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

ISM

Hanford Site Waste Stabilization and Disposition Project

September 2006

HSS
Office of Health, Safety and Security

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

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Abbreviations Used in This Report

AJHA	Automated Job Hazards Analysis
ALARA	As Low As Reasonably Achievable
ARA	Airborne Radioactivity Area
BED	Building Emergency Director
CAIRS	Computerized Accident/Incident Reporting System
CAMS	Corrective Action Management System
CATS	Corrective Action Tracking System
CFR	Code of Federal Regulations
CWC	Central Waste Complex
DART	Days Away and Restricted Time
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
dp	Differential Pressure
DSA	Documented Safety Analysis
EAL	Emergency Action Level
E-CAP	Environmental Compliance Assessment Program
ECP	Employee Concerns Program
EJTA	Employee Job Task Analysis
EM	DOE Office of Environmental Management
EMS	Environmental Management System

(Continued on inside back cover)

OVERSIGHT

1.0 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight, within the Office of Security and Safety Performance Assurance, conducted an inspection of environment, safety, and health (ES&H) programs at the DOE Hanford Site Waste Stabilization and Disposition Project (WSD) during August and September 2006. Since the time of the inspection, the Office of Security and Safety Performance Assurance and the Office of Environment, Safety and Health were disestablished upon the creation of the new Office of Health, Safety and Security.

The inspection was performed by Independent Oversight's Office of Environment, Safety and Health Evaluations. In conjunction with the inspection of ES&H programs, the Independent Oversight Office of Emergency Management Oversight conducted a limited-scope inspection of selected aspects of the site's emergency management program, concentrating on program implementation at T-Plant.

T-Plant

This inspection focused on the Hanford Site WSD, which encompasses efforts to store, retrieve, and treat contaminated waste from former nuclear production facilities at the Hanford Site. The DOE Office of Environmental Management (EM) provides funding for and has Headquarters line management responsibility for the Hanford Site WSD activities. At the site level, the Manager of the Richland Operations Office (RL) has DOE line management responsibility for the WSD activities. Under a contract to DOE, Fluor Hanford, Incorporated, (FH) and its subcontractors manage and perform WSD project activities.

In addition to FH activities, there are two other major DOE activities at the Hanford Site: the Office of River Protection oversees a project to manage and clean up the tank farms, and the Office of Science oversees a multi-program national laboratory, Pacific Northwest National Laboratory.

The WSD project activities at the Hanford Site involve various potential hazards that need to be effectively controlled. These hazards include exposure to radiation, radiological contamination, hazardous chemicals, and various physical hazards associated with facility operations (e.g., drum handling, heavy equipment operation, trenching and excavating, heat and cold stress, elevated work, hoisting and rigging, and noise). Additionally, volatile organic compounds associated with past nuclear and chemical operations may be present in waste drums, and possible vapor releases from these drums are an ongoing concern for managers and workers alike.

The purpose of this Independent Oversight inspection was to assess the effectiveness of ES&H programs and emergency management programs for the project as implemented by EM, RL, and FH. Independent Oversight evaluated a representative sample of activities, including:

- Implementation of the core functions of integrated safety management (ISM) for selected facilities and activities, focusing on work planning and control systems and their application to remedial actions, operations, and maintenance work activities at the Low Level Burial Grounds, the Central Waste Complex (CWC), the Waste Receiving and Processing Facility (WRAP), and T-Plant. In evaluating these activities, Independent Oversight focused primarily on implementation of ISM at the facility and activity/task levels.

- EM, RL, and FH feedback and continuous improvement systems.

- Essential safety systems, with primary emphasis on engineering, configuration management, surveillance, testing, maintenance, operation of safety systems, and feedback and improvement processes that are specific to essential safety systems, such as FH system engineers and RL safety system oversight. The essential safety system review focused on the safety-significant ventilation and fire suppression systems at two T-Plant buildings: 221-T and 2706-T.

- EM, RL, and FH effectiveness in managing and implementing selected aspects of the ES&H program that Independent Oversight has identified as focus areas, including environmental management system (EMS) implementation; workplace monitoring of non-radiological hazards; quality assurance in engineering and configuration management programs and processes; and safety system component procurement. Although these topics are not individually rated, the results of focus area reviews are integrated with or considered in the evaluation of ISM core functions and/or essential safety systems.

- Selected aspects of the emergency management program, including: work control and configuration management processes related to maintenance of emergency planning hazards surveys and emergency preparedness hazards assessments (EPHAs); facility-specific emergency response plans and procedures; initial training and proficiency mechanisms for facility emergency responders; emergency management and response feedback and improvement mechanisms; and functionality of selected facility systems for identifying and communicating emergency conditions and implementing protective actions.

Sections 2 and 3 discuss the key positive attributes and weaknesses identified during this review. Section 4 provides a summary assessment of the effectiveness of the major ISM and emergency management elements that were reviewed. Section 5 provides Independent Oversight's conclusions regarding the overall effectiveness of EM, RL, and FH management of ES&H and emergency management programs, and Section 6 presents the ratings assigned during this review. Appendix A provides supplemental

Solid Waste Storage and Disposal Facilities

information, including team composition, and Appendix B identifies the specific findings that require corrective action and follow-up.

Five technical appendices (C through G) contain detailed results of the Independent Oversight review. Appendix C provides the results of the review of the application of the first four core functions of ISM for work activities. Appendix D presents the results of the review of feedback and continuous improvement processes and management systems. Appendix E presents the results of the review of essential safety system functionality and two related focus areas (quality assurance in engineering and configuration management programs and processes, and safety system component procurement). Appendix F presents the results of the review of safety management of the other selected focus areas. Appendix G presents the results of the review of selected aspects of the emergency management program. For each of these areas, Independent Oversight identified opportunities for improvement for consideration by EM, RL, and FH management. The opportunities for improvement are listed at the end of each appendix so that they can be considered in context of the status of the areas reviewed.

2.0 Positive Attributes

Several positive attributes were identified in ES&H and emergency management programs, including certain aspects of work control processes, engineering controls, and feedback and improvement processes.

Workplace monitoring of non-radiological hazards is robust for those activities that present the highest potential for worker exposures. For those work tasks that involve the highest potential risk for worker exposures (e.g., chemical vapors from drums and metals), significant attention is focused on characterizing the exposure source and minimizing worker exposures through engineering, administrative, and personal protection controls. For example, at the waste retrieval sites, industrial hygienists have monitored and continue to monitor

Waste Activities

worker exposures during drum retrieval and drum venting activities for a number of hazardous waste streams. At CWC, industrial hygienists routinely monitor hazardous waste drum storage warehouses and workers in those facilities for potential exposures to chemical vapors. At T-Plant,

Waste Verification at T-Plant

industrial hygienists continuously monitor worker exposures and worker environments for chemical vapors when sorting hazardous waste drums. Collectively, these work activities present some of the most significant potential for worker exposures to chemical vapors at each of these WSD projects. In addition to worker exposures to chemical vapors, heat stress is another potential significant workplace hazard at several of these WSD projects. For these hazards, industrial hygienists provide continuous monitoring of wet bulb globe thermometer values so that line managers can determine the appropriate engineering, administrative, and personal protection controls.

RL and FH have each instituted an effective environmental management system for meeting DOE Order 450.1, *Environmental Protection Program*, requirements, including a noteworthy pollution prevention facility. RL has developed an EMS for Federal activities and oversight of contractor activities that has been effectively integrated into the RL integrated management system. As part of contractor oversight, RL has performed an initial environmental compliance assessment program (E-CAP) assessment that shows the E-CAP can be an effective tool for identifying and defining compliance concerns. FH has successfully integrated environmental requirements into the ISM system and deploys environmental expertise to the field organizations to ensure that environmental requirements are met. FH also operates a noteworthy Centralized Consolidation/

Recycling Center, which provides an efficient and effective recycling program for the site.

Waste Retrieval Activities

FH has established and implemented a robust and effective performance monitoring program. Quality assurance and safety and health personnel and functional area managers conduct routine, formal analysis of event/incident and non-event performance data and metrics that identify reportable recurring events, adverse safety trends, and emerging issues that require further monitoring or evaluation or directed corrective or preventive actions. Results of this iterative process of data collection and analysis are documented in quarterly performance analysis reports, and newly identified issues and actions are managed through the FH corrective action management system. This process is an effective means to identify and address declining performance and proactively address emerging potential safety issues.

RL and FH have effectively integrated the T-Plant facility emergency preparedness program with the sitewide emergency management program. The site emergency management plan provides a solid foundation for an integrated, strategic approach to emergency response at this multi-contractor site, and it is adequately supported by a system of emergency plan implementing procedures. Project- and facility-specific implementing procedures are generally well-integrated with the site procedures and largely provide the facility operators with the necessary tools to respond to emergency events. Furthermore, training and drills at the T-Plant have been effective at preparing responders for their roles in an emergency. The T-Plant drill program, based on a mostly-comprehensive set of institutionalized drill program requirements, is a notable programmatic strength, and drill results have been used to improve the facility's program.

3.0 Weaknesses

Although many aspects of ES&H and emergency management are effective and mature, there are weaknesses in the engineering design and safety bases for essential safety systems, activity hazards analysis and controls, and feedback and improvement.

The engineering design and safety bases for T-Plant safety systems are not sufficient to ensure that their safety functions will be performed in all accident scenarios. The minimum allowable building negative differential pressures for 221-T and 2706-T and the minimum allowable fire sprinkler header water pressure for 2706-T are not adequate to ensure that their safety functions will be reliably accomplished. Further, the safety basis documents and supporting analyses for these systems contain numerous discrepancies and inconsistencies that could keep users from fully and confidently understanding the commitments, performance requirements, and capabilities for these systems and the facility.

Weaknesses in activity-level hazards analysis and control processes at WSD activities have not been adequately addressed. Although mechanisms for analyzing and controlling hazards associated with WSD activities are generally adequate, in some cases insufficient rigor has been applied to these processes. As a result, hazards have not been properly identified or analyzed. Additionally, the job hazards analysis process provides excessive latitude for classifying work as skill-based. In some cases, the processes are not implemented in a manner that ensures that all hazards are properly evaluated and analyzed for skill-of-the-craft work so that appropriate controls can be implemented before work is performed. Systemic weaknesses in hazard control implementation were evident across WSD in application of the FH work control process, including inadequate linkage between hazards and controls and ineffective specification of controls. The resulting controls are not always sufficient to fully ensure worker protection. At the WRAP facility, there are weaknesses in radiological work planning and evaluation and application of some radiological controls for airborne radioactivity associated with transuranic glovebox waste processing. Also, instances were observed across WSD in which workers did not follow applicable safety and health requirements, in part because of workers' perception of low risk and insufficient attention to requirements. Although FH received a finding from RL in June 2005 that identified cross-cutting concerns regarding FH work planning processes for identifying hazards and implementation of controls in work instructions, deficiencies observed during this inspection indicate that FH line organizations have made limited improvement in implementation of the hazard control process. Weaknesses in radiological control implementation were also identified in a 2005 FH independent assessment and all corrective actions have been closed; however, corrective actions were not fully effective, as evidenced by the continuing deficiencies.

The rigor of implementation of some feedback and improvement programs is insufficient. While FH assurance systems are generally well defined, there are implementation inadequacies and a lack of rigor in documenting activities and actions in employee concerns, occupational injury and illness investigation, and lessons-learned programs. Although FH has compiled excellent injury and illness statistics and has had few significant operational safety events and incidents, injury investigation and corrective/preventive action processes and documentation need considerable strengthening to ensure effective prevention of occupational injuries and exposures. Process weaknesses and deficiencies in case file documentation adversely impacted the effectiveness of the employee concerns program. Although there is much anecdotal evidence of the identification and application of lessons learned, the level of effectiveness and thoroughness of the program cannot be determined because of insufficient rigor in documentation of screening, analysis, and corrective/preventive actions. The weaknesses in feedback and improvement contribute to the continuing weaknesses in hazards analysis and controls discussed above.

4.0 Summary Assessment

The following paragraphs provide a summary assessment of the EM, RL, and FH activities that Independent Oversight evaluated during this inspection. Additional details relevant to the evaluated organizations are included in the technical appendices of this report.

Work Planning and Control

FH has defined a systematic work control process that includes the use of enhanced work planning, activity job hazards analyses, operating procedures, work instructions, and work packages to control workplace hazards. When used correctly, this process appropriately communicates the hazards and necessary controls for discrete work activities. The appropriate work documents sufficiently describe the planned activity, scope, schedule, and requirements, and the mechanisms for identifying and analyzing activity-level hazards are generally adequate. Most work activities that were observed in WSD were conducted safely in accordance with established controls. Worker experience and skill contribute to the safe performance of work. However, the Independent Oversight team identified a systemic problem with the work control process and several problems with work control implementation. The job hazards analysis process provides excessive latitude for classifying work as skill-based. FH has not ensured that the work control process is used effectively and implemented consistently for all WSD work activities so that controls are clearly defined, address all workplace hazards, and are properly integrated into work instructions. In addition, continuing problems exist in radiological work planning and evaluation and application of some radiological controls. For some work activities, insufficient rigor and attention to requirements, including procedures, have resulted in the failure to meet some health and safety requirements. Increased management attention is needed to ensure that work activities are planned and conducted in accordance with FH requirements so that all hazards are identified and analyzed, appropriate controls are developed and implemented, and workers perform the work in accordance with the established hazard controls and requirements.

Feedback and Improvement Systems

EM. EM senior managers demonstrated that they clearly understand their safety management roles and responsibilities, and are engaged in making safety decisions and in setting priorities. Communication mechanisms between EM and RL are effective, and the delegation of safety management roles and responsibilities is formal and appropriate.

RL. RL roles and responsibilities for ES&H are generally well described, and most ES&H responsibilities are adequately implemented. The RL FR program is a mature, well-managed, and generally well-documented program. RL evaluations of contractor performance appropriately reflect ES&H performance in incentive fee determinations. RL has an assessment program in place and conducts surveillances, operational awareness, self-assessments, and formal assessments of its contractors. However, there are a number of deficiencies in RL assessments in the areas of self-assessments, planning and scheduling assessments, and several procedures. RL has self-identified that the technical qualification program does not meet applicable requirements and needs to be significantly enhanced. The RL issues management/corrective action tracking process has a number of deficiencies and requires senior RL management attention to revise and implement an effective program. Some aspects of the employee concerns program are adequately implemented, but disposition criteria for the transfer of employee concerns are not adequately defined.

FH. FH has established and implemented effective processes for the various elements of a contractor assurance system as delineated in DOE Order 226.1. Generally robust assessment, safety inspection, and issues management programs have been established. Performance analysis is used effectively to identify adverse trends and emerging safety concerns and issues. Lessons learned are being identified and applied. Safety concerns are addressed, and several new processes are being piloted to identify and prevent safety problems. With some exceptions, implementation of the activity-level feedback and improvement processes is effective, with many examples of improvements in processes and safety attributed to staff feedback as reported by WSD management. However, process and procedure weaknesses and implementation deficiencies in several areas hinder fully effective safety oversight. Some feedback and improvement program procedures lack sufficient detail, clear responsibilities, and sufficient process controls. More rigor is needed in the implementation of employee concerns and lessons-learned programs to demonstrate and provide assurance of the effectiveness of these programs. The implementation of assessment and issues management processes also needs improvement in some areas. Issues identified by assessments of work control and radiological controls have not been addressed in a fully effective or timely manner. Although FH has compiled excellent injury and illness statistics and few significant operational safety events and incidents, the injury investigation and corrective/preventive action processes and documentation need considerable strengthening to ensure effective prevention of occupational injuries and exposures.

Essential System Functionality

At T-Plant, the FH and WSD configuration management policies, processes and supporting procedures adequately establish a rigorous framework for such areas as identification of safety-significant systems, structures, and components; development of a configuration baseline; control of design calculations, drawings, and modifications; and document control. Configuration management requirements have been translated and implemented at T-Plant except for the potentially inadequate safety analysis portion of the unreviewed safety question process, as exemplified by several safety basis deficiencies identified during this inspection that were not promptly evaluated by the process as required. The facility has established an effective configuration baseline for the safety systems that were reviewed (the fire suppression and exhaust ventilation systems). The surveillance procedures are generally well written and controlled, and are performed and completed in a rigorous manner. Similarly, the operating procedures and operator training for the safety systems that were reviewed have prepared T-plant personnel to monitor and operate the safety systems and supporting systems at T-Plant and take appropriate actions during emergencies. Safety system components are in good physical condition and are appropriately maintained to ensure their continued integrity, operability, and reliability.

T-Plant Canyon Deck

Many aspects of the FH engineering and configuration management programs are comprehensive and well defined. However, the number and nature of the discrepancies identified in the safety bases for the safety systems that were reviewed indicate that the safety basis generation and review processes and their translation into support documents have not always been executed with the rigor necessary to assure reliable performance of accident prevention and mitigation functions, and therefore warrant significant management attention and near-term action. An extent of condition evaluation is needed to determine the full extent of deficiencies with all WSD nuclear facilities.

WSD has a mature corrective action management process in place that in most cases addressed T-Plant deficiencies effectively by identifying, prioritizing, and defining effective corrective actions for essential safety system issues. The corrective action management process also adequately tracks the status and closure of corrective actions. FH has established an effective system engineer program to ensure that the configuration management and operating status is maintained for the safety systems at T-Plant. Similarly, RL has established an adequate safety system oversight program that reviews the effectiveness of the FH system engineer program, the configuration and material condition of safety systems, and the appropriateness of safety system maintenance and surveillance activities to determine the reliability of the safety systems. However, the roles and responsibilities specified in DOE Order 420.1B, *Facility Safety,* for contractor system engineers, and indirectly for DOE safety system oversight engineers, do not include the responsibility to validate that the safety bases and their supporting analyses are correct for their assigned systems. Instead, the safety basis review and approval process is assumed to adequately perform such validations. However, as was demonstrated by the number and nature of the safety basis discrepancies identified in this assessment, this approach was not sufficiently effective for the master documented safety analyses for those facilities.

Focus Areas

EMS and pollution prevention program. RL has instituted an effective EMS for Federal activities and for ensuring that contractors meet DOE Order 450.1 requirements. FH has an approved EMS that integrates environmental requirements into the ISM system. The EMS adequately sets general expectations for line organizations to integrate environmental requirements into work activities, including requirements for pollution prevention/waste minimization. Environmental expertise is deployed to field organizations, and effective tools (environmental-activity screening form and a waste planning checklist) are used to ensure that environmental aspects are effectively integrated into facility operations and work activities. Although the FH environmental program generally meets expectations, a few areas for improvement were identified in the technical review of field operations by subject matter experts, assurance that pollution prevention activities are conducted, and training for hazardous waste generators.

Waste Receiving and Processing Facility

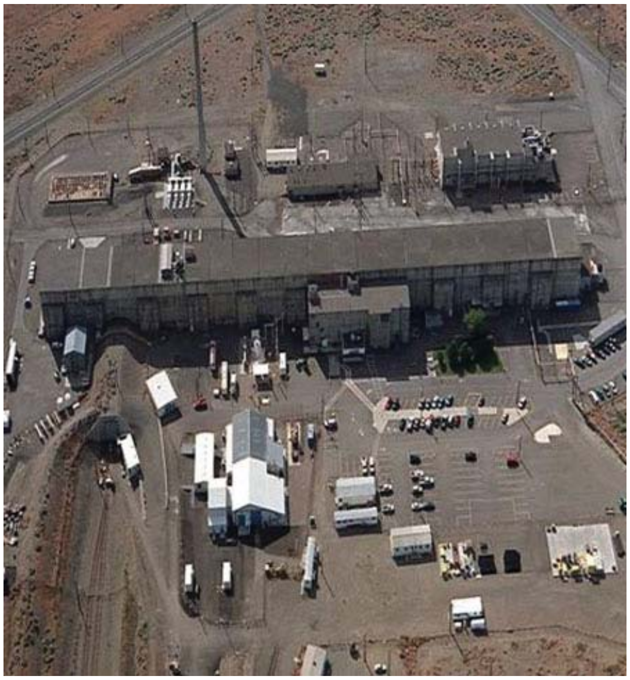
Workplace monitoring of non-radiological hazards. Overall workplace monitoring of non-radiological hazards is robust and in accordance with the intent of DOE Order 440.1A, with a few exceptions. Most exposure hazards have been identified, analyzed, and quantified at each of the WSD projects that were assessed. For those work tasks that involve the highest potential for worker exposures (e.g., chemical vapors and metals), significant attention is focused on characterizing the source and minimizing worker exposures through engineering, administrative, and personal protection controls. Exposure monitoring and sampling programs have been implemented, including direct monitoring instruments and personal breathing zone monitoring to assess the vapor hazard. Adequate resources have been allocated to implement the exposure assessment and workplace monitoring requirements of DOE Order 440.1A. However, there are several areas in which improvements are warranted, such as workplace exposure assessment program documentation, exposure records and retrieval of records, provisions to ensure sufficient industrial hygiene involvement in the analysis of the exposure potential (particularly for skill-based work and when changes in the workplace environment result in new hazards or increased risk to worker safety and health), and integration of workplace monitoring and exposure assessments into work documents.

Quality assurance in engineering and configuration management programs and processes. FH's engineering design implementing procedures (design criteria, calculations, and drawings) provide acceptable instructions for the generation, review, and approval of important engineering documents. The FH configuration management procedures provide adequate instructions.

Safety system component procurement. Safety system procurement processes are well defined and are effectively implemented for procured items to ensure that they meet quality criteria and are appropriate to the intended application for safety-related systems, structures, and components.

Emergency Management

Previous Independent Oversight inspections of the Hanford Site emergency management program found that the program was comprehensive, thoroughly documented, and well integrated. With a few exceptions, FH and RL have continued to implement an effective emergency management program that provides confidence in the ability of the emergency response organization to protect workers and the public in the event of a hazardous material release. Planning for identified hazards has provided site responders with a sound, integrated approach to emergency response and includes appropriate training and drills to prepare them to execute their responsibilities. Self-assessment and oversight processes have contributed to improvements in the program, and RL has maintained adequate oversight of the program. FH has also implemented critical self-assessment and appropriate corrective action processes that have been effective in identifying and addressing program weaknesses. RL continues to maintain adequate oversight of the FH programs through a combination of Facility Representative observations of facility emergency preparedness activities and emergency preparedness program manager involvement in operational awareness activities at the site level.


T-Plant

Nevertheless, the Independent Oversight team identified some weaknesses in the site's planning, preparedness, and readiness assurance activities. Development of emergency action levels and emergency response procedures is hampered by limitations in the spectrum of potential mid-range events that were analyzed within the T-Plant confinement areas (necessary to fully support the facility's emergency response) and some weaknesses in the emergency action level bases in the EPHA. Although no significant hazardous chemicals were identified at the facility during the inspection, processes to identify potentially hazardous materials, particularly chemicals, for screening and potential analysis were not always implemented effectively. And, although overall the readiness assurance program is contributing to program improvements, it does not always capture facility drill program improvement items for trending and inclusion in the lessons-learned program, and the RL effectiveness review process does not ensure that the review scope is well understood and that report conclusions are adequately supported and documented.

5.0 Conclusions

Many aspects of EM, RL, and FH ISM and emergency management systems are conceptually sound, and many aspects are effectively implemented. For the most part, RL and FH managers and workers are well qualified and demonstrate their understanding of and commitment to safety, which has contributed to the excellent injury and illness statistics. FH's record for Occupational Safety and Health Administration total recordable case rates and days away and restricted time rates is the second best of eight EM sites, is better than the overall DOE complex averages, and generally shows improving trends.

However, the identified weaknesses in engineering design and safety bases for the systems reviewed at the T-Plant raise questions about their operability and adequacy. There are also continuing weaknesses in work planning and control at the facilities and activities that were reviewed. Many of these weaknesses were previously identified but have not been adequately addressed, in part because of weaknesses in implementation of feedback and improvement programs and insufficient management attention to line management accountability for corrective actions.

6.0 Ratings

The ratings reflect the current status of the reviewed elements of the Hanford Site WSD ISM and emergency management programs.

Work Planning and Control

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

Feedback and Continuous Improvement - Core Function #5

RL Feedback and Continuous Improvement Processes ....NEEDS IMPROVEMENT
FH Feedback and Continuous Improvement Processes ....NEEDS IMPROVEMENT

Essential System Functionality

Configuration Management Programs and Supporting Processes .... EFFECTIVE PERFORMANCE
Engineering Design and Authorization Basis .... SIGNIFICANT WEAKNESS
Surveillance and Testing .... EFFECTIVE PERFORMANCE
Maintenance and Procurement.. EFFECTIVE PERFORMANCE
Operations .... EFFECTIVE PERFORMANCE

Emergency Management

Emergency Planning .... EFFECTIVE PERFORMANCE
Emergency Preparedness .... EFFECTIVE PERFORMANCE
Readiness Assurance .... EFFECTIVE PERFORMANCE

APPENDIX A
SUPPLEMENTAL INFORMATION

A.1 Dates of Review

Planning Visit	August 8-10, 2006
Onsite Inspection Visit	August 21-31, 2006
Report Validation and Closeout	September 25-27, 2006

A.2 Management

Glenn S. Podonsky, Chief, Office of Health, Safety and Security*
Michael A. Kilpatrick, Deputy Chief for Operations, Office of Health, Safety and Security*
Bradley Peterson, Director, Office of Independent Oversight
Patricia Worthington, Director, Office of Health and Safety
Thomas Staker, Acting Director, Office of Environment, Safety and Health Evaluations

A.2.1 Quality Review Board

Michael Kilpatrick	Bradley Peterson	Thomas Staker
Dean Hickman	Robert Nelson	Bill Sanders

A.2.2 Review Team

Brad Davy, Team Leader	Steve Simonson, Deputy Team Leader		
Phil Aiken	Vic Crawford	Ivon Fergus	Ali Ghovanlou
Mike Gilroy	Marvin Mielke	Bill Miller	Jim O'Brien
David Odland	Robert Compton	Al Gibson	Joe Lischinsky
Jim Lockridge	Tim Martin	Joe Panchison	Don Prevatte
Ed Stafford	Mario Vigliani		

A.2.3 Administrative Support

MaryAnne Sirk	Tom Davis

A.3 Ratings

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

* Formerly the Office of Security and Safety Performance Assurance. The Office of Security and Safety Performance Assurance and the Office of Environment, Safety and Health were disestablished upon the creation of the new Office of Health, Safety and Security.

- **Significant Weakness (Red):** Indicates senior management needs to immediately focus attention and resources necessary to resolve management system or programmatic weaknesses identified. A Significant Weakness rating would normally reflect a number of significant findings identified within a management system or program that degrade its overall effectiveness and/or that are longstanding deficiencies that have not been adequately addressed. A Significant Weakness rating would, in most cases, warrant immediate action and compensatory measures as appropriate.

- **Needs Improvement (Yellow):** Indicates a need for improvement and a significant increase in attention to a management system or program. This rating is anticipatory and provides an opportunity for line management to correct and improve performance before it results in a significant weakness.

- **Effective Performance (Green):** Indicates effective overall performance in a management system or program. There may be specific findings or deficiencies that require attention and resolution, but that do not degrade the overall effectiveness of the system or program.

APPENDIX B
SITE-SPECIFIC FINDINGS

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

FINDING STATEMENTS	PAGE
C-1: WSD has not sufficiently implemented the JHA process and associated AJHA tool to adequately identify, analyze, and/or document all existing or changing workplace hazards. (DOE Policy 450.4, *Safety Management System Policy)*	20
C-2: The FH JHA process lacks sufficient requirements to ensure that the hazards for skill-based work activities are appropriately identified, adequately analyzed, and documented, particularly when confounding elements are introduced into the work activity (e.g., complex work environments, use of multiple crafts). (DOE Policy 450.4, *Safety Management System Policy*)	21
C-3: WSD has not ensured that AJHA controls are sufficiently concise, tailored, and linked to the hazard for which the control was intended to mitigate, and are sufficiently integrated into procedures and work instructions so that worker understanding and safety are maintained. (DOE Policy 450.4, *Safety Management System Policy)*	24
C-4: FH and WSD have not properly evaluated the applicability of certain required airborne radioactivity controls during TRU glovebox load-out operations at WRAP, or followed established FH processes to ensure that an appropriate technical basis for current practices has been established and approved by senior FH radiological control management. (FH Radiological Control Manual)	25
C-5: WRAP has not always applied sufficient rigor to radiological work planning activities as needed to ensure that radiological work control documents are tailored to specific work activities, have been properly screened for risk, contain accurate information, and are properly integrated with each other and the FH work control and AJHA processes. (DOE Policy 450.4, *Safety Management System Policy,* and 10 CFR 835)	26
C-6: WSD workers do not always meet requirements in work documents or operating procedures. (FH procedures, conduct of operations requirements, DOE Policy 450.4, *Safety Management System Policy*, and DOE Order 440.1, *Worker Protection Management for DOE Federal and Contractor Employees)*	29
D-1: RL has not implemented a defined process that ensures that all required assessments are listed and are conducted at the required periodicity. (DOE Order 226.1, *Implementation of DOE Oversight Policy)*	34
D-2: RL has not implemented a fully effective self-assessment program. (DOE Order 226.1, *Implementation of DOE Oversight Policy*)	34
D-3: RL has not implemented an adequate technical qualification program for subject matter experts. (DOE Manual 360.1-1B, *Federal Employee Training Manual*, and DOE Manual 426.1-1A, *Federal Technical Capability Manual*)	35

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

FINDING STATEMENTS	PAGE
D-4: RL has not ensured that its issues management and corrective action tracking processes adequately identify issues and corrective actions, track them to closure, and are effective in resolving deficiencies and preventing recurrence. (DOE Order 226.1, *Implementation of DOE Oversight Policy)*	36
D-5: RL has not established disposition criteria for employee concerns that are adequate to ensure independent, objective evaluations. (DOE Order 442.1A, *Employee Concerns Program*)	38
D-6: FH is not consistently effective in rigorously addressing safety issues and employee concerns to ensure that all elements of deficient or potentially deficient conditions and performance are thoroughly evaluated, with appropriate corrective and preventive actions implemented in a timely manner. (DOE Policy 450.4, *Safety Management System Policy*, and DOE Order 226.1, *Implementation of DOE Oversight Policy)*	41
E-1: FH, in several cases, did not enter the formal PISA evaluation process in a timely manner for valid safety basis concerns identified during this inspection. (10 CFR 830 and procedures *USQ Process* [HNF-PRO-062] and *Unreviewed Safety Questions* [WMP-200-4-3])	55
E-2: The T-Plant safety-related fire suppression system TSR static pressure value and supporting surveillance test do not ensure that the system will perform its intended safety function (sprinkler flow) as defined and required in the TSR bases, as well as support concurrent manual hose stream flow as required by NFPA 13. (10 CFR 830 and T-Plant technical safety requirements)	56
E-3: The T-Plant safety-related ventilation exhaust systems' safety bases' limits for building negative pressures and HEPA filter loading during fires, the safety bases' descriptions of equipment and strategies for dealing with fire-induced filter failures, and the supporting analyses for these limits and descriptions are not adequate to ensure that the systems will perform their intended safety functions, as credited in the safety bases. (10 CFR 830 and T-Plant safety bases)	59
E-4: FH has not ensured that the safety bases for the T-Plant facilities, including the MDSA, the TSRs, and the FHA, and the supporting analyses are valid, consistent, and adequate, and that the translation of the safety bases into facility procedures/practices is adequate to demonstrate that the safety-significant ventilation and fire suppression systems will perform their intended safety functions. (10 CFR 830 and T-Plant safety bases)	60
E-5: RL's reviews were not performed with sufficient rigor, depth, and detail, in some cases, to ensure that the safety bases for the T-Plant facilities, including the MDSA, the TSRs, and the FHA, and the supporting analyses are valid, consistent, and adequate, and that the translation of the safety bases into facility procedures/practices is adequate to demonstrate that the safety-significant ventilation and fire suppression systems will perform their intended safety functions. (10 CFR 830 and DOE Standard 1104)	60

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

FINDING STATEMENTS	PAGE
F-1: FH has not fully met the requirements of DOE Order 440.1A with respect to maintaining baseline hazards assessments, recording personnel exposure records, and ensuring that industrial hygienists are appropriately involved in assessing changes in workplace exposures. (DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees)*	75
G-1: The SWOC EPHA does not include a spectrum of mid-range events to facilitate development of response tools that support T-Plant emergency response organization personnel in addressing a full range of potential internal building events. (DOE Order 151.1C, *Comprehensive Emergency Management System*, and RLEP 3.22, *Emergency Preparedness Hazards Assessments)*	80

APPENDIX C
WORK PLANNING AND CONTROL

C.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight evaluated work planning and control processes and implementation of the core functions of integrated safety management (ISM) at the DOE Hanford Site Waste Stabilization and Disposition Project (WSD). The Independent Oversight review of the ISM core functions focused on environment, safety, and health (ES&H) programs and work planning and control systems at the Solid Waste Operation Complex (SWOC).

The SWOC is comprised of the Hanford Site Low Level Burial Grounds (LLBG), the Central Waste Complex (CWC), the T-Plant Complex, and the Waste Receiving and Processing Facility (WRAP). These facilities are functionally interrelated, and their combined functions are integrated into a cohesive solid waste management function that is the responsibility of Fluor Hanford, Incorporated (FH). The primary mission of the SWOC is to receive, retrieve, treat, process, store, ship, and dispose of low-level waste, low-level mixed waste (LLMW), transuranic (TRU) waste, and TRU mixed waste. The LLBG mission is to dispose of low-level waste and LLMW, and to store and retrieve TRU wastes. The CWC mission is to receive, stage, store, treat, and ship a wide variety of wastes. The T-Plant mission is to decontaminate equipment, and to ship, receive, store, treat, and repackage a variety of wastes. The basic mission of the WRAP is to receive, stage, store, treat, and ship wastes to treatment, storage, or disposal facilities. These missions will last until all low-level waste and LLMW are placed in disposal, the LLBG are covered as part of closure, and the TRU waste and TRU mixed waste are shipped off site for final disposal. The T-Plant, WRAP, LLBG, and CWC are Category II non-reactor special nuclear material (SNM) facilities. The SWOC facilities are located in the 200 West Area and 200 East Area of the Hanford Site.

This Independent Oversight review focused on procedure-driven operations (mission-related) work and facility infrastructure and maintenance activities, which include both moderate- to high-hazard operations and maintenance work activities, and low-risk, repetitive activities performed under minor maintenance work tickets and "no planning required" work orders. At the selected facilities, Independent Oversight reviewed implementation of the core functions of ISM, observed ongoing operations, toured work areas, observed equipment operations, conducted technical discussions and interviews with managers and technical staff, reviewed interfaces with ES&H staff, and reviewed ES&H documentation (e.g., facility standards, permits, and safety analyses). Observed work included drum retrieval, movement, sorting, venting, testing, repackaging, storage, and shipment; glovebox and bag operations; trenching and shoring; crane and forklift operations; preventive and corrective maintenance; construction; and other common industrial work. FH activity-level feedback and improvement systems at the SWOC were also reviewed and are discussed in Appendix D.

C.2 Results

Core Function #1: Define the Scope of Work

The FH work management process, as described in HNF-PRO-12115 (Rev. 12), governs conduct of work activities under the Project Hanford management contract. Most of the operational work performed at the SWOC facilities is defined in detailed facility operating procedures. Maintenance work is defined in work packages or minor work orders. Operations procedures and work packages are developed in conjunction with the job hazards analysis process (HNF-PRO-079) for work planning and control of these tasks.

The scope and purpose of work performed at WSD facilities is generally well defined in operations and maintenance procedures, work instructions, work packages, and related work documents. Work activities performed under the individual facilities' operating procedures are generally well defined with respect to work scope and boundaries. Many individual work activities were observed during this evaluation and most were well defined. For example, operational waste retrieval plans and procedures at LLBG provide adequate work scope definition so that hazards and controls can be identified, and Solid Waste Storage and Disposal (SWSD) waste retrieval operations and maintenance-like activities are well defined in SWSD procedures and work packages, respectively. The CWC's primary activity of receiving, transferring, and storing waste drums is well defined in one central operating procedure, and minor maintenance activities, such as forklift maintenance performed by a central shops mechanic at CWC, was appropriately defined in the work package. The reviewed T-plant operational processes, corrective general and minor maintenance packages, preventive maintenance packages, and facility modifications performed by subcontractors (e.g., the life safety upgrade project) contained the appropriate scopes of work. At WRAP, operations procedures cover a variety of waste management activities performed in the facility, including package receipt, inspection, handling, movement, sampling, repackaging, loading, shipment, and related actions. For preventive and corrective maintenance work, specific work packages are prepared to address actions needed to complete these activities. The scopes of work in both operations procedures and work packages are sufficiently detailed to permit hazard identification.

If the work satisfies the necessary criteria for a minor work ticket (e.g., the work is low-risk, radiological, skill-based work as defined by HNF-PRO-079, *Job Hazard Analysis*, or is listed as skill-based in the work management procedure), the work management procedure allows the use of minor work tickets, and no additional planning is required. In most cases, the minor work tickets that were reviewed adequately defined the scope of work. For example, at CWC, two minor maintenance work packages involving forklift corrective and preventive maintenance correctly defined the work being performed and properly bounded the activities. At the T-Plant, the definition of work in a minor maintenance work package for the generic electrician tasks involved in "Canyon Relamping/Fixture Replacement" was sufficiently specific to appropriately support hazard identification and work instruction development. Further, the work package included two work change notices that appropriately replaced the original work document statement of scope and purpose to encompass additional specific work tasks.

Although work scope and definitions are generally adequate, the Independent Oversight team observed a few exceptions. For example, the defined scope of a generic work package for "Routine Gas Bottle change out and miscellaneous pipefitter tasks" encompassed a broader set of activities than is routinely performed, intended, or analyzed for hazards at T-Plant. For instance, it includes adjustment of manipulators not currently present at T-Plant.

For some maintenance activities incorrectly treated as skill-based, Independent Oversight identified several instances where the work being performed exceeded the limitations of that category of work. These cases included work performed in environmental conditions not previously or specifically assessed, or that could not be evaluated solely through the knowledge level of the workers performing the activity. Examples include work performed in radiologically contaminated areas, confined spaces, and in areas with changing high-noise conditions. These and other examples are detailed later in this appendix.

Summary. Although isolated cases of inadequately documented work scope definitions were identified, appropriate work control processes are in place at the WSD facilities evaluated, and the work documents reviewed by Independent Oversight were generally sufficient to describe the planned activity scope, schedule, and requirements.

Core Function #2: Analyze the Hazards

Many hazards associated with WSD operations and maintenance activities have been adequately analyzed, and workers are often well informed of these hazards. At the facility level, hazards are defined in authorization basis documents. Technical safety requirements (TSRs) bound operations and maintenance activities, and are included in appropriate operations and maintenance procedures (see Appendix E).

At the activity level, FH provides several mechanisms to ensure that work hazards are identified, analyzed, and documented, including the employee job task analysis (EJTA), job hazards analysis (JHA), and the radiological work permit (RWP) process. Nonradiological hazards are identified and analyzed through the EJTA and/or JHA processes. The EJTA is completed for all workers and is intended to document the routine job-/task-based hazards to which each category of worker is expected to be exposed during his/her work assignments. Appropriate employee training and/or medical monitoring is scheduled through an integrated training electronic matrix based on the results of the EJTA, and in some cases is the extent of the formal hazards analysis needed to perform skill-based work. When more detailed nonradiological hazards analysis is required (i.e., because of changing or complex work area hazards), the JHA process requires use of the automated job hazards analysis (AJHA) tool to further document and ensure sufficient analysis of these hazards by appropriate subject matter experts (SMEs). Radiological hazards are also identified through the EJTA/JHA processes, but are further analyzed through the RWP development process using a graded approach. All radiological work requires formal risk-ranking that dictates the level of required hazards analysis. Low-risk radiological work may include only completion or assignment of a general RWP, whereas medium- and high-risk radiological work requires more comprehensive analysis, including completion of an as-low-as-reasonably-achievable (ALARA) management worksheet, job-specific RWP, and higher level radiological control management reviews.

The JHA procedure, AJHA tool, and the radiological risk screening and RWP processes provide suitable mechanisms and protocols for identifying and analyzing most activity-level hazards at WSD facilities and field locations. Overall, these processes provide an appropriate framework for identifying all hazards applicable to a specific work scope and provide mechanisms that include a detailed discussion of the unique hazards specific to the work activity/location. A number of AJHAs contain adequate identification of the work activity, the specific hazards present, and safe work requirements or controls, including personal protective equipment (PPE), to mitigate or control hazards. When these processes are properly implemented, hazards can be systematically evaluated and appropriate controls can be implemented, as evidenced in the following examples:

- At CWC, personnel performing minor, non-complex maintenance work appropriately identified and analyzed the hazards. For example, a forklift mechanic demonstrated the necessary knowledge of the hazards of the work and used proper PPE.

- The nine-page standing AJHA for retrieval of TRU waste containers in 218-W-4C identified the major hazards encountered in the retrieval of TRU waste containers, detailed the required controls to mitigate the hazards, and provided explanations for many of the hazards and controls identified.

- At T-Plant, canyon operations procedures generally included or referenced documents that identified and analyzed the appropriate hazards. For example, the T-Plant operating procedure for drum waste processing referenced an RWP and standing AJHA; both the RWP and the AJHA identified the associated hazards and corresponding controls, and included precautions and limitations, prerequisites, boxed warnings and notes, and "continuous" use procedure steps. The reviewed T-Plant maintenance packages, which included AJHAs, operating experience reviews, radiological risk screening forms, ALARA management review forms, RWPs, waste planning checklists, electrical work checklists, energy control checklists, and hand calculations determining work-specific safety requirements, almost always appropriately identified and analyzed hazards.

- Most construction and maintenance activities at T-Plant were sufficiently identified and analyzed before the start of work. For example, lockout/tagout requirements for hazards identified in the AJHA, the plan-of-the-day meeting, and a pre-job briefing for the T-Plant life safety upgrade project were identified, planned, and executed by the facility controlling authority prior to authorizing work for that day. In another example, a subcontractor construction AJHA completed by Fluor Government Group safety personnel was reviewed by T-Plant SMEs (radiation, industrial hygiene, and safety experts) to determine whether site-specific hazards could have impacted the AJHA.

The JHA process provides for involvement and integration of appropriate ES&H SMEs into the hazard identification and analysis process. For example, environmental compliance officers are properly engaged in work planning to ensure that environmental requirements are met. Deployment of environmental compliance officers within field organizations promotes daily contact with management and workers so that hazards and controls can be quickly identified and implemented. The environmental compliance officer also interfaces with the FH central environmental compliance organization to resolve more complex environmental concerns. In most cases, environmental requirements are imbedded as steps in the developed procedures. Similarly, industrial hygienists and safety professionals are involved in the preparation of most AJHAs and in the review of EJTAs, which are used to identify and assess routine hazards and provide data to determine training needs, medical qualification, and appropriate levels of exposure monitoring for the routine work activities/tasks to be performed. The vast majority of WSD work tasks have been evaluated by Industrial Hygiene for potential worker exposures. For work activities that could expose workers to hazardous vapor releases from the movement, storage, and opening of waste drums, considerable monitoring of both the drum contents and worker exposures has been performed and is still performed as needed based on the potential risk to workers. In most cases, Industrial Hygiene has also assessed the hazards to workers from the environmental stressors in which they work, such as noise, heat stress, and ergonomic hazards.

While the FH JHA process provides an appropriate framework for hazards analysis, some hazards have not been sufficiently identified or analyzed using the JHA or other alternative processes, such as EJTAs. Some work plans and procedures as well as AJHAs have not adequately identified all of the applicable hazards to which workers may be exposed. Examples of missed or poorly defined hazards as well as unanalyzed hazards observed by the Independent Oversight team include the following:

- At LLBG waste retrieval operations, the AJHA for dart venting operations (a puncture operation used to vent drums) makes no reference to such hazards as the potential for volatile organic compounds or hydrogen release, or the unanticipated release of stored potential energy. Although engineering and administrative controls have been implemented to control worker exposures to these hazards and these hazards are identified in safety basis documents, they are not addressed in the AJHA. In addition, changes to processes or equipment resulting in the potential for new hazards are not always managed in accordance with AJHA requirements (including conduct of additional monitoring and appropriate posting or implementation of additional controls) as required. For example, although the AJHA for waste retrieval activities at 218-W-4C provided explanations for most previously identified controls, the AJHA had not been sufficiently modified to identify additional controls to mitigate noise hazards resulting from recent equipment movement. A staging area contained three pieces of equipment (a diesel-powered electric generator, a gas-powered electric generator, and a water mist high-pressure pump), each with the potential for generating significant noise levels. When they operated at the same time, the surrounding noise levels significantly increased. Workers frequently traversed this unanalyzed high-noise area to access supplies kept within the immediate area. Although individual equipment had been previously monitored by Industrial Hygiene, operational activities resulted in the collocation of this equipment, creating the unanalyzed high-noise area; however, additional Industrial Hygiene monitoring was not requested by operations or conducted by Industrial Hygiene personnel who provide routine job coverage. Subsequent Industrial Hygiene monitoring indicated elevated noise levels, prompting replacement of one generator and relocation of supplies to a less noisy area. In another example, workers used an impact wrench and mallet to place rings on drums; however, neither the workers nor other individuals in close proximity used hearing protection. The AJHA addressing powered hand tools states "Hearing Protection - As determined by Industrial Hygiene". Noise dosimetry data had been collected by Industrial Hygiene for one individual, indicating an average 80 decibels adjusted (dBa); however, this individual was not representative of a maximally exposed worker.

- At the LLBG, a work activity using a crane to place LLMW into a trench at LLBG was performed in accordance with procedure SW-100-144, *Management of LLMW at LLBG*, and a standing AJHA, 2X-236, but no analysis was performed to address the unique hazards at the trench. Because the procedure was generic for all LLMW crane moves, the AJHA for this procedure only required a qualified crane operator and spotter, and did not address hazards analysis of the work location. Further analysis of the work location was not performed, as required by the FH work management procedure, although hazards to environmental remediation equipment did exist. For example, the manhole in place at the trench is vulnerable since the structure is fully exposed. In addition, part of the piping from this manhole is less than two feet below the surface. The use of the crane around the manhole and above the piping could result in unnecessary damage to the leachate sampling and collection system required by the Resource Conservation and Recovery Act permit. Task-/location-specific planning, including crane placement, could have eliminated this potential impact; however, this risk was not evaluated or analyzed in accordance with DOE-RL 92-36, *Hanford Site Hoisting and Rigging Manual*.

- At T-Plant, noise hazards related to the installation of dry wall were not adequately analyzed, and although hearing protection was available, some workers were not utilizing ear plugs at the job site. The potential for noise hazards was initially identified in the AJHA for the T-Plant life safety upgrade construction project; however, the condition created by fastening dry wall into metal studs created a potential noise hazard that was not recognized by the Fluor Government Group crew. A subsequent assessment of the hazard following questions from the Independent Oversight team determined that the noise level reached the 85 dBa threshold and should have been analyzed to determine whether and what type of noise protection should have been used.

- At T-Plant, the potential hazards from flammable vapors and from radioactive and toxic emissions were not specifically identified in the drum waste processing AJHA (although they were controlled through a number of mechanisms, such as an RWP, enclosure ventilation, drum waste processing continuous use procedure requirements, glovebag integrity, glovebag exhaust subsystem, drum hood and hood exhaust, and radiological control technician and Industrial Hygiene monitoring).

- At WRAP, JHAs for a number of operations procedures did not identify unique hazards and controls associated with the work, and often, lacked sufficient task breakdown and detail. The AJHA tool allows for up to three subtasks to be specified so that unique hazards and controls for various elements of the work can be identified. However, JHAs for some WRAP operations procedures did not utilize the subtask feature, resulting in missed hazards and/or controls not tailored to specific work activities. For example, the TRU load-out glovebox operation JHA had numerous deficiencies, including not properly accounting for work performed inside and outside the glovebox for which hazards and controls varied (i.e., drum handling hazards during load-out). Other problems included failing to identify a number of hazards in the JHA associated with the work, including hoisting, rotating/moving machinery, powered hand tool use, system breaches, chemicals/hazardous waste, noise, and generation of airborne dusts and/or radioactive or toxic air emissions.

FINDING #C-1: WSD has not sufficiently implemented the JHA process and associated AJHA tool to adequately identify, analyze, and/or document all existing or changing workplace hazards. (DOE Policy 450.4, *Safety Management System Policy)*

The FH JHA procedure and AJHA process guide lack sufficiently clear requirements for when to classify work as skill-based. Work supervisors and/or work planners are allowed to make an informal, subjective decision about whether work is skill-based, thereby eliminating the need for a formal, documented hazards analysis. In some cases, work activities have been incorrectly classified as skill-based, but then later discovered that the task required an AJHA. For example, a recent work activity at the WRAP involved repair to the stack monitoring system. The work was initiated as a skill-based activity without an AJHA, based on experience with prior evolutions that used an AJHA. However, because of the number of hazards (e.g., work at elevated heights) and involvement of multiple crafts (e.g., pipefitters, RCTs, electricians) that were not familiar with the hazards associated with the other crafts' work, the work was paused by a concerned worker and the WRAP Employee Zero Accident Council (EZAC) chairperson was consulted. After further review, the EZAC chairperson and facility manager agreed that a new AJHA should be prepared before the work could proceed. In this case, the workers appropriately intervened and questioned the adequacy of the hazards analysis; however, the planning process failed to ensure classification of this work as beyond skill-based.

Some maintenance work lacks a sufficient documented hazards analysis because the work is sometimes incorrectly classified as skill-based, contrary to FH expectations delineated in the AJHA process guide. At the WRAP, most minor and planned maintenance is performed as skill of the craft, for which an AJHA is not prepared. For these activities, hazard identification is conducted by the workers performing the activity and maintenance planners based on their experience and training as defined in their EJTAs. According to the JHA procedure and AJHA process guide, hazards associated with work classified as skill-based must be assessed and mitigated through the EJTA and integrated training electronic matrix process. In many of the WRAP maintenance work packages, hazards and hazard levels varied with the work activity, and the general EJTA information did not provide sufficient analysis to ensure that controls chosen by the worker were adequate. In these cases, a limited hazards summary or full AJHA should have been performed to ensure that hazards were properly analyzed. For example, continuous air monitor functional testing exposed workers to high noise levels for extended periods of time, but the work was classified as skill-based and therefore did not have a formal hazards analysis. The EJTA process does not qualify the worker to determine the specific noise level or determine the appropriate level of hearing protection needed. In another example, work involving a confined space and lockout/tagout of energized equipment was classified as skill-based, contrary to the information suggested in the AJHA process guide stating that confined space work is beyond skill-based. Through the EJTA process, the worker is not able to ascertain whether a permit-required confined space can be downgraded to non-permit, and whether or not the chemical products used during the work would require a change to the space evaluation. In the example just given, material safety data sheet information was not reviewed or evaluated as part of the original confined space evaluation.

FINDING #C-2: The FH JHA process lacks sufficient requirements to ensure that the hazards for skill-based work activities are appropriately identified, adequately analyzed, and documented, particularly when confounding elements are introduced into the work activity (e.g., complex work environments, use of multiple crafts). (DOE Policy 450.4, *Safety Management System Policy)*

Summary. Mechanisms for identifying and analyzing hazards associated with WSD activities are generally adequate. In some cases, insufficient rigor has been applied to these processes, and as a result, hazards have not been properly identified or analyzed. Additionally, the JHA process lacks sufficient clarity on expectations for classifying skill-based work, and in some cases the JHA/AJHA is not implemented in a manner that ensures that all hazards are properly evaluated and analyzed so that appropriate controls can be implemented before work is performed.

Core Function #3: Identify and Implement Controls

WSD facilities rely extensively on engineering and administrative controls to mitigate hazards. Designed engineered controls are prevalent at permanent WSD waste processing and storage facilities, such as T-Plant and WRAP. These controls include the use of such containment devices as gloveboxes and bags, enclosures, ventilation systems, remote operating panels, and shielding systems specific to the work. Engineered ventilation systems are also used in waste storage facilities at CWC and are designed to mitigate such potential airborne hazards as carbon monoxide build-up from forklift operation and vapor build-up from residual off gassing from stored drums. At all WSD facilities, engineered controls are complemented by a variety of administrative controls including work permits, postings, administrative procedures, and work instructions prepared to control particular activities. Because hazards cannot be completely eliminated with engineered and administrative controls, PPE is also used extensively in some operations, such as waste retrