supply batteries offgassing hydrogen in enclosed areas, were neither documented on NCRs nor tracked to resolution in any system. Bypassing the NCR process also limits the effectiveness of the centralized PAAA process, which relies on formally defined tracking systems as the sources of issues to review.

- Some management assessments improperly categorized results or used terminology different from the assessment standard's definitions, so some issues were not properly documented as NCRs.

- Root cause analyses in many cases did not address the potential extent of condition (i.e., whether there are similar deficiencies in other areas), did not accurately identify the root cause, did not identify important contributing causes, or did not fully address all pertinent elements of the issue being evaluated.

- Corrective action plans are not always rigorous enough to adequately address contributing or root causes. Corrective action plans for some significant issues, such as the root cause analysis and management assessment reportable PAAA issues, do not provide for timely, interim monitoring of the effectiveness of individual actions. Consequently, weaknesses in the progress of improvement in these areas are not always identified by BWXT.

- Deficiency data from ongoing procedure quality/adherence assessments conducted by the Manufacturing and Infrastructure divisions has not been analyzed for root causes or generic issues.

- The significant potential benefits of using divisional issues management subject matter experts have not been realized. Many DPOCs and the DPOC Board have not been effective in ensuring consistent, rigorous documentation and evaluation of safety issues, as outlined in the plant standard and in the Board's charter. An issues management process improvement team completed a review during the OA inspection that recommended significant changes to improve the process.

These weaknesses in the management of safety issues were reflected in insufficient BWXT actions to address incidents involving significant inadvertent contact with or cutting of buried utilities during excavation work. A series of six such incidents occurred in less than four months between May and September 2002, including two incidents documented on NCRs, one ORPS report, and three incidents not formally documented other than in log entries. The causal analyses and corrective action plans for the incidents documented on NCRs were inadequate and incomplete. For example, the actions of personnel with direct responsibilities for monitoring the relevant work activities (e.g., subcontractor supervision and a BWXT Project Manager) were not addressed.

Of the three events that were not formally documented on NCRs, no actions were taken in two cases because the lines that were cut were found to have been abandoned. In one case, an informal analysis was performed (evidenced by an unsigned and dated statement citing the violations of plant standard requirements and corrective actions taken or planned), but the actions were not formally tracked, and lessons learned were not documented and disseminated. The improper processing of this buried cable cutting event was more significant because it occurred one week after the cut cable was reported in ORPS. All three of these events should have been formally investigated to determine whether there were process or performance deficiencies and whether the events were reportable in ORPS as near misses. Further, a meeting between BWXT and OASO management and responsible individuals after the latest incident did not identify the fact that the event had not been properly documented or investigated for reportability. This meeting resulted in the identification of no further required actions. The OA team identified numerous weaknesses in the plant standard and the excavation permit process, as well as performance deficiencies related to the events discussed above. For example, excavation permits were not fully or accurately completed, and maps or sketches of dig areas and utility locations were not attached as required (see Appendix E).

BWXT has conducted many special studies that identified needed process improvements, as reflected in the 46 initiatives identified in the Quality Assurance Improvement Plan, 82 completed and 69 ongoing Six Sigma projects, and a variety of other independent reviews. Many of these related either directly or indirectly to ISM and safety processes. Although there is significant value in conducting studies that

result in process improvements, the many related reviews and studies are not always well defined and coordinated, contributing to overlaps and conflict, and a fragmented approach to resolving systemic issues. Furthermore, BWXT management has not established clearly delineated overall plans for implementing and coordinating the resulting corrective actions, milestones for completing individual actions, and acceptance criteria for judging the completion and effectiveness of corrective actions. Similar concerns were identified in BWXT's fragmented approach to managing numerous improvement initiatives related to clarifying roles and responsibilities. For example, a recent improvement initiative was the development of divisional quality plans, a process that was not included in the master quality improvement plan and whose objectives and expectations were not formally defined in an implementation plan. Citing information provided in new divisional quality plans, some divisions deleted procedures for implementing plant standards for performing management assessments and lessons learned, significantly reducing the availability of information on implementing these processes. Eliminating procedures was not an objective of the quality plan initiative, but was part of other initiatives to reduce the number of procedures (see Appendix C). Volume II provides additional examples of weaknesses in Pantex processes and performance for management of safety issues related to the emergency management program.

Finding #2: BWXT management assessment and issue management processes and their implementation do not ensure that deficiencies in ES&H and emergency management programs are identified, documented, evaluated, and resolved and that recurrence controls are implemented in a consistently appropriate and timely fashion.

Lessons Learned. Externally generated lessons learned are screened for applicability to the Pantex Plant, lessons-learned reports are generated from Pantex Plant events, and both external and internal lessons learned are disseminated to workers. Some lessons learned are incorporated into some training lesson plans, placed in required reading files, and/or discussed at standup safety meetings. The Lessons Learned Program Manager forwarded approximately 400 lessons learned for further dissemination in the last two years.

Notwithstanding the communication of many lessons learned at the Pantex Plant, several weaknesses limit the effectiveness of this feedback mechanism. Standards and instructions do not address using subject matter experts to evaluate applicability or needed actions, and limit possible actions to apply lessons learned to required reading and some aspects of training. Other potentially necessary actions (e.g., assessments, hardware inspections, or procedure/process changes) are not addressed, and there is little formal documentation of any actions taken (e.g., placement of lessons learned in required reading, or discussion at safety meetings). There was no response, as required by the plant standard, to two of the six lessons learned in CY 2002 that the Training Department Lessons Learned Coordinator considered to have training implications and forwarded to division training coordinators for review or action. Other such lessons learned were forwarded by the Training Department Lessons Learned Coordinator without the required response form or a request for feedback. Further, there is no user friendly, searchable, easily accessible database of lessons learned or website links to external or internal sources available to the Training Department, work planners, or other potential users. Formal post-job notes or briefings are not addressed in work control standards and procedures and are not being used by the Infrastructure Division as a method to obtain lessons-learned feedback from workers. Thus, though many lessons learned are communicated to many BWXT managers, their relevance and application to Pantex Plant conditions and processes is not monitored or measured.

Behavior-Based Safety Program. In November 2001, BWXT initiated a behavior-based safety program to increase worker awareness of safety behavior on a personal basis through training observers and the immediate feedback provided by one-on-one observations in the workplace. The number of observers

and behavior observations in the program has been growing. BWXT senior management supports this program with the dedication of personnel time needed to attend training, conduct observations, analyze data, and administer the program. Improving reportable and lost time accident statistics over the past seven months can be attributed, in part, to the increased attention to safe behavior on the job.

Employee Concerns Programs. BWXT employees and subcontractors have access to several safety concerns programs that register safety questions or concerns and obtain feedback and resolution, and allow for confidentiality or anonymity. Most concerns are adequately resolved in a timely manner. Although not required by DOE orders, BWXT has chosen to implement its own employee concerns program in accordance with DOE Order 442.1 provisions, rather than using the OASO employee concerns system. The BWXT employee concerns program received approximately ten ES&H-related concerns in CY 2002. In response to a contract performance evaluation element for FY 2002, BWXT has made a number of improvements in the employee concerns program, including a revised procedure, adding staffing, reducing backlog and processing time, improving documentation, and developing new bulletin board posters. An ES&H division safety hotline receives approximately 40 inquiries each year, which are promptly and properly resolved. In addition, a new program called "No More Surprises" that was initiated by BWXT management in the summer of 2001 has received at total of approximately 150 ES&H-related concerns and inquiries in the past year. The availability of these processes is advertised to Pantex Plant employees and subcontractors in a module of the initial and annual refresher general employee training.

Although these processes help resolve many employee concerns, procedural inadequacies and implementation deficiencies limit their effectiveness. The formal employee concerns program, although governed by a DOE order and involving actions by any BWXT employee and various support organizations, is administered through a lower-level internal operating procedure without a specified organizational sponsor, rather than a plant standard (which would be appropriate for implementing a DOE order that applies to all site personnel and organizations). Further, this internal operating procedure does not adequately address evaluation documentation and closure requirements. One recent safety-related concern submitted through the employee concerns program received an incomplete evaluation and disposition of all safety aspects and was prematurely closed. For another such concern, there was inadequate documentation addressing actions taken prior to closure. There are no standards or written procedures for the administration of the "No More Surprises" program, although this process has attracted the most response by Pantex Plant workers. Line management and support organization responses to "No More Surprises" program concerns often have not been timely (e.g., many months for responses and resolutions), some concerns were closed before commitments were complete, and some actions did not fully address the concerns. These weaknesses may reflect the lack of formal processes and ownership for monitoring effective implementation.

The significant amount of data from the safety hotline and "No More Surprises" program processes has not been analyzed for common issues or root causes to prevent recurrence. The presence of posters on facility bulletin boards advertising the employee concerns program (as required by the internal operating procedure) and the safety hotline is not periodically monitored, and posters were not in place on a number of plant bulletin boards.

D.3 CONCLUSIONS

OASO has established an appropriate organizational and administrative framework for conducting operational awareness and assessment activities related to BWXT safety performance at the Pantex Plant. FRs and H&S staff maintain operational awareness and conduct assessments, although much of their time is currently devoted to the high-priority efforts to support, monitor, review, and approve the safety-basis documents. OASO has established an adequate process for trending and analysis of contractor ES&H

performance information, and is taking appropriate steps to ensure the quality and accuracy of performance data provided by BWXT. OASO has established processes to effectively track and communicate identified issues from oversight activities to the contractor, and OASO personnel actively perform follow up to ensure that closure of corrective actions is verified by the contractor.

BWXT uses many mechanisms to provide feedback and improvement in safety performance at the Pantex Plant. Formal programs have been established for conducting independent and management assessments; documenting deficiencies and tracking corrective actions; addressing employee concerns; and identifying and communicating lessons learned. An employee-conducted, behavior-based safety observation program is positively influencing safe work practices. BWXT management uses safety-related indicators effectively to focus attention and drive performance improvements. Weaknesses in several of these feedback and improvement processes have been self-identified, and corrective actions to improve performance have been taken through a number of quality initiatives, PAAA and NCR corrective actions, and as a result of special quality team reviews.

However, continuing process and implementation weaknesses have hindered the effectiveness of these mechanisms in driving consistent, continuous improvement, especially in reporting and managing the evaluation and resolution of safety deficiencies. Management assessment programs need further strengthening to ensure that effective ISM function assessments are scheduled and performed and that assessment results are entered in deficiency tracking systems. The processes and performance for managing ES&H incidents and deficiencies need management attention to ensure that incidents are properly documented and investigated; adverse trends and repetitive incidents are identified; the extent of condition, causes, and recurrence controls are properly established; and implementation of actions is timely and effective. BWXT management has not sufficiently ensured that lessons learned are evaluated for applicability, that appropriate actions are taken when indicated, and that both are properly documented. Employee concerns related to safety have not always been resolved in a formal, timely, and effective manner. Further, management has not always ensured that corrective actions for significant, systemic issues are coordinated, with established milestones and clear acceptance criteria, and timely monitoring and verifying for completion and effectiveness.

D.4 RATING

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

D.5 OPPORTUNITIES FOR IMPROVEMENT

The OA review identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible line management and prioritized and modified as appropriate, in accordance with site-specific programmatic objectives.

OASO

1. Enhance OASO processes for reporting assessment results.

- Provide clear definitions for assessment terminology (e.g., findings, issues, weaknesses) and revise procedures/guidance to ensure that consistent terminology is used and that assessment reports clearly communicate the expected actions to the contractor.

- Ensure that OASO H&S weekly reports include appropriate judgments of the adequacy of the observed processes.

2. **Increase focus on the BWXT feedback and improvement programs in accordance with the NNSA reengineering initiative to rely more on contractor self-assessments.**

- Periodically monitor BWXT management assessment programs to ensure that assessments are completed on schedule and provide for a rigorous and self-critical review that includes observation of work and effective performance of ES&H requirements.

- Periodically monitor BWXT efforts to enhance issues management systems. Ensure that deficiencies from BWXT assessments and other reviews are entered into issues tracking systems and that processes for establishing milestones and criteria for corrective action are established and effectively implemented.

- Regularly evaluate the database of deficiencies and corrective actions to determine whether BWXT is adequately managing the deficiencies and making sufficient progress on corrective actions. Determine causes for issues that are behind schedule and perform follow-up.

- Consider establishing contractual performance objectives/indicators that promote development of a comprehensive and effective BWXT assessment and issues management program.

BWXT

1. **Strengthen self-assessment processes to ensure that ISM processes and performance are effectively measured and that weaknesses are identified and corrected**. Specific actions to consider include:

- Conduct a new root cause analysis of the management assessment PAAA issue. Review and revise the corrective action plan as necessary to address newly identified contributing and root causes.

- Ensure that each division has developed sufficient formal procedures to define the processes for implementing the plant standard's requirements for conducting management assessments.

- Implement a rigorous monitoring process to ensure the adequacy of management assessment schedules and completed assessments until all divisions/departments consistently achieve management expectations.

- Ensure that independent assessment reports better describe the basis for conclusions that evaluation criteria have been met.

- Provide additional training and mentoring to the divisions/departments in the planning, conduct, and documentation of assessments, especially in the identification and classification of weaknesses and deficiencies in processes and performance.

2. **Ensure that sufficient controls have been established such that the NCR system captures deficiencies as intended and that evaluations and corrective action plans result in timely and effective correction of the issues and prevent recurrence**. Specific actions to consider include:

- Revise the root cause analysis standard to more clearly reflect the process and to include a requirement to evaluate whether deficiencies might apply to other similar processes or other locations at the Pantex Plant (extent of condition).

- Implement a rigorous monitoring process to ensure the adequacy of causal analysis and corrective action plans until management is assured that these processes are effectively implemented.

- Clearly communicate senior management expectations for using the NCR process for reporting and tracking the resolution of program and performance deficiencies to support managers and staff.

- Provide additional training and mentoring to DPOCs, line managers, and staff on conducting causal analysis for NCRs. Use examples of recently completed inadequate analyses as training aids.

- Establish clear expectations for documenting and investigating safety-related incidents, such as the recent excavation events, by clarifying the thresholds for conducting operations event critiques and ORPS reporting. Consider applying the accident investigation plant standard to environmental restoration and construction-related events.

- Conduct a thorough evaluation of all elements of the recent excavation incidents to identify processes and performance improvements that may preclude recurrence and prevent a more serious event. Assess the adequacy of existing excavation/penetration procedures and current policies on incident investigation and thresholds for ORPS reporting.

3. **Revise and enhance plant standards to improve and formalize the lessons-learned program, the "No More Surprises" program, and the employee concerns program**. Specific actions to consider include:

   - Revise the plant standards to clearly delineate the process for reviewing and implementing lessons learned and the roles and responsibilities of evaluators and potential users.

   - Incorporate into the plant standards a structured and documented process for lessons learned applicability reviews by subject matter experts and line organizations that ensures that any necessary actions are identified, documented, and implemented.

   - In the plant standards and procedures for training plan development and work planning, incorporate explicit expectations that lessons learned are to be reviewed and applied to these activities. Senior management should ensure that applicability and action feedback is consistently performed and documented by support and line organizations.

   - Use plant standards to establish processes for formally documenting and dispositioning post-job reviews for work packages to promote direct worker feedback and procedure improvement.

   - Establish a user-friendly, searchable database of lessons learned with links from the BWXT home page to encourage and facilitate access to lessons-learned data by planners, trainers, and other potential users.

- Consider using a prioritized screening process to reduce the number of lessons learned given wide dissemination and to focus user attention on the most pertinent and significant subjects.

- Develop a plant standard detailing the process, roles, and responsibilities for the “No More Surprises” program that incorporates a formal oversight function to ensure timely and effective resolution of concerns and inquiries from concerned individuals.

- Issue the formal employee concerns program process details as a plant standard (rather than an internal operating procedure) and provide more details on how the Pantex Plant implements the applicable DOE order, including criteria for closing and communicating resolutions to concerned individuals.

- Establish and implement a formal method for periodically monitoring the placement of employee concerns program posters on plant bulletin boards.

APPENDIX E

Core Function Implementation (Core Functions 1-4)

E.1 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Independent Oversight and Performance Assurance (OA) evaluation of work planning and control and implementation of the first four core functions of integrated safety management (ISM) at the Pantex Plant focused on safety performance during the conduct of selected aspects of the Pantex Plant mission. The specific areas of review were:

- Nuclear Explosives and Sealed Insert Operations (i.e., nuclear weapon pit repackaging)
- High Explosives Operations
- Facility Maintenance
- Subcontract Work
- Waste Management and Groundwater Monitoring.

For the most part, these mission areas are performed by different BWXT Pantex, LLC (BWXT) divisions, each of which has its own processes and procedures for implementing ISM. Consequently, OA's assessment of the Pantex Plant's implementation of the ISM core functions discusses each mission area separately. Examples of observed work activities included W-87, W-76, and sealed insert programmatic work activities; explosives formulation and synthesis work activities; facility remodeling work being performed by BWXT subcontractors; and groundwater pump-and-treat and soil vapor extraction work activities. This approach enabled OA to evaluate differing work control processes governing a number of primary mission areas for the Pantex Plant.

In addition, a sampling of the plant's engineering processes and products was reviewed to evaluate their ability to perform commensurate with their importance to safety. This sampling included functional reviews of two critical safety systems: (1) the cell confinement structures and features, and (2) the bays and cells fire protection system. The engineering evaluation included a review of various authorization basis (AB) documents, modification packages, calculations, surveillance test procedures, drawings, equipment manuals, unreviewed safety question (USQ) evaluations, and procedures, including the USQ procedure.

E.2 STATUS AND RESULTS

E.2.1 Core Function #1 – Define the Scope of Work

Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.

Nuclear Explosives and Sealed Insert Operations

The scope of weapons program work is clearly defined from initial planning through the task-specific implementing procedures. The scope of work associated with weapons programs at the Pantex Plant is initially described in requests for work from the design agencies (i.e., the National Nuclear Security Administration [NNSA] national laboratories). Early in the planning process, a project team consisting of laboratory and Pantex Plant personnel is formed. The project team has members from multiple

disciplines, including the production technicians, who are the end users of the process. For example, several production technicians were assigned full time to a previous project team (W-87), from the beginning of process design and tooling work to manufacturing operations. One of the project team functions is to develop a project plan that provides a detailed scope of work and, as the project progresses, guide the development of the manufacturing process, including hazard identification/analysis and identification/implementation of controls. This process results in manufacturing procedures containing task-specific scopes of work. For example, the scope of W-76 and W-87 work is clearly described in the associated nuclear explosives operations procedures (NEOPs) and nuclear explosives engineering procedures.

Schedules and production requirements for weapons programs are adequately defined for the Pantex Plant Manufacturing Division in program-specific program control documents provided by DOE. These documents break down stockpile needs on a monthly basis. The facility works from these program control documents to produce the required products.

The Campaigns and Special Programs Division of the Nuclear Materials Department develops and maintains the Pantex Plant Pit Management Plan, which defines the scope of work for safe and secure storage of all pits at the Pantex Plant, from receipt to final disposition. The plan is updated annually and provides a detailed description of the scope of work for the sealed insert pit repackaging project, which is one of the key objectives of the Pit Management Program. At the activity level, pit repackaging activities are governed by a set of formal operating procedures, which clearly define the bounds of each task and provide detailed step-by-step instructions for accomplishing the work.

High Explosives Operations

Work activities in explosives formulation and synthesis consist of developing new explosive formulations and processes, formulating and/or manufacturing explosives for DOE and outside agencies, developing new processes for sanitizing components, and recovering materials from the sanitization processes. For new work activities, work is defined in objectives stated in project plans and orders. New formulation processes, or the use of new materials in existing formulation processes, requires an evaluation of the new or revised process against the safety basis, a review of the process by the Office of Amarillo Site Operations (OASO), the development of new or revised procedures, and start-up activities performed in accordance with BWXT Standard 7301. For previously approved processes or materials, an informal review of the procedure is performed to verify adequacy.

For work performed in both explosives formulation and synthesis, work is defined principally through technical procedures and developmental instructions. Technical procedures are used for routine operations in which the work process is mature and can be performed within well-defined parameters. Developmental instructions are used for non-routine operations, which may include process development, a one-time order or requirement, or projects that have a limited life. The OA team reviewed several technical procedures and developmental instructions and determined that the content of such procedures adequately defines the work activity in most cases.

The basis for determining procedural usage for explosives operations procedures is not sufficiently defined in BWXT procedures. The cornerstone of Pantex Plant policies and directives governing procedures development and use is a program to ensure strict adherence to procedures. The plant standard on procedural adherence and the Pantex Plant Conduct of Operations Manual describe how procedures are to be used based on three “level of use” categories (i.e., critical use, general use, or reference use). Definitions for these “level of use” categories are established primarily for nuclear explosives work. The critical use category, for example, is designated only for nuclear explosives work. Additionally, the general use and reference use categories are explained in Pantex Plant standards only as

they apply to nuclear work; the correlation to non-nuclear explosives work is not well established. As a result, the application of these "level of use" categories to explosives work is unclear and subjective. Furthermore, the assignment of a "level of use" category is not sufficiently risk based; that is, there is no defined correlation between "level of use" categories and any potential health and safety impact on workers, the public, or the environment; potential monetary losses; or adverse consequences to product quality. Although in practice there appears to be a correlation between general use and reference use categories to moderate- and low-hazard activities (hazard classes and level of protection, respectively), this correlation is not defined and documented, as required in the DOE Explosives Safety Manual.

Maintenance

The Infrastructure Division performs several types of maintenance that encompass preventive maintenance (PM) and corrective maintenance (CM): "fix it now" (minor work), modifications, manufacture of tooling to support programmatic work, and maintenance for site and Office of Transportation Safeguards vehicles. Formal processes are implemented and require that all infrastructure and maintenance work at the Pantex Plant use approved work orders generated by the Passport computerized maintenance management system. This process is governed by a plant standard on work control, an infrastructure internal operating procedure, environment, safety, and health (ES&H) procedures, and other associated implementation procedures. These procedures adequately address the initiation, processing, completion, and documentation of work orders for infrastructure maintenance work.

The scope of work for PM and CM work that OA observed was generally well defined in work order packages, which included the Passport work order, the CM work instructions, and attached procedures and references. The scope of work for CM packages, non-routine PM tasks, and minor modification work was adequately specified by work planners, with input from the requestor and some craft personnel. For recurring routine PM, the Passport work order system automatically generates the work orders and PM instructions based on pre-determined PM periodicities. Schedulers and/or planners review all work packages, including "fix it now" work activities, before they are sent to the field. The three screening personnel in the scheduling department who review all incoming work are also qualified USQ reviewers, and are more likely to recognize potential USQ concerns posed by maintenance work, thus providing an added safety benefit.

Subcontract Work

Work scopes are adequately defined through various contractual and subcontractor documents and meetings such that hazards can be identified, and controls can be developed and implemented. Subcontractors provide various plans on how work is to be achieved (e.g., safety plans and hazardous communication plans) to BWXT for review and approval before BWXT issues a "Notice to Proceed." Work scope is also defined through contract specifications, activity hazard analyses (AHAs), and safe work permits (SWPs). Work scope is further communicated to subcontractors through pre-construction meetings. Some subcontractors, such as the environmental subcontractor for the Pump and Treat Facility, have developed detailed descriptions of work tasks and associated hazards for each task identified in their work scope.

Although the definition of work scope is generally comprehensive for subcontracted work, in some cases, ambiguous statements in the statement of work provided to the subcontractor have resulted in some confusion and potential work scope impacts. For example, the statement of work for one environmental subcontractor states, "The subcontractor and respective employees shall become familiar with and comply with applicable Pantex Plant standards and procedures." Based on discussions with subcontractor personnel, the subcontractor did not have a clear understanding about which plant standards were

applicable. The selection of some standards in lieu of others could significantly impact the work scope. Recently, BWXT Division I contract specifications have been revised to minimize the ambiguity about the applicability of BWXT Pantex Plant procedures to subcontracted work.

In another case, the subcontractor's roles, responsibilities, and requirements were not sufficiently defined in contractual documents (e.g., scope of work, and contract specifications). For example, an environmental restoration subcontractor performs the operation and maintenance of the Pump and Treat Facility. Although the subcontractor supplies the chemicals to the facility, the contract does not clearly identify whether BWXT or the subcontractor has the responsibility for labeling the facility's chemical tanks. Although chemical tanks were labeled to identify hazards, the National Fire Protection Association (NFPA) labeling system used by the subcontractor is different from the BWXT chemical labeling standard. Similarly, the same subcontractor was tasked with developing operating procedures for the facility, but was given no guidance. Standards to be used for BWXT operating procedures are identified in DOE Order 5480.19, *Conduct of Operations*, and are implemented for BWXT workers through standards/requirements identification document (S/RID) requirement 1.1.1(a) and BWXT Standard 0143. However, these requirements have not been rolled down to subcontractors tasked with developing operating procedures. Existing operating procedures for the Pump and Treat Facility do not meet these requirements, and an alternative set of requirements has not been provided to the subcontractor (see Appendix C).

Waste Management and Groundwater Monitoring

The current environmental management system (EMS) is defined in the mission support S/RID for environmental management, which adequately delineates the applicable requirements. BWXT is proactively working to enhance its EMS in anticipation of the issuance of the new DOE environmental protection order (i.e., DOE Order 450.1, *Environmental Protection Program*), which is currently in final review. For example, the Pantex Plant tasked a quality assurance team to define actions necessary to meet the proposed fiscal year (FY) 2005 DOE goal for an enhanced EMS. BWXT plans to use the ISO 14001 standards as a basis for its EMS and has performed a gap analysis to identify the differences between the current Pantex Plant EMS and the ISO 14001 provisions.

The Pantex Plant has entered into a site treatment plan that establishes a framework, consistent with Federal Facility Compliance Act regulations, for defining the approach and schedule for meeting Resource Conservation and Recovery Act provisions. Although the Pantex Plant continues to reduce legacy mixed waste, some wastes regulated by the Texas Commission on Environmental Quality (TCEQ) cannot be treated or disposed of off site within the one-year limit for storage of hazardous waste. The site treatment plan effectively defines the management process for identifying mixed-waste streams that exceed regulatory limits, reporting amounts in storage, tracking milestones for treatment and disposal of that waste, assigning responsibilities for actions to the various organizations (NNSA, OASO, BWXT, and TCEQ), and establishing response times for required actions.

The Pantex Plant has implemented a radioactive waste management basis program that adequately describes provisions for managing low-level radioactive waste and low-level mixed (hazardous and radioactive) waste in accordance with DOE Order 435.1, *Radioactive Waste Management.* The program defines the appropriate program elements (e.g., quality assurance, incorporation of waste management manuals/plans/standards, radioactive waste facilities description, waste containers, waste characterization and certification, and long-term storage and accumulation limits). The radioactive waste management basis program document contains a compliance crosswalk that clearly delineates how the DOE Manual 435.1-1 sections have been addressed in Pantex Plant standards, manuals, or plans, and identifies responsible Pantex Plant organizations.

The Pantex Plant groundwater restoration program has been adequately defined in a suite of documents. The program ensures that restoration activities can proceed at a controlled pace, decisions are made through a clearly defined review and approval process, and decisions are appropriately documented in technical reports, memoranda, and meeting notes. As part of this process, the Pantex Plant has established a strong working relationship with external regulators. This strong relationship facilitates the effective resolution of professional differences about restoration activities. The regulators understand that past practices created the legacy concerns and that the current management and staff at the Pantex Plant are committed to addressing these legacy problems proactively.

Summary

Overall, most Pantex Plant operations have good frameworks in place for defining the scope of work, and most processes are effectively implemented. Activity-level documents that were reviewed, such as procedures, developmental instructions, work orders, and subcontract specifications, adequately defined the scope of work activities to allow the identification of hazards. However, providing more guidance based on operational risks or hazards could strengthen the site procedure for categorization of procedural use. In addition, increased attention to detail when developing subcontractor technical specification work documents is needed to ensure that applicable standards and requirements are clearly defined for the work to be performed.

E.2.2 Core Function #2 – Analyze the Hazards

Hazards associated with the work are identified, analyzed, and categorized.

Nuclear Explosives and Sealed Insert Operations

Comprehensive hazard analyses for work are performed in a multitiered process. Safety analysis reports as well as other sitewide and facility-specific approved AB documents provide the appropriate hazard analyses applicable to multiple facilities or programs, such as analyses of bay or cell performance. The Pantex Plant is currently performing AB upgrades to meet the upcoming 10 CFR 830 Subpart B implementation commitments as part of an ongoing AB upgrade program. The program includes a comprehensive schedule to develop, review, and approve AB documents for ongoing and upcoming weapons programs.

For weapons programs, the initial hazard analyses are performed under the requirements of the DOE nuclear explosives safety program. For each specific program, the associated weapons safety specification document from the design agency is used to generate a hazards analysis report. At the task-specific level, the project team analyzes new procedures related to nuclear operations, and procedure revisions are analyzed as part of the procedure review process. For example, the review process for NEOPs and other procedures includes review by nuclear safety and other safety professionals to ensure that the appropriate hazards are addressed. Hazards introduced in new or unusual operations, such as pit repackaging, receive more detailed reviews of specific hazards based on their significance. For example, pit repackaging radiological hazards were evaluated and documented prior to embarking on the project, using experience gained from a prior repackaging effort**.** A formal as-low-as-reasonably-achievable (ALARA) review was conducted and was used in developing the most effective expected dose reduction process flow and bay configuration for the work, as well as such necessary controls as lead aprons and lead-loaded gloves for certain pit types.

High Explosives Operations

Non-nuclear explosives work is performed according to procedures or developmental instructions developed for each operation. The associated hazards are identified, analyzed, and documented through a variety of mechanisms. The process safety management (PSM) process hazards analysis (PHA) process is the focal point for identifying and analyzing hazards on both a facility and process level, because all explosives work is governed by the applicable Occupational Safety and Health Administration (OSHA) PSM standard (29 CFR 1910.119). Extensive PHAs have been developed for both synthesis and formulation processes based on a "what if" checklist approach. A review of these PHAs determined that these hazard analyses were extensive, thorough, and used the DOE Explosives Safety Manual checklists to ensure compliance with DOE Explosives Safety Manual requirements.

However, two weaknesses were identified:

- PHAs did not adequately address some potential hazards from external events (e.g., chemical spills due to derailed freight train cars).

- The controls or strategy that resulted from the “what-if” analysis could not be directly linked to the controls in operational and developmental procedures.

Facility- and process-level hazard analyses are also performed and documented through systematic fire hazard analyses, hazard integration teams, and change management evaluations, which are performed to meet the requirements of 29 CFR 1910.119.

Workers and supervisors are generally knowledgeable of the hazards associated with their work environment. Except for one procedure discussed below, hazards associated with reviewed explosives operations have been identified and analyzed by line management and industrial hygiene and safety personnel, and the appropriate controls have been documented within developmental instructions.

Some hazards for the operation of the dimethyl sulfoxide (DMSO) distillation column in Building 12-17, Bay A, are not sufficiently analyzed, documented, or linked to their respective hazard controls. While the Formulation PHA addresses the DMSO distillation operation, the hazards identified in the PHA are not clearly linked to the DMSO procedure and the controls identified in the DMSO procedure. Although the health and safety staff reviewed the DMSO procedure, the few comments provided were administrative in nature. Collectively, there is no documented hazards analysis for the DMSO distillation operations that links the process hazards to the controls in use, as required by OSHA 29 CFR 1910.132. Specific concerns with the hazards analysis supporting the DMSO distillation column operation are as follows:

- Although dimethyl sulfide (DMS) is produced as a by-product of the DMSO distillation, the hazards from handing DMS filter cartridges have not been identified or analyzed (although there is a brief mention of DMS in the PHA), and the potential DMS exposure hazard or hazard controls have not been addressed in the operating procedure.

- Respirators have been assigned to DMSO operators in case of a spill. However, there is no identification of any hazard that might require respirators in the PHA, operating procedure, or procedure review.

- Although butyl gloves are used for the DMSO hazard, as defined on the DMSO chemical request form, the short length of the gloves has resulted in some DMSO workers being routinely exposed to small quantities of DMSO on their forearms, because the DMSO splash hazard was not identified or analyzed.

- Safety eyewear with side shields is identified as a control when operating the DMSO distillation column, which conflicts with the BWXT generated material safety data sheets (MSDSs) that require splash resistant safety goggles to prevent eye contact. Line management has informally analyzed the splash hazard, but has not documented their analysis to justify the exception to the preferred control in the MSDS.

Maintenance

The identification and analysis of job hazards for maintenance work is guided by formally established processes and checklists for work planning and scheduling, AHA screening, job safety hazard analyses (JSHAs), SWPs, nuclear explosives area evaluations, and by ES&H professionals and nuclear safety officers who provide support for planned and in-process work activities. The maintenance department maintains over 100 task-specific JSHAs for tasks such as operating band saws, operating shop equipment, performing elevator work, and other frequent maintenance tasks. Although most of the JSHAs were developed in 1995, the reviewed JSHAs were adequate for the tasks selected. BWXT has initiated a project to upgrade the existing JSHAs. The new automated job safety analysis project will provide new software technology and improve integration of hazard information into existing work control processes.

The OA team observed a number of maintenance activities that involved a wide range of potential hazards to workers. The hazards included working in close proximity to nuclear weapons and explosives, unique hazards associated with maintenance of safeguards transports (SGTs) and safe secure trailers (SSTs), and common industrial hazards. With few exceptions, the hazards associated with CM and PM activities were clearly identified in the work packages and supporting documentation. The Passport work control system also includes a section on each work request for workers to screen for additional hazards before starting work.

Work control procedures for such work as energized work, confined-space work, and work requiring fall protection provided minimal guidance or thresholds for when work planners or ES&H personnel should perform pre-job walkdowns. In addition, work control procedures allow repair work during PM activities with only supervisor concurrence and provide limited guidance or thresholds on when work requests must be returned for additional work planning, walkdowns, hazard identification, and work instructions.

DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, requires a written worker protection program that includes an initial or baseline survey of all work areas; routine evaluations of workplaces and activities by workers, supervisors, and managers; and periodic evaluations of workplaces and activities by qualified work protection professionals. Many aspects of workplace surveys are effective. The Pantex Plant has placed high priority on establishing and implementing a comprehensive program for identifying and analyzing beryllium contamination. As a result of these efforts, the beryllium program at the Pantex Plant has improved, and beryllium-contaminated areas have been addressed. In addition, ventilation surveys for the carpenter shop are current, and ventilation exposure assessments for the pipe fitters, boilermakers, and sheet metal workers were current and effectively implemented. Further, numerous industrial hygiene evaluations and exposure assessments have been conducted for painting operations and the carpentry shop, although some are outdated.

While the focus on beryllium is appropriate, a large fraction of the industrial hygiene resources has been focused on the beryllium program. As a result, some aspects of implementation of workplace hazard surveys have received less attention. Some elements of the program are not well defined or implemented, particularly with respect to the establishment of baseline hazard surveys or work areas, and periodic resurveys of those areas using an established methodology, such as that described in DOE-STD-6005-2001, *Industrial Hygiene Practices.* For example:

- An evaluation and analysis of the ventilation system for the forklift maintenance and cart battery charging area was not retrievable, and there was insufficient documentation to verify that controls were identified or adequate to minimize spark-producing occurrences and potential hydrogen buildup. The BWXT Engineering organization performed a compensatory calculation during the inspection period that indicated hydrogen buildup should not be a problem; however, controls related to some of the calculation's assumptions were not in place (e.g., controls to prevent spark-producing activities).

- Some industrial hygiene exposure assessments are outdated and have not been performed for the range of materials that could be used in the Pantex Plant maintenance shops (e.g., cement board, welding fumes, and laminates). Also, several ventilation face velocities were 30 to 50 percent below baseline values, and the assessments provided no acceptance criteria or explanation for the lower values.

- Industrial hygiene task evaluations for painting operations had deficiencies that limited their effectiveness in specifying personal protective equipment (PPE) and establishing needed controls; for example, the evaluations did not specify the type of paint, quantities used, the task duration, or types of respirator cartridges). In addition, these assessments were performed in 1995 and have not been updated to reflect changing materials and new American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit values (TLVs).

The maintenance shops warranted increased attention by workers, supervisors, and managers. Several readily identifiable safety deficiencies (unrecognized hazards) in the maintenance shop areas were not identified by workers, supervisors, and managers during self-assessments and day-to-day activities. For example, welding screens in an active welding area were missing, electrical panels and machine disconnects were partially obstructed, material was stored on top of power panels, eyewash stations were partially obstructed, and a few machine grinders were improperly used and maintained.

Subcontract Work

The hazards analysis process for subcontractors is robust and, in most cases, provides sufficient assurance that the applicable hazards are recognized and evaluated. The hazards analysis for subcontractor work is performed by the subcontractor and is based on the scope of work described in contractual documents, walkdowns of the project area, and discussions with BWXT construction staff. Identified hazards are analyzed, and the hazard information is documented in AHAs that are prepared by the subcontractors. Subcontractor AHAs are reviewed and approved by BWXT. The preparation of the AHAs by subcontractors is a new emphasis by the BWXT construction staff, and its implementation has increased subcontractor accountability and knowledge of hazards and controls in their workplaces. BWXT construction independently identifies and analyzes the work hazards, and documents their review of the hazards and controls provided by the subcontractor in a SWP, which is attached to the subcontractor's AHA. The SWP also provides a mechanism for BWXT to identify special controls, limitations, and prerequisites for subcontractor work. In addition to the AHA and SWP, work activity hazards and controls are also documented on a variety of permits, subcontractor safety and health plans, and hazard communication plans.

BWXT safety engineers are knowledgeable of OSHA and BWXT requirements, and when engaged in the oversight of subcontractors, provide additional safeguards to ensure that hazards are identified and the appropriate control(s) are implemented. While BWXT policies require that safety engineers inspect each subcontractor on a daily basis, the increasing demands of project document reviews, limited resources, an increasing number of subcontractors, and work that is performed over two shifts sometimes inhibits the implementation of this requirement.

Although the BWXT AHA can be an effective mechanism for identifying and documenting hazards and controls, the process is not formally documented in BWXT policies or procedures. The lack of a documented AHA process can result in unclear and inconsistent expectations for identifying, analyzing, and documenting hazards on the AHA, revising AHAs, gaining approval authority for revisions, and identifying conditions for stopping work. For example, during the initial work to remodel Building 12-53, an excavated area was discovered under the flooring, which had not been addressed in the AHA. The excavated area constituted an unevaluated confined space. Subsequently, the subcontractor evaluated the space, which consisted of entering the excavated area and taking an initial reading of gases. The evaluation resulted in the space being declared a non-permit confined space. Consequently, the excavated area was barricaded. Although the subcontractor revised the AHA to account for a new work activity to backfill the pit with sand, the revised AHA did not adequately address the potential confined-space hazard or the fall hazard for which the barricading was intended. Without an AHA procedure, there is no guidance on when and how an AHA should be revised for work scope changes. In another example identified by the OA team, the noise hazard associated with power tools used by subcontractors in the boiler house was not sufficiently analyzed, and hearing protection was not worn. Upon reanalyzing the noise hazard, hearing protection requirements were identified and implemented; however, the AHA was not updated to reflect the new hazard and controls. In general, the SWP, which accompanies the subcontractors AHA, identifies common construction hazards, which require screening. However, potential noise hazards are not included on the screening form.

Waste Management and Groundwater Monitoring

The BWXT Waste Operations Department (WOD) has implemented a process that effectively links waste streams to disposal paths. To date, WOD has completed process information forms (PIFs) for waste stream analysis on about half the processes used at Pantex. These PIFs document the operation/process, the waste that will be generated, the location, and the generator. The PIF process ensures that waste management is an integral part of work activities and facilitates the incorporation of pollution prevention measures into operations.

In addition, WOD is taking actions to enhance recycling efforts. Specifically, WOD is developing standard terminology for recyclable waste streams (solvents, batteries, oils) so that these streams can be combined. In the past, inconsistent use of terminology across different operations/facilities made it difficult to determine the total amounts of materials being dispositioned. The development of consistent plant-wide terminology enables an analysis of the total amounts, and a determination of whether recycling is warranted. In conjunction with this effort, seven pollution prevention assessments were conducted in FY 2002.

A comprehensive groundwater assessment of the site has been conducted to determine the need for remediation and continued monitoring. In addition, the environmental protection/restoration group continues to examine the site for potential sources of contamination, while performing interim remediation at the two known contaminated locations.

BWXT effectively manages hazardous substances that have been declared waste. BWXT also has processes for tracking hazardous materials and disposing of materials that have exceeded their shelf life. However, in one case, BWXT did not analyze the hazardous material in storage and had no plans to determine whether it should be declared waste. Specifically, a sulfuric acid tank used for pH adjustment at the sewage treatment plant (which was no longer in service) was emptied into plastic containers about one year ago. These containers were then stored at the materials warehouse, but the container information was not entered into the chemical control program. A material evaluation form, prepared in anticipation of the material being declared waste, shows the containers as hazardous waste and categorized as non-recyclable material. However, no action had been taken to recycle the containers until the issue was

raised during this OA inspection. Although the material in these containers could be considered waste, no analysis has been performed to determine its regulatory status, in part because organizational responsibility for the materials is unclear.

As part of their environmental restoration program, the Pantex Plant established an effective groundwater pump-and-treat system. A planned improvement to this system is the development of water table maps that demonstrate the effectiveness of the groundwater pump-and-treat system. However, groundwater levels in the vicinity of the system are not currently being displayed on a water table contour map to display the system's radius of influence. Thus, Pantex Plant personnel are not provided with optimal information for monitoring and analyzing the effectiveness of the pump-and-treat system.

Engineering

The function of the cell confinement features is to confine the radioactive material release of a high explosives violent reaction (HEVR) occurring inside the cell. The primary features incorporated in the design to accomplish this function include the cell structure itself (which is designed to contain the high-pressure shock waves resulting from the HEVR), the gravel gertie (which is designed to absorb some of the energy of the HEVR, filter the explosion gas, and channel the gas release upward through the gravel), seals around doors, and the blast valves.

Most aspects of the reviewed cell confinement features were adequate. The AB, including the final safety analysis reports (FSARs), technical safety requirements (TSRs), and their bases documents, was generally complete, correct, and clear. The design of the confinement features was adequate to perform their safety functions, and modifications have maintained or improved the abilities of these features. Testing procedures and actual tests performed were in accordance with AB requirements and were generally adequate to demonstrate the abilities of the features to perform their safety function.

However, two notable exceptions were identified in hazards analyses.

- **Insufficient Evaluation of Co-Located Worker Exposures From Cell Accidents**. During 1994 and 1995, the Pantex Plant discovered that the worst-case cell accident scenario for an HEVR, with regard to radioactive exposures outside the cells, would be from a less-than-maximum amount of high explosives. Previously, Pantex Plant personnel had assumed that an explosion involving the entire amount of explosive material was the worst case. However, their subsequent analysis indicated that smaller explosions could be worse, because they might not have sufficient energy to activate the gravel gertie and, thus, the safety benefits (filtering and directing the plume through the top of the pile) of the gravel gertie would not be realized. This would result in an unfiltered radioactive release from cell openings at ground level. Initial analyses of the site boundary exposures from this scenario were performed and were subsequently updated as the understanding of this event was refined. These analyses all showed that site boundary exposures could be maintained less than the 25-rem limit defined in regulations and the AB. It was recognized and accepted in the AB that worker exposure in the cell would exceed the 100-rem AB guideline, and that the cell workers would likely suffer death or serious injury from this event. However, no additional analyses were performed for this modified scenario to address co-located worker exposures outside the cell.

  As a result of discussions between OA and BWXT staff, BWXT performed informal analyses. BWXT's preliminary results indicated that the unprotected co-located worker exposure at 100 meters from the release point would significantly exceed the AB guideline. (Previous analyses had indicated exposure in the range of 50 rem at 100 meters.) Such exposures would have the potential to cause fatalities or serious injuries to those co-located workers outside the cell. These additional potential consequences had not been previously evaluated or clearly documented in the AB. Additionally,

emergency response planning did not recognize the higher consequences posed by this increased exposure.

The need to address the co-located worker exposures had also been recognized by OASO in the bays and cells safety evaluation report (Appendix B, Item 71d), which directed BWXT to estimate the consequence to workers and the public if the postulated consequences of the event is an HEVR in a bay or cell. This direction to BWXT was reinforced by an OASO review and comment sheet on the bays and cells safety evaluation report dated September 16, 2002. The BWXT response stated "The SAR [safety analysis report] will be updated to identify the straight line distance from the location of an HEVR with dispersion in a nuclear explosive bay or cell at which a co-located worker would receive a significant radiation dose." Although an implementation plan for this directive has not yet been generated, the newly identified magnitude of the potential exposures to co-located workers indicates a need to respond promptly to the OASO direction, and to complete the analysis of risks to workers in a timely manner.

- **Inadequate Analyses of Waterborne Releases From Cell Accidents.** Current radioactive material release analyses of the worst-case HEVR event in a cell address only respirable airborne releases. However, the OA team identified previously unrecognized conditions that could result in significant waterborne releases of radioactive materials from the cell for this event, causing higher exposures to co-located workers and a need for revisions to emergency preparation and responses.

    - In the event of an HEVR, the potential exists for the fire protection systems inside the cells to be damaged, which could flood the cell at a very high rate and entrain most of the radioactive material affected by the HEVR. Leakage of this water could release much additional material from the cell. Although the material would be unlikely to become respirable, it would pose a previously unrecognized exposure pathway, which could result in significant doses to co-located workers and emergency response personnel.

    - Two water release pathways were identified that were not previously recognized. The first pathway is through the contaminated waste sump in some cells. For some cells, the contaminated waste sumps are designed to gravity drain to the contaminated waste tank outside the cell through a contaminated waste isolation valve. These valves are normally closed, but they are designed to open in response to a high sump level, as sensed by float switches. If this system functions as designed post-accident, it would allow accident-contaminated water from the cell to drain to the contaminated waste tank, which has an open atmospheric vent. The contaminated water in the tank would begin to be released into the environment at the point where the cell water level reached the tank vent level. The second release pathway is in Building 12-44, Cells 5 and 6, through the cell internal equipment room sump, which receives drains from the cell air handling unit, and which contains pumps that discharge to the ground outside the cell.

Although it had been previously recognized that there were leakage pathways around personnel and equipment door seals, the potential for large volumes of water to be introduced into the cells post-accident had not been recognized; the two additional leakage pathways described above had not been recognized; and the effects of waterborne radioactive releases by these pathways had not been analyzed. BWXT has initiated formal analyses of this discovery, but has not initiated the USQ process under the "New Information" provisions of the procedure.

The OA team also identified a less-significant deficiency in the analyses of leakage areas in HEVR cell leakage. The current analyses of offsite exposure as a result of an HEVR in a cell are based on the total identified leakage areas in the cells. One leakage pathway from Building 12-44, Cells 5 and 6, was not accounted for in the analyses. These cells are equipped with internal equipment room sumps to collect

condensate from the air handling units. The sump pumps discharge onto the ground outside the cells. Although the analyses accounted for leakage through the penetration annulus around the discharge piping, they did not account for the internal leakage area of the piping itself, which would be open to the environment during periods when no water is in the pumps, such as winter months when there is little condensate generated by the air handling units. The increase in exposure from this source would be directly proportional to the increase in total leakage areas. BWXT indicated that they would correct this analysis error.

Summary

Hazard identification and analysis programs in a number of areas were robust and effectively implemented in most respects. The hazard identification and analysis processes for nuclear explosives and nuclear operations—which pose the greatest potential hazards/risks at the Pantex Plant—are effective, and hazards analysis processes for environmental programs are effective. In addition, OASO and BWXT have made significant improvements and are assigning high priority to the upgrade of the Pantex Plant AB to meet the upcoming 10 CFR 830 Subpart B implementation commitments as part of an ongoing AB upgrade program. With some exceptions, the processes reviewed for the identification and analysis of hazards are well established and documented. Most hazards associated with observed work have been adequately identified, analyzed, and/or documented.

However, additional focus is needed in a few specific aspects of hazard identification and analysis. The radiological risks to the worker and environment associated with the worst-case HEVR event have not been sufficiently evaluated and documented within existing approved AB documents, and the emergency response planning does not reflect that full range of potential scenarios. Further, although the AHA can be an effective mechanism for identifying and documenting hazards and controls for subcontracted work, the process is not formally documented in BWXT policies or procedures. In addition, some hazards associated with explosives operations and subcontractor work were not sufficiently analyzed and/or documented, and some weaknesses in implementation of workplace hazard surveys were identified.

Although a few areas need additional analysis and documentation, the OA review of the operations indicates that the most significant hazards at the Pantex Plant are well understood, identified, and analyzed. The deficiencies identified during this OA inspection are characterized as isolated problem areas and do not indicate systemic weaknesses in the hazard identification and analysis systems.

E.2.3 Core Function #3 - Develop and Implement Hazard Controls

Safety standards and requirements are identified and agreed upon, controls to prevent/mitigate hazards are identified, the safety envelope is established, and controls are implemented.

Nuclear Explosives and Sealed Insert Operations

The controls for hazards identified and analyzed in the program-specific hazards analysis reports are effectively flowed down into program-specific TSRs and/or user documents, such as NEOPs and operating procedures. Program-specific TSRs are documented in activity-based control documents that, in conjunction with applicable sitewide and building-specific TSRs, form the AB envelope of controls for a specific weapons program. The AB upgrade efforts in recent years have resulted in significant improvement in the controls for nuclear explosives work. For example, the SS21 initiative (a major ongoing effort to reengineer nuclear explosives operations to increase efficiency and enhance safety) has resulted in improved procedures, better tools, and a safer methodology for activities in weapons programs.

The Pantex Plant has a comprehensive program for the development, review, approval, use, and revision of technical procedures. Detailed instructions for format and content are contained in a writer's manual for technical procedures. A plant standard on the review, approval, and revision of technical procedures provides a structured process to ensure that accurate, appropriately reviewed procedures are available to the users. Another plant standard addresses management expectations on procedure adherence and use. Although some ambiguity exists on use classification of procedures (see explosives operations section in Core Function #1), the standard explicitly lays out management expectations regarding strict adherence to procedures.

The procedures used in nuclear explosives and pit repackaging operations are technically accurate and complete. The NEOPs for the W-87 program provide the necessary information to perform the work. The W-76 program NEOPs are SS21 compliant, and improvements in the comprehensiveness and usability of these procedures are evident. The operating procedures for pit repackaging provide the necessary level of detail to perform the work. However, these procedures can be difficult to follow, given the non-sequential nature of some of the activities and the need to skip to other procedures or reference other sections of the procedure and/or operator aids. In a few cases, the level of detail in NEOPs may sometimes exceed that necessary to effectively communicate the instructions to a trained and certified production technician. However, usability is improving as the procedures are transitioned to the SS21 format and content. The procedures for bay and cell preoperational checks are well written and contain the appropriate information and level of detail to allow the production technician to verify that the building (including safety systems) is ready for operations.

The SS21 equipment and tooling in the W-76 program allow for a significant reduction in the number of lifts of weapons components. Production technicians and management see the SS21 initiative as an improvement in manufacturing and recognize that the tooling and procedures improve efficiency and enhance safety.

The production technician training program is comprehensive and logically arranged. Training consists of an appropriate mix of classroom and hands-on training with mock-up weapons in simulated cells and bays. The training includes oral boards and written exams. The production technicians are then required to attain and maintain proficiency by working with certified production technicians prior to gaining full certification.

External radiation exposure represents a primary hazard for work in nuclear explosives and pit repackaging operations. A rigorous program for characterizing radiation levels and contamination potential of the various nuclear components handled at the Pantex Plant has been established. A vast amount of radiological characterization data for the radiological components, including pits, has been collected and documented by the Radiation Safety Department (RSD). The RSD Operations Control Manual requires this information to be kept current through continuing verification surveys. Radiological information gathered as part of this program is included in training and various operator aids for all production technicians working near the nuclear components.

The Pantex Plant RSD Workplace Monitoring and Control Manual and the Operations Control Manual are comprehensive and provide a high level of detail regarding radiation safety practices to be followed in support of both occupational radiation protection requirements of 10 CFR 835 and environmental radiation protection requirements of DOE Order 5400.5, *Radiation Protection of the Public and the Environment*. The technical basis and justification for site-specific implementation of certain subjective requirements, including application of volumetric release limits and radiological soil posting standards, is particularly effective. In these areas, implementation across the DOE complex is widely inconsistent and, in some cases, lacking proper technical justification. However, the Pantex Plant has appropriately flowed

down the requirements to an implementing document using a technically justifiable and conservative technical basis.

While management priority and attention has been focused on improving hazard controls and has resulted in major improvements, some deficiencies associated with hazard controls were identified, as discussed below.

Some safety and health requirements associated with pit repackaging were not always clearly specified or implemented. The safety requirements for pit repackaging procedures require beryllium monitoring as deemed necessary by the BWXT Office of Safety and Health (OSH). However, aside from weekly email notifications to OSH identifying when beryllium pits will be processed, the procedure does not specify conditions under which production technicians should request specific beryllium monitoring (e.g., visible dust, oxide formation, or scratches). The use of a hoist to lift and then lower sealed insert containers into the AL-R8 container presents a potential pinch/crush hazard if workers do not grasp the designed tooling to guide the sealed insert into the container. However, discussion of how to control the potential hazard, including the proper technique for lowering the sealed insert container into the drum, is not defined in the procedure.

There is limited radiation safety job coverage required for pit repackaging and W-76/87 operations, and application of ALARA practices was inconsistent in some areas. For these programs, there is no continuing requirement to ensure that production technicians review survey information and maintain awareness of area dose rates before or during their work, as needed to enhance and foster proper ALARA practices. Reliance on worker training and work ethic to maintain doses ALARA has resulted in less-than-optimal dose reduction in some cases, as evidenced by continuing weaknesses in production technician ALARA practices observed by RSD personnel during assessments. Dose rate information is posted on the wall in those bays and cells designated as radiation areas (areas where radiation levels exceed 5 millirem (mrem)/hr). However, dose rate information is not posted in bays or cells that are not radiation areas, even though dose rates up to 5 mrem/hr are allowable in non-radiation areas. For the W-76 program, the posted dose rate information in the cell did not include information on dose rates from a bare pit with the shield cap in place, a configuration required by the NEOP. Thus, it would be impossible for production technicians to understand from the information presented what the dose rates are and whether ALARA practices are needed.

In some cases, the technical basis for the use of extremity and other individual monitoring was not well defined or may not be representative of the total cumulative doses received. Production technicians perform hands-on operations with depleted uranium components without extremity dosimetry. The contact dose rates with the depleted uranium range from 70 to 100 milliradian (mrad)/hr; however, the procedure does not require extremity monitoring, and there is no documented analysis of the need (or lack thereof) for extremity monitoring for the uranium beta hazard. In addition, some of these workers would accrue additional extremity dose from the uranium operations, which should be added to extremity doses recorded for other tasks that require extremity dosimeters (i.e., pit handling). However, there is no mechanism to ensure that this occurs, resulting in a likelihood of total extremity exposures for some workers being biased low. Similarly, some operations, including visual pit inspections, expose other areas of the worker's body, such as the face and eyes, to non-uniform radiological hazards, and the basis for determining the need for dosimetry and/or special monitoring for these conditions has not been clearly established.

In the area of external radiological hazard identification and control, nuclear explosives and pit repackaging procedures did not have the necessary controls sufficiently defined or implemented to ensure that DOE-defined high-radiation areas are properly identified and controlled. 10 CFR 835 defines high-radiation areas as any area where radiation levels at 30 centimeters (cm) from a source could result in an

individual receiving a dose of greater than 100 mrem in one hour. The regulation also requires written procedures to be developed and implemented to ensure and demonstrate compliance. Nuclear explosives operations and pit repackaging efforts routinely expose sources of radiation with dose rates greater than 100 mrem/hr at 30 cm. While appropriate PPE is required for use with certain types of pits, neither program has established formal controls, such as procedural restrictions (e.g., time limits/logging), to ensure that high-radiation areas could not be created during work. For pit repackaging, RSD conducted a time-motion study to justify the use of 300 mrem/hr as the threshold for a high-radiation area; however, sufficient positive controls have not been incorporated into the procedures to ensure and demonstrate compliance. Similar concerns exist for other nuclear operations that handle bare pits with dose rates in excess of 100 mrem/hr at 30 cm, including the W-76 program. In 1996, the previous site contractor and OASO (formerly the Amarillo Area Office, reporting to the Albuquerque Operations Office [AL]) recognized a concern associated with high-radiation areas, and the contractor prepared a request for clarification for submittal to DOE Headquarters. AL's review of the matter and response issued to the contractor determined that a Headquarters interpretation was not necessary. However, the AL letter addressed only posting requirements, which have since been resolved with the revision to 10 CFR 835. The AL letter did not provide an answer to the original question regarding definition and designation of high-radiation areas, a designation that requires recognition and application of more rigorous controls than other radiation areas.

Finding #3: **NNSA and BWXT have not ensured that all potential high-radiation areas are properly identified, designated, and controlled, in accordance with site and DOE requirements.**

High Explosives Operations

Most hazard controls were identified and appropriately implemented to control or mitigate the hazard. Hazard controls for non-nuclear explosives operations are identified in process hazards analyses, S/RIDs, the Non-Nuclear Facility Safety Systems Manual, and facility standards. Hazard controls are implemented through procedures and standards, training and qualification, plant engineering controls, and facility standards. For example, in addition to establishing an operating envelope (i.e., maximum limits for explosives quantity and personnel as permitted by the quantity-distance criteria), the DOE Explosives Safety Manual also requires that the quantity of explosives and number of personnel at an explosives operating location (e.g., facility, bay and/or room) be established at the minimum necessary to carry out the operation in a safe and efficient manner. Both the maximum and operating limits for explosive quantities and number of personnel were posted on the entrance for each explosives bay and/or room. In addition, to ensure that personnel would follow operating limits established by facility managers, and to better meet the intent of the DOE Explosives Safety Manual requirements on personnel limits (worker and casual), BWXT was taking steps to clarify existing postings by consolidating the postings into a single limit on the placard unique to the operation.

Inspections of safety equipment and systems (e.g., remote operation bay door interlocks, deluge fire suppression system, and lightning protection) in high explosives areas were being performed on a regular basis as required by procedures.

An adequate training program is in place for the high explosives synthesis and formulation areas; explosives training requirements for supervisors and workers were identified by line management; and the training records were well documented. A sampling of worker training records for DMSO operations was also conducted. Workers' training was generally extensive, applicable to the process hazards, and kept current.

Although most observed controls were adequate, controls for the DMSO distillation column operation were inconsistent with and/or inadequate for the process hazards as previously described in Core Function #2. BWXT line management has implemented an interim corrective action to address this concern while BWXT Industrial Hygiene seeks an improved hazard control.

OA observed that some procedural controls were outdated, based on a limited sampling. For example, the current DMSO procedure identifies hearing protection requirements and a requirement to notify Industrial Hygiene if an operation is to occur, although the noise hazard was abated a year ago, and the Industrial Hygiene notification was intended only for initial start-up of the distillation column. In addition, documents in the Hazard Information Center in the DMSO Distillation Facility are outdated. For example, there is an old MSDS book listing chemicals that are no longer present in the work area, as well as an outdated explosives safety manual.

Maintenance

Controls for hazards encountered during maintenance activities include formal training and qualification, skill of the craft gained through apprentice and journeyman programs, work package task instructions and procedures, permits, signage and postings, and verbal direction from ES&H personnel, supervisors, and facility personnel. Maintenance work packages for jobs that OA observed generally demonstrated an adequate integration of controls and provided appropriate instructions for craft personnel to safely complete work activities.

Work packages for observed work activities were well constructed and contained procedures and forms required by the Pantex Plant work control standard and ES&H procedures. For example, the work package for an "important to safety" annual PM on a Building 12-17 elevator contained the PM procedure, an AHA walkdown screening checklist, the facility/building transfer permit, the lockout sheet, the confined-space entry permit, the elevator JHA, and the work order performance record. The work order contained appropriate controls to safely perform the job; however, an area where there is room for improvement is discussed below.

PM procedures for some observed PM were of high quality and could easily be followed in a sequential systematic fashion. These PM actions included Office of Transportation Safeguards SGT and tractor PM, uninterruptable power supply PM, and crane PM in nuclear facilities. Recent emphasis on the quality of procedures has resulted in improvements to these and other PM procedures. However, a few deficiencies with current procedures were identified. For example, although workers tested door interlocks, the PM procedure for the Building 12-17 elevator did not address testing the door interlocks to ensure that they were working properly. The PM procedures for the Building 12-60-2 jib crane did not contain post-maintenance testing requirements or acceptance criteria for maximum transverse travel speed, or periodic lubrication of the trolley air motor to meet manufacturers recommendations (BWXT initiated corrective actions).

Plant Standard 5053 for the excavation permit process has weaknesses that, in conjunction with several implementation weaknesses, may have contributed to a number of recent excavation events (see Appendix D). For example:

- The standard requires a penetration/excavation permit application but has no procedural guidance on penetration work activities. The Infrastructure Division has a separate internal operating procedure on penetration, but its use is not referenced in or required by the excavation plant standard. The permit also does not document who (by specific name or title) is accountable for ensuring that the excavation/penetration is performed safely. The permit only documents the requesting individual.

- The procedure references form PX-1212, Underground Utilities Locations, but does not address how it is used or whether it is required. In addition, the non-destructive examination (NDE) organization is required to sign the excavation permit, but the procedure does not list NDE responsibilities for excavation or penetration.

- The procedure does not require marking the location of the excavation zone on the drawings. Having the limits of the excavation zone clearly marked on both the ground and on the drawings facilitates recognizing interference between excavation and buried utilities.

- The plant standard does not address marking the buried utilities and excavation zone in separated, distinct colors to ensure that there is no confusion between markings. In addition, the procedure does not address excavation close to utilities that are not practical to de-energize or isolate, such as gas lines that are greater than ten inches in diameter.

With some exceptions, housekeeping in the many maintenance shop areas and building equipment rooms was good, and shop areas were free of safety hazards. Shop equipment was well maintained, areas were free of obstructions and trip hazards, electrical equipment and cords were free of defects, and a supervisor was assigned and accountable for each shop area. Flammables were neatly stored in flammable lockers, and the lockers were free of rags, cardboard, and standing oil. The carpentry shop, battery charging and forklift maintenance area, and vehicle maintenance facility were well maintained, orderly, and clean.

Subcontract Work

Hazard controls for subcontracted work are identified through AHA, SWPs, and such safety permits as confined-space permits and hot work permits. In addition, hazard controls are specified in subcontractor health and safety plans, waste management plans, and hazard communication plans, which are reviewed and approved by BWXT before work begins. OA's review indicates that subcontractors effectively implemented these processes and appropriately identified and implemented controls, with some exceptions (e.g., training, as discussed below).

Another mechanism for defining hazard controls is the use of contract specifications to identify and tailor regulatory requirements to a specific subcontractor work activity. Contract specifications are also the mechanism for the flowdown of DOE and BWXT requirements to subcontractors. As indicated in Appendix C, some DOE Order 440.1A and other DOE requirements, which are contractually imposed on BWXT by DOE, have not been incorporated into subcontractor's contracts and work documents (see Finding #1 in Appendix C). However, all OSHA construction requirements have been incorporated into contract specifications. For the majority of worker safety requirements, DOE requirements and OSHA requirements are identical or comparable in effectiveness. OA's review indicated that subcontractors were implementing OSHA requirements; however, a few deficiencies exist.

Differences between the full set of DOE requirements and the set of requirements imposed by subcontracts (which do not include all DOE requirements) have resulted in health and safety requirements that are, in some cases, less rigorous for subcontractors than for BWXT employees. For example, subcontractors and BWXT employees may be working in the same facilities, performing similar work activities, and encountering the same hazards, but be subject to different requirements, providing different levels of protection. DOE Order 440.1A requirements that have not been imposed on subcontractors, even in a graded approach, include DOE occupational medical requirements, ACGIH TLVs for hazardous chemicals and other physical stressors, and ergonomic hazards assessments.

In some cases, this has resulted in a disparity of health and safety controls between BWXT workers and subcontractors. For example, annually the ACGIH reviews and revises some TLV limits for hazardous

chemicals based on new toxicological studies. BWXT work must be performed within the ACGIH TLVs for hazardous chemicals, which are mandated through DOE Order 440.1A and the BWXT S/RIDs. Subcontractors, however, are not contractually required to adhere to ACGIH TLVs, but only to OSHA regulations. Although OSHA regulatory limits for hazardous chemicals are based in part on recommendations by the ACGIH, the acceptance by OSHA of ACGIH recommendations may lag the published recommendations by years or may never be adopted. The current OSHA construction requirements published in 29 CFR 1926 are based on TLVs established by the ACGIH in 1970, and are significantly different from a number of the current TLVs. Recent DOE policies on worker's compensation for former DOE site workers have not made such a distinction between contractor and subcontracted workers at DOE sites, inferring that all workers at DOE sites should be afforded comparable health and safety protection, whenever practical.

BWXT subcontractors have not been afforded the same health and safety safeguards as BWXT employees in several areas, in addition to those previously discussed. For example, BWXT workers and line managers have a clear responsibility and authority to stop work if work is performed outside of established controls, such as those identified in procedures or work documents. Stop-work authority for subcontractors, however, is governed by the authority provided in OSHA regulations and contract specifications, which is limited to cases involving "life threatening conditions" or "when asbestos containing materials are identified." In addition, the reporting thresholds for BWXT subcontractors are different than those for BWXT workers in some cases because DOE imposes stricter limits than OSHA.

The contract specification process, when employed by BWXT Construction in conjunction with SWPs to identify subcontractor OSHA requirements, has been an effective mechanism to clarify BWXT expectations for implementing OSHA requirements, with a few exceptions. Most subcontract work is construction related, and the contract specifications are focused on OSHA construction requirements as defined in 29 CFR 1926. However, the subcontractor performing maintenance and operations of the Pump and Treat Facility must operate the facility in accordance with OSHA general industry standards as defined in 29 CFR 1910. A few of the contract specifications are inappropriate for work in the Pump and Treat House.

Contract specifications for some subcontractors do not identify applicable safety training requirements. Furthermore, safety training requirements are not sufficiently defined in subcontractor AHAs and safety and health plans. A review of three BWXT subcontractor work projects identified several training requirements mandated by OSHA that were not identified by the subcontractor, not performed, or no record (verbal or written) was available to verify that the required training was adequate or that the training was conducted. For example, fall protection was identified as a control in AHAs for two subcontractors evaluated by the OA team. However, fall protection training as required by 29 CFR 1926.503 was not identified in the contract specifications or identified as a control in the AHAs or health and safety plans of either contractor. Interviews with the subcontractors performing the work indicated that such training either had not been performed, or a training record did not exist as required by the OSHA standard. For hazard communication training, training requirements were specified in safety and health plans; however, interviews with subcontractor personnel could not verify that such training had been completed. Other areas of subcontractor training concerns included scaffolding erection, PPE, stairways and ladders, and compressed air. Other than training requirements for asbestos, respiratory protection, material handling, and confined spaces, training requirements are seldom identified in AHAs, SWPs, and/or health and safety plans (see Finding #1 in Appendix C).

Waste Management and Groundwater Monitoring

Pantex has implemented an effective program for controlling hazardous waste storage areas. Plant Standard 3443, *Less-than-55 Gallon Hazardous Waste Accumulation Sites,* lists requirements to be

followed to meet Pantex, DOE, and regulatory requirements, and requires the storage areas to be registered and to use only WOD-supplied containers. Less-than-90-day storage areas are registered and reported to the TCEQ, and are established under requirements set forth in Plant Standard 3444, *Less-than-90 Day Hazardous Waste Accumulation Site*. As an operator aid, standard signs have been developed for use in less-than-55-gallon and less-than-90-day storage areas. These signs identify the requirements for proper operation of the area in accordance with regulations and plant standards. However, the signs are optional and are not used by all Pantex Plant organizations/facilities.

BWXT weapons and high explosives programs effectively incorporate waste management aspects into operating procedures, which specifically delineate waste handling requirements. The procedures use a unique identifier for each waste stream and require disposal in a corresponding container. This process ensures that waste is properly placed in the containers provided for that specific waste. As an additional control to ensure that requirements are followed, a waste certification official independent of those directly responsible for performing waste generator activities performs the certification process. This waste certification official is responsible for ensuring that all waste packages, data, and waste shipments meet Federal, state, and DOE requirements.

BWXT has an appropriate program for ensuring that subcontractor waste management activities are defined, analyzed, and controlled. WOD attends the pre-bid meeting with contractors to define waste management requirements and then provides specific requirements at the contract award meeting. WOD provides support to the subcontractor as they develop a waste management plan, which WOD reviews. The information in the subcontractor waste management plan is used to characterize waste streams and to define disposal requirements based on acceptable disposal paths. WOD compares the project specification package with the plan to ensure that waste streams generally match the types of work. WOD has assigned one person to provide support and review the plans for all construction, restoration, and decontamination and decommissioning (D&D) activities. As time permits, this individual also conducts walkdowns of subcontractor activities. However, current workloads are such that walkdowns are typically only performed in response to requests for field support/inspections by the BWXT project lead or a construction inspector.

The Pantex Plant Radioactive Material Certification and Characterization Program Manual successfully combines waste characterization activities at the Pantex Plant with the quality plan for the Nevada Test Site waste acceptance criteria. This manual sets requirements for various organizations at the Pantex Plant, including WOD and waste generators.

The Pantex Pollution Prevention Plan is comprehensive and the pollution prevention team has worked aggressively to achieve the pollution prevention goals. Waste management refresher training includes a section on pollution prevention. The Pantex Plant is achieving all Secretary of Energy goals for waste reduction, with the exception of sanitary waste. In response, a quality assurance team, including WOD and line personnel, has been formed to determine methods to reduce the generation of sanitary waste, thus ensuring that the line organizations are involved in the efforts to reduce waste. The Pantex Plant has also developed innovative methods (e.g., donating cardboard to a nearby town) to recycle materials that would otherwise incur disposal costs.

BWXT is taking action to help ensure that only sanitary waste is placed in dumpsters. As a result of discussions during this OA inspection about the lack of markings on sanitary dumpsters, WOD has developed a new label that will be placed on the dumpsters to clarify that they are for sanitary waste only.

The Pantex Plant is proactively remediating contamination that could impact, or has impacted, ground water in the perched aquifer. They have installed a system to pump contaminated groundwater from the

perched aquifer and to remove dissolved chromium, high explosives, and chlorinated solvents. The system then returns the clean water back to the perched aquifer.

The Pantex Plant is also proactively remediating legacy soil contamination in the area of Playa #3 through the use of a soil vapor extraction (SVE) system. The contamination found in this area is related to historical disposal practices. Although an effective system, several aspects of the SVE controls were not fully effective. The SVE system involves storage of a caustic chemical, which is used to treat the contaminated soil vapors. At the time of the OA inspection, the hazardous material placard for this container had been blown off by the wind. In addition, the system generates water as a by-product of the vapor extraction phase. This water is transferred to portable tanks and disposed of as non-potable, non-hazardous waste, though the tanks have not been clearly and permanently labeled as non-potable, non-hazardous waste, as would be indicated by best management practices. Finally, there was no MSDS available at the SVE location for the caustic chemical; the MSDS was only available in the field vehicle used by the sampling technician. It is possible that plant personnel other than the sampling technician might perform work at the site, and would not have access to an MSDS. BWXT personnel took prompt action to correct these items once they were identified.

Engineering

The function of the bays and cells fire protection system is to protect the bays and cells from fire. The fire suppression portion of this function is accomplished with two subsystems—a wet-pipe system and a deluge system. Both of these subsystems are supplied by the high pressure fire loop (HPFL), which in turn is supplied by two pump stations, each of which included a jockey pump, an electric fire pump, a diesel fire pump, and a water storage tank. These elements of the fire protection system were also reviewed by this assessment.

Most aspects of this system were determined satisfactory. The AB, including the FSARs, TSRs, and their bases documents, were generally complete, correct, and clear. The system design is adequate to perform its safety function, and reviewed modifications have maintained or improved the abilities of the system. Testing procedures and actual tests performed were in accordance with AB requirements and were generally adequate to demonstrate the system's ability to perform its safety function. However, the following weaknesses in the area of system testing were identified:

- **Diesel Fire Pump Annual Performance Testing Procedure Non-Conservatism** The annual diesel fire pump performance test procedure requires that test performance data be taken with the pump at 1,790 revolutions per minute (rpm), and that this data then be adjusted for 1,750 rpm. The operability of the pumps is then evaluated using the 1,750 rpm-adjusted data. However, the normal engine governor setting is 1,717 rpm, and pump pressure performance at this speed for any given flow would be about four percent less than what is actually evaluated. Therefore, the existing procedure did not provide a valid basis for determining the operability of the diesel fire pumps. BWXT has not evaluated the effect this discovery would have on the current test results.

- **Fire Pump Testing Calculation Errors.** The current fire pump testing procedures have no performance acceptance criteria. Instead, for each separate pump test, data is taken and provided to Fire Protection Engineering for acceptability evaluation. The fire protection engineers then perform calculations using this data to determine if TSR performance requirements were met. OA's review of a sampling of these calculations identified the following errors, some of which have the potential to mask pump performance below TSR requirements; however, none of these errors render the current actual pump performances as unacceptable.

- The calculated pump discharge pressure capability at the TSR-required flow rate was compared with the "churn pressure" (the discharge pressure at approximately zero flow) to judge acceptability. A pressure capability less than the "churn pressure" was considered as acceptable. This comparison was invalid because it would always indicate acceptable performance, regardless of how poor it actually was, since "churn pressure" would always be greater than the discharge pressure for any flow rate greater than "churn" conditions. Instead, the discharge pressure capability should have been compared to the required capability at the TSR-required flow rate, which was also determined in the calculation.

- Instrument uncertainty was not accounted for. The pressure instruments that were used had an accuracy of plus or minus 3 psig (pounds per square inch). Because some of the data is taken at low flow rates where the pump curves are relatively flat, such error could induce large indicated pump flow errors (previously identified by the fire protection engineers).

- The calculations did not account for system leakage, which would require additional pump performance to offset.

- The elevation differences between the pumps and the buildings' post indicating valves were not accounted for (a conservative error).

- The pump discharge pressures were corrected to the minimum fire water tank level from which they could maintain suction, but this correction was not identified in the calculations.

The OA team also reviewed a sample of the USQ evaluations and the plant's USQ procedure. Overall, reviewed USQ evaluations were adequately performed; however, a number of areas where there is room for improvement were identified with the plant's USQ procedure.

- The site procedure includes instructions for addressing all changes to the facility, as described in the AB, with the standard seven-question review to determine whether they constitute a USQ. However, certain types of changes were allowed to be screened out of the process before reaching the seven questions, including "insignificant" changes. One of the criteria for identifying insignificant changes was whether the "change implements what is currently in the AB" (e.g., changes to such procedures as operating procedures, testing procedures, and maintenance procedures). Allowing such procedures to be changed without undergoing the seven-question USQ evaluation is not the intent of 10 CFR 830.203, which states, "The Contractor...must implement the DOE-approved USQ procedure in situations where there is…Temporary or permanent change in the procedures as described in the existing documented safety analysis." BWXT maintained that screening out such changes did not violate the intent of the CFR if they were made as a direct, immediate, flow-down result of a DOE-approved change to the AB, although the procedure wording was not specific on this point, and would allow *any* procedure change to be screened out. BWXT indicated their intent to make the USQ procedure wording more specific, to allow only those procedure changes that were a direct, immediate, flow-down result of DOE-approved AB changes to be screened out of the seven-question evaluation.

- Question seven of the procedure's seven-question USQ evaluation process states, "Does the subject issue reduce the margin of safety?" However, the procedure does not define the term "margin of safety." BWXT personnel had informally defined the term (i.e., the difference between the performance capabilities of the systems, structures, and components and the requirements stated in the FSAR) and indicated their intent to add this definition to the procedure. For one modification to the HPFL, the term "margin of safety" was misunderstood, illustrating the need for the term to be defined. The accompanying USQ evaluation answered question seven as "no", and gave as the

justification, "There is not [sic] explicit margin of safety for the HPFL." This justification was incorrect; the performance capability of the diesel fire pumps was approximately twice the TSR requirements. (The "no" answer was correct, however, for another reason that was not identified in the evaluation.)

- One of the types of changes that the procedure allows to be screened out of the seven-question evaluation is "like-for-like" changes. However, this term is also not defined in the procedure. The contractor indicated that a definition of this term would be added.

The OA team reviewed several calculations and analyses generated by different elements of the contractor's organization, as well as the practices and procedural guidance, where it existed, for generation of such documents. The practice and procedural requirements were inconsistent across the organization and within the different types of analyses/calculations. The commonly accepted standard for calculation/analyses generation, as contained in American Society of Mechanical Engineers (ASME) NQA-1-1994, is that such documents should be "sufficiently detailed as to purpose, method, assumptions, design input, references, and units such that a person qualified in the subject can review and understand the analysis and verify the adequacy of the results without recourse to the originator." Although some of the calculations reviewed met this standard, most did not, in large part because there was no sitewide procedure that promulgated such a standard. The lack of a sitewide procedure also contributed to the observed calculation errors.

Summary

For most work observed, sufficient controls were established and implemented for the recognized hazards. Major AB upgrade efforts in recent years (including the efforts toward the SS21 initiative) have resulted in significant improvements in the controls for nuclear explosives work. The procedures used in nuclear explosives and sealed insert operations are technically accurate and complete. The recent management attention on TSR-related maintenance procedures has resulted in improvements in procedural quality. Reviewed training programs for nuclear and high explosives operations were extensive, and training was provided on schedule. Testing procedures and actual tests performed were in accordance with AB requirements and were generally adequate to demonstrate the cell confinement and fire protection systems' ability to perform their safety functions.

However, some weaknesses in processes, procedures, analysis, documentation, and implementation were identified. Administrative or engineering controls in nuclear explosive and nuclear operation procedures were not sufficiently defined to ensure that high-radiation areas would not be inadvertently created during work activities. Some hazard controls within developmental instructions were not current and/or complete for some high explosives operations observed. A few plant standards, such as the excavation permit process and maintenance work control procedures, had some deficiencies. In addition, some health and safety requirements, which are contractually imposed on BWXT, have not been incorporated into subcontracts. In some cases, subcontractors have not fully implemented controls (e.g., training). However, subcontractor work activities observed by the OA team were generally performed safely. The technical accuracy of design calculations and AB change control processes had some administrative and analytical deficiencies (which did not prevent the system from performing its safety function). Continued management attention on procedural quality is needed to ensure that hazard controls are clearly identified and documented. Overall, while a number of weaknesses need to be addressed, most controls are well designed and effectively implemented, and the controls in place provide a high degree of protection to the public, workers, and environment. The improvements in the past few years have been particularly effective in ensuring the adequacy of controls for the highest potential risks/hazards (i.e., nuclear explosives operations). Further, OASO and BWXT have addressed a number of the identified weaknesses and are taking action on several others.

E.2.4 Core Function #4 – Perform Work Within Controls

Readiness is confirmed and work is performed safely.

Nuclear Explosives and Sealed Insert Operations

Readiness to perform work is effectively verified on a daily basis through standup meetings and preoperational checks. For example, the W-76 Section Manager performs standup briefings each morning before the start of work. Work assignments and plan-of-the-day activities, such as maintenance and potential delay activities, are covered. Following the standup meeting, production technicians perform preoperational checks for the cell for the W-76 work in accordance with the checklist to ensure that the cell is ready for the planned activities.

Nuclear explosives operations were performed safely and in accordance with established controls. Production technicians performed operations in accordance with NEOP requirements and were knowledgeable of the activities, controls, and processes. In nuclear explosives activities, the procedure reader/worker/verifier system was appropriately implemented in accordance with plant standards. For example, production technicians performing W-76 and W-87 program work effectively utilized the system during all observed nuclear explosives work. Production technicians who were interviewed were fully aware of their stop-work authority and would use it if an imminent danger situation arose. In pit repackaging operations, production technicians (with one exception noted below) appropriately performed procedures in accordance with site requirements.

As discussed in Core Function #3, the site's radiation protection requirements related to continuing verification surveys for weapons activities are comprehensive and clearly defined. However, RSD expectations concerning continuing pit dose verifications during the pit repackaging effort (following initial characterization) are less clear and have not been properly implemented, as defined during pit repackaging project planning. Some RSD personnel incorrectly believed verification surveys were being performed for pit repackaging in accordance with the weapons activities requirements delineated in the RSD Operations Control Manual, which requires the performance of ten percent statistical characterization surveys as continuing verification of the validity of initial characterization surveys. However, pit repackaging does not fit either D&I or disassembly categories defined in the manual, and RSD has not performed any periodic confirmatory surveys on the initial dose rate characterization of pits being processed. Periodic confirmatory measurements were required by the initial ALARA review for the project but have not been formally defined or implemented.

Some deficiencies with implementation of certain radiation control practices and procedural compliance were observed in the sealed insert program and weapons program activities.

- A worker in the pit repackaging program did not wear lead-loaded gloves as required when working with a level 3 pit. The procedure requires the workers to refer to an appendix to determine PPE requirements for various pit types rather than listing it in the procedure steps.

- The pit repackaging procedure does not reflect actual practice related to the conduct of dose rate surveys prior to packaging in the sealed insert container.

- A few workers did not have their thermoluminescent dosimeters (TLDs) properly located in the area of most representative exposure.

- Workers did not always follow proper ALARA techniques to minimize dose, such as closing pit shield doors and maintaining optimal distance from sources during periods of inactivity.

The procedure for suspension of activities or operations (stop work) is not being fully implemented as required by the applicable Pantex Plant standard, which contains a procedural requirement that any individual suspending work initiate a "suspension of activity or operation" form. Although suspensions of activities are relatively frequent, this form is rarely used.

High Explosives Operations

For non-nuclear explosives operations, work is to be performed in accordance with established procedures and the requirements of the Conduct of Operations Manual and DOE Explosives Safety Manual. Readiness to perform work is achieved through readiness verification programs, readiness assessments, and pre start-up safety reviews defined in OSHA process safety management requirements.

Observed explosives operations were performed safely and generally in accordance with established controls. For example, engineering technicians effectively utilized the remote operations control systems (e.g., blast door interlocks and access controls) during high explosives pressing operations. Operators, technicians, and supervisors were knowledgeable of the process operations, hazards, and controls to mitigate the identified hazards.

The OA team also performed a simulated walkthrough of synthesis operations with workers in the Building 11-55 High Explosives Synthesis Facility (HESF). This operation had been performed previously and was governed by a developmental instruction (i.e., procedure). The engineering technicians and supervisors were very experienced and knowledgeable of the operation, chemicals, compounds, and safety controls for the synthesis process, and safely performed the simulated operation with no safety-significant deficiencies. It was evident that these individuals had input to the developmental instruction and were familiar with the equipment used, the hazards, and controls. The HESF pre-operational check list (a prerequisite to performing the operation) was comprehensive and had detailed instructions. Every page of the checklist contained a statement to suspend operations in the affected area and to notify supervision if the system does not meet the checklist criteria (stop-work instructions). The developmental instruction had clearly identified “exit points” to other procedures where required, such as operating the pressure vessel (to produce steam-heated water) and the utility systems (chill water). Exit point references were appropriately pointed to the specific section of the procedure to be performed, rather than to the entire procedure.

However, several deficiencies were identified with the developmental instruction, which did not fully comply with the requirements of Plant Standard 0170, *Temporary Technical Procedures Systems.* For example:

- Although several sections of the procedure had to be followed in exact sequence, that requirement was not specified in the procedure, as required by Plant Standard 0170. The standard requires specifying steps or sections that must be followed in sequence and/or those that do not have to be followed in sequence.

- Two cautions and warnings did not precede the step or were not on the same page as the step to which they applied. The standard requires warnings, cautions, and notes to be easily identifiable, to precede the described steps (on the same page), and to contain no action statements.

- Numerous steps in the procedure contain more than one action, contrary to the requirement of the standard.

- The procedure contained general instruction sections that were a mix of information, requirements, and actions. The prerequisites and initial conditions (required by the plant standard to be listed) were

somewhat obscured by the general information. The procedure would be clearer if it had separate sections for prerequisites (e.g., pre-op done and utilities in operation), initial conditions (e.g., operation-specific equipment setup and tools stages), and precautions/limitations (e.g., general instructions and information).

Maintenance

A variety of maintenance work activities were observed that involved a cross-section of nuclear and non-nuclear work, maintenance shops, and craft workers. Observed PM tasks included critical, important-to-safety, and "balance-of-plant" maintenance. Observed work included PM on: Office of Transportation Safety SGTs, tractors, and courier vehicles; the Building 12-84 uninterruptable power supply; carpentry shop work; air handling units and humidifiers; tooling manufacturing work in the large machine shop; Building 12-60-2 cranes; Building 12-116 Radsafe; security building ventilation work; winterization; fire doors; and Building 12-17 elevators. Observed work activities included lockout/tagout (LO/TO), energized electrical work, confined-space work, overhead work, and hot work.

Maintenance craft performed most work safely, with few identified deficiencies. Pantex Plant maintenance craft are experienced and knowledgeable of systems, equipment, and procedures. Craft workers were competent, and most have extensive experience at the plant. Workers displayed a safety-conscious approach and a high regard for safety. Workers had appropriate training for assigned jobs, and supervisors were observed verifying training during pre-job briefings. Several LO/TOs observed during work were performed in accordance with procedures. SWPs and other permits, when necessary, were obtained and completed properly.

The work approval and work authorization process for maintenance is formal, properly implemented, and well documented. All work, including "fix it now" tasks, requires an approved Passport work package, an approved work order, and specific authorization by the Facility Manager, in accordance with Plant Standard 5011. A facility/building transfer permit is used to authorize system LO/TO and to ensure that the LO/TO is removed after maintenance, and requires a review of the completed work order by the Facility Manager.

Observed pre-job briefings for complex jobs were thorough and addressed job hazards, procedural steps, communications, controls, and critical points of the jobs. Stop-work authority and responsibilities were addressed and well understood by maintenance workers and supervisors. Workers indicated they would not hesitate to stop work for safety concerns or questions.

A few deficiencies were observed during observations of maintenance work.

- One work practice resulted in unnecessary worker exposure to welding fumes. A worker was performing arc welding in the sheet metal shop without using local ventilation. Fumes from the welding were wafting up directly under the welding helmet into the workers breathing zone. The Maintenance Manager and shop supervisor, in addition to an OA team member, observed the unsafe operation and indicated that corrective action would be taken. Inspections of local ventilation cones revealed they had heavy accumulation of dust and were swung up and well away from work areas, indicating they were not being regularly used for welding, except for the plasma cutting ventilation.

- During crane CM on a safety class jib crane in a bay, maintenance supervision decided to disconnect an air line and lubricate an air motor without task instructions or without consulting work planners, engineering, or the vendors manual for the equipment. The decision and actions were not addressed in a CM work package or by any other procedures. After prompting by the OA team, technical

documentation was obtained that an airline lubricator was recommended, but was not installed. Therefore, lubrication (with additional task instruction) was appropriate.

- During an elevator PM, a stepladder was placed with the front legs outside the elevator and the back legs inside the elevator to inspect oil lubricators for the rails. Inadvertent elevator movement (elevator was not locked out during this step) could have caused worker injury.

Subcontract Work

Subcontractor work observed by the OA team was performed in a safe manner and in accordance with the controls described in subcontractor AHAs. AHAs were available at all subcontractor job sites, and subcontractor superintendents and workers were knowledgeable of the hazards and controls defined in AHAs, SWPs, and other permits. For the Pump and Treat Facility, the subcontractor responsible for maintaining and operating the facility has kept the facility in excellent condition.

Most subcontractors also conduct informal safety briefings on a weekly basis. Daily pre-job briefings, when conducted, are informal and focus on current work assignments and the availability of materials and resources. There is no requirement for subcontractors to conduct such briefings at Pantex, because there is minimal guidance in the OSHA regulations for pre-job briefings.

Work authorization for subcontractors is provided through the SWP and/or the issuance of a "Notice to Proceed." With few exceptions, the OA team observed that required safety plans, permits, and hazards analyses had been submitted to BWXT as required, and reviewed and approved by construction management prior to starting any work.

Since the contract transition to BWXT in FY 2000, there have been improvements in integration of safety engineers into subcontractor work activities. Recently, BWXT safety engineers supporting construction work were transferred to the Construction Department to further improve the integration of safety engineering at the work-activity level.

During the past two years, the increased focus on worker safety and the implementation of behavior-based safety programs, among other safety initiatives, have resulted in a continual reduction of injuries and illnesses for BWXT workers. For example, the BWXT total recordable case rate dropped from 3.2 in calendar year (CY) 2000 to 1.9 in CY 2002, which is below the DOE complex average of 2.3. Likewise, the BWXT lost time case rate dropped from 1.2 in CY 2001 to 0.50 in CY 2002.

Although these continually decreasing rates are commendable, these rates do not include or reflect the trends in injuries and illnesses for BWXT subcontractors at Pantex. During the same period, the total recordable case rate for BWXT subcontractors dropped from 6.8 in CY 2001 to 4.7 in CY 2002, but remains higher than the current recordable case rate of 2.3 for DOE construction contractors. During the same period, the lost workday case rate for BWXT subcontractors increased from 4.1 in CY 2001 to 4.7 in CY 2002 and remains higher than the current lost workday case rate of 1.3 for DOE construction contractors.

Waste Management and Groundwater Monitoring

BWXT's central waste management facilities are effectively operated by WOD, in accordance with environmental regulations and DOE requirements. All radioactive waste is stored in buildings or structures and in containers that are in acceptable condition. Hazardous and mixed waste is labeled and stored indoors in containers that meet regulatory requirements. Housekeeping in these facilities is excellent, and aisle spacing is marked on the floor to ensure that the required distance between rows is

maintained. Secondary containment is provided for all areas that contain liquid waste. Required spill and emergency response equipment was present and in acceptable condition. Drums are stacked using metal-framed pallets with heavy, recycled plastic cross members. Facility managers and operators were knowledgeable of requirements. The central waste facilities (buildings) were well maintained and the explosive magazines, although old, were clean and in acceptable condition.

Less-than-90-day and less-than-55-gallon storage areas are operated within regulatory requirements. Containers in the less-than-55-gallon storage areas were labeled, kept closed, and were under the control of the generator. The less-than-90-day areas also had proper container management; areas were properly posted, logs were maintained, and emergency equipment was available. A few minor concerns were noted in these areas. Marking on floors to delineate less-than-55-gallon storage areas had worn away, and one hazardous waste drum was in a position behind another drum such that the label was not readily visible. The maintenance shops have clearly marked the less-than-55-gallon storage areas, appropriately use locked containers to ensure that "under the control of the operator" requirements are met in the plumbing shops, and have posted signs in the paint shop over the waste containers. In addition, the carpenter shop has most sanitary waste containers labeled to help prevent the introduction of hazardous waste.

BWXT is effectively performing groundwater restoration activities. The SVE system and a groundwater pump-and-treat system are reducing levels of subsurface contaminants. Other examples of effective groundwater protection/restoration activities include the technical functions of data gathering, data verification, data management, interpretation, and display. Sample collection, sample handling, and well construction processes meet or exceed Environmental Protection Agency (EPA) guidelines. The Pantex Plant routinely conducts split sampling with the TCEQ, and splits samples between different laboratories for comparison. In addition, groundwater monitoring and reporting concerns that were identified in FY 2000 have been corrected.

Worker safety in the area of drilling is controlled and documented through contractual agreements, inspections, and daily briefing reports. Drill site exclusion zones are defined with yellow tape. Persons entering the exclusion zone must have a safety briefing and wear appropriate PPE.

Although most waste management activities are performed in accordance with environmental regulations and DOE and Pantex Plant requirements, several waste management compliance deficiencies were identified in shop and subcontractor work locations: waste (consisting of aerosol cans and used adhesive containers) was left in a shop area; a paintbrush used for applying an adhesive was discovered in sanitary waste; a hazardous waste container had not been kept closed as required by regulations; and a spray adhesive being used at subcontractor work site was not on the project's Waste Management Plan. BWXT took prompt action to resolve these specific concerns.

Summary

Overall, most observed work was performed within established controls, and workers understood the site hazards and the importance of procedural compliance. Workers who were interviewed indicated that they felt empowered to stop work if safety concerns arose. The increased focus on procedural compliance, worker safety, and the implementation of behavior-based safety programs, among other safety initiatives, have resulted in improvements in procedural adherence and a continual reduction of injuries and illnesses for BWXT workers. However, some instances were observed where workers failed to fully comply with procedures or work instructions, and the total recordable case rate for BWXT subcontractors is significantly higher than comparable rates for BWXT workers. While work activities at the Pantex Plant were performed with a high regard for safety, continued management attention is needed to ensure the expected level of rigor of procedure compliance, and to ensure that more attention is devoted to

monitoring and reducing injury and illness rates for BWXT subcontractors. OASO and BWXT management have addressed many of the deficiencies identified during this OA inspection.

E.3 CONCLUSIONS

Nuclear Explosives and Sealed Insert Operations. The initial planning processes for nuclear explosives and pit repackaging operations have resulted in clear definitions of the scope of work. Hazards have been adequately identified, analyzed, and documented. Appropriate controls, in most cases, have been established and implemented for recognized hazards. Most health and safety requirements and controls were adequately integrated. Observed work was generally performed within established controls, and workers understood the site hazards and the importance of procedural compliance. Recent management attention to procedure adherence has resulted in significant improvements in this area; however, a few instances were still observed where workers did not fully comply with all aspects of procedures or work instructions. Continued management attention is needed to ensure the expected level of rigor of procedure compliance and that procedures can be readily understood and used, as written. Pantex Plant management also needs to ensure that formal controls associated with potential high-radiation areas are properly defined and implemented, and that the technical bases for use of all radiological controls are well established. Although further improvements are needed in a few areas, OASO and BWXT have devoted significant management priority and attention to improving hazard controls for nuclear explosives and nuclear operations; these efforts have contributed to improvements in safety management and performance, and the overall effective implementation of the core functions for nuclear explosives operations and other nuclear operations.

High Explosives Operations. Work activities in explosives formulation, synthesis, and pressing areas were adequately defined, principally through technical procedures and developmental instructions. However, the basis for determining procedural usage for explosives operations was not sufficiently defined in BWXT procedures. Although hazards have been adequately identified, analyzed, and documented in PHAs, and although most hazard controls have been identified and appropriately implemented to control or mitigate the hazards, controls from PHAs could not always be directly linked to the controls in operational and developmental instructions and procedures. Workers and supervisors were knowledgeable of hazards associated with work activities, an adequate training program was in place, and training was kept current. Observed explosives operations were performed safely and generally in accordance with established controls. Some procedural deficiencies were identified in developmental instructions, indicating a need for continued management attention in ensuring procedural quality. Overall, although procedures and documentation need additional attention in a few specific areas, high explosives operations were performed with a high regard for safety, and controls were effective in protecting workers.

Maintenance. The scope of work for observed maintenance activities was generally well defined in work order packages, which included the work order, work instructions, and attached procedures and references. Formally established processes and checklists for work planning and scheduling guided the identification and analysis of job hazards. With few exceptions, the hazards for CM and PM activities were clearly identified in work packages and supporting documentation. Maintenance work packages for observed jobs generally demonstrated an adequate integration of controls and provided appropriate instructions for craft personnel to safely complete work activities. The work approval and authorization process for maintenance is formal, properly implemented, and well documented. Observed pre-job briefings for complex jobs were thorough and addressed job hazards. Observed maintenance work was performed safely, with few deficiencies (e.g., workplace monitoring, and a welding operation), and those deficiencies were mainly in programs and procedures, and not in the performance of supervisors and craft personnel at the working level. With few exceptions, maintenance shop areas were orderly and well

maintained. Some deficiencies need to be corrected, but the overall maintenance program is effectively implementing the ISM core functions of safety management.

Subcontract Work. Overall, construction and environmental work performed by BWXT subcontractors is well defined in contract specifications, AHAs, SWPs, and project plans, and is communicated through meetings, conferences, and ongoing interfaces between BWXT construction staff and the subcontractor. The definition of work is typically comprehensive, although in some cases, ambiguous work scopes have resulted in unclear work assignments. Work hazards for most subcontractor work activities are identified, analyzed, documented, and communicated to workers. However, the hazards analysis process (i.e., the AHA process) is not sufficiently documented to ensure that the hazards analysis process is consistently implemented, and some common construction hazards were not identified on SWPs. For subcontracted work, there are many mechanisms to define and implement hazard controls. While subcontractors are required to implement all OSHA safety requirements, some DOE requirements that are contractually imposed on BWXT have not been incorporated into subcontractor contracts, specifications, and work documents. This inconsistency in requirements between BWXT workers and subcontractors has resulted in different and, in some cases, less rigorous safety and health requirements and controls for subcontractors than for BWXT workers when performing the same activity. In some cases, safety training requirements and training programs were not sufficiently defined, implemented, or documented for subcontractors. Although some weaknesses are evident, observed work performed by subcontractors was performed safely and within prescribed controls. Injury and illness rates for BWXT subcontractors are below national averages but higher than those for BWXT employees, indicating that additional management attention on subcontractor requirements and monitoring of subcontractor work activities could result in further improvements in safety at the Pantex Plant.

Waste Management and Groundwater Monitoring. BWXT has implemented effective controls for managing hazardous, mixed, and low-level waste. Process information forms (PIFs) that link waste generation to disposal are especially effective; their use ensures that waste management is an integral part of work activities and facilitates including pollution prevention measures into operations. Legacy waste has significantly been reduced and, as a result, all current and legacy hazardous, mixed, and low-level waste is stored inside enclosures or buildings. The site is aggressively working to achieve the Secretary's pollution prevention goals. Groundwater monitoring and reporting problems that occurred in CY 2000 have been corrected, and a comprehensive groundwater assessment of the site has been conducted. Pantex has also implemented two proactive interim groundwater remediations. Finally, in anticipation of the new DOE environmental protection order, BWXT has initiated actions to meet the proposed FY 2005 DOE goal for an enhanced EMS. A few items were identified where improvements in waste management and groundwater restoration would increase the effectiveness of remediation and decrease the potential for non-compliance with regulatory, DOE, and plant requirements.

Engineering. Most aspects of the cell confinement and bays and cell fire protection systems were adequately designed, analyzed, and implemented. The AB, including the FSARs, TSRs, and their bases documents were generally complete, correct, and clear. The designs of the systems were generally adequate to perform their intended safety functions, and modifications have maintained or improved the abilities of the systems. Although some improvements were needed in technical accuracy of design calculations and test procedures, testing procedures and tests performed were in accordance with AB requirements and were generally adequate to demonstrate the ability of the system(s) design features to perform their safety function. However, the radiological risks to the worker and environment associated with the worst-case HEVR event have not been sufficiently evaluated and documented within existing approved AB documents or reflected in emergency response planning. However, BWXT plans to evaluate these risks through the Safety Evaluation Report process.

E.4 RATING

The ratings of the first four core functions reflect the status of the reviewed elements of the ISM programs for the five areas reviewed.

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

E.5 OPPORTUNITIES FOR IMPROVEMENT

This OA inspection identified the following opportunities for improvement. These potential enhancements are not intended to be prescriptive. Rather, they are intended to be reviewed and evaluated by the responsible NNSA, OASO, and contractor line management, and prioritized and modified as appropriate, in accordance with site-specific programmatic objectives.

OASO

1. **Ensure that BWXT effectively monitors the safety performance of its subcontractors. Specific actions to consider include:**

   - Develop injury and illness performance metrics for BWXT subcontractors.
   - Define accountability mechanisms for BWXT oversight of subcontractors.
   - Perform independent assessments of subcontractor work activities to evaluate the effectiveness of BWXT oversight programs.

BWXT

1. **Increase the emphasis on establishing more formal technical bases for application of radiological controls, and increase efforts to ensure worker awareness of radiation levels and area designations to optimize ALARA practices**. Specific actions to consider include:

   - Designate and control as high-radiation areas all operations that expose sources of radiation with dose rates greater than 100 mrem/hr at 30 cm, or incorporate appropriate administrative/engineering controls to ensure that any individual with access to the area would not be able to receive a dose of 100 mrem in an hour.
   - Consider posting dose rate information in bays and cells that have radiation levels above background but which do not exceed the 5 mrem/hr Radiation Area threshold.
   - Ensure that dose rate information is collected, captured, and posted for all program-specific component configurations, such as “bare pit with shield cap in place” for W-76.
   - When defining radiological controls, such as extremity monitoring, establish a mechanism that considers all workers’ tasks when considering the need to provide extremity dosimetry.

- Establish a technical basis for monitoring needs for non-uniform exposure to areas of the body, such as the face and eyes, which may occur during certain operations.

2. **Expand the current procedural "level of use" categories, as defined in the Pantex Conduct of Operations Manual and plant standards, to address non-nuclear explosives operations.** Specific actions to consider include:

   - Include expanded definitions and examples for non-nuclear operating procedures and developmental instructions.

   - Broaden the "critical use" category to include provisions for non-nuclear operations.

   - Designate risk-based criteria for each of the three "level of use" categories to account for potential health, safety, and environmental impacts; potential monetary losses; and adverse impact on quality control.

3. **Strengthen plant standards and procedures for maintenance work planning and control.** Specific actions to consider include:

   - Establish clearly documented thresholds in work control procedures for pre-job walkdowns that are based on the risk, complexity, and importance of the task involved.

   - Utilize the "Work Order Task Written To" field on the Passport work request to document a clear scope of work for all work orders in order to promote consistency in defining the scope of work for maintenance work orders.

   - Review PM procedures to ensure that they all have acceptance criteria for individual readings, sections, and the overall PM that can be used for determining operability of the equipment or system involved, with particular emphasis on PM tasks associated with AB requirements.

   - Strengthen the plant standard and implementation practices for excavations.

   - Review all welding operations in the maintenance shops, particularly the activities associated with the use of local ventilation during welding. Establish training, controls, and monitoring that will ensure that personnel exposure to welding fumes is minimized.

4. **Revise and/or develop plant standards and/or procedures to strengthen identification of hazards and to clarify the link between hazards and controls.** Specific actions to consider include:

   - Ensure that hazard controls identified during hazards analyses of operating instructions and development procedures are documented. Ensure that the processes identify a clear linkage between the hazard and the control intended to mitigate the hazard.

   - Expand the procedure review to include a documented hazards analysis.

   - Review the DMSO operating procedure and include a documented hazards assessment in the review package.

- Revise hazard controls in the DMSO procedure to be consistent with the hazards analysis. Remove outdated hazard controls (e.g., hearing protection).

- Develop a BWXT standard, or equivalent, to document how the requirements for a baseline hazard survey, as described in DOE Order 440.1A and DOE Standard 6005-2001, will be achieved.

- Develop a BWXT standard for the AHA process that addresses the purpose, content, and format of the AHA; the process for preparing, issuing, and approving the AHA; the interface between the AHA, SWPs, and other required permits; the AHA revision process; and AHA training.

- Promulgate a sitewide procedure for generating, reviewing, approving, and controlling calculations and analyses to meet the intent of ASME NQA-1-1994.

- Add pre-determined acceptance criteria to the fire pump performance testing procedures to replace the current practice of performing individual calculations after each test is completed to determine whether the pump's performance was acceptable in order to increase efficiency, timeliness, and accuracy of test results.

5. **Improve the identification, documentation, and performance of required safety training for BWXT subcontractors**. Specific actions to consider include:

   - Verify that training requirements are adequately identified in subcontractor contract specifications, safety and health plans, and AHAs.

   - Ensure that training requirements are consistent with identified hazards.

   - Improve the communication of training requirements with subcontractors.

   - Increase the monitoring of subcontractors with respect to developing training programs (formal training, briefings, computer-based training), conducting training, and documenting training results.

6. **Enhance waste activities management to ensure continued compliance with regulatory, DOE, and plant requirements**. Specific actions to consider include:

   - Ensure that hazardous substances are either included in the chemical control program or managed as part of the hazardous waste program pending recycle/reuse or disposal.

   - Continue labeling sanitary dumpsters as "Sanitary Waste Only - No Hazardous or Radioactive Waste" to help ensure that both hazardous and radioactive waste do not inadvertently enter the sanitary waste going to the offsite landfill.

   - Increase environmental awareness for operations involving waste generation in shop and subcontractor work locations to help ensure that these activities are performed in accordance with environmental regulations and DOE and plant requirements.

7. **Evaluate the need for increased or modified controls of the groundwater remediation systems**. Specific actions to consider include:

   - Upgrade hazards communication at the SVE system to ensure placarding and labeling of containers, and posting of MSDSs for chemicals used at the site.

   - Continue working toward maximizing operating time of the SVE system. Consider such actions as trending operating parameters to identify developing problems so they can be corrected before impacting operations.

   - Consider developing a series of water table contour maps as a tool to document the system's impact on groundwater flow to assist in enhancing system efficiency.

8. **Complete the co-located worker exposure analyses for the cell HEVR accident, and analyze options for reducing exposures to acceptable levels**. Specific actions to consider include:

   - Remove excessive conservatism from the analyses.

   - Evaluate the costs and benefits of design changes that ensure that penetration seals will not be blown out.

   - Evaluate the benefits and feasibility of emergency response procedures that require immediate shutdown of building ventilation for any indication of explosion to minimize the potential intake into the buildings of the initial release from the HEVR and to maximize the buildings' shelter.

9. **Revise the USQ procedure to clarify terminology and expectations**. Specific actions to consider include:

   - Clarify the USQ procedure wording regarding "insignificant changes" to allow only those procedure changes that are a direct, immediate, flow-down result of DOE-approved AB changes to be screened out of the seven-question evaluation.

   - Add the definition of the term "margin of safety."

   - Add the definition of the term "like-for-like."

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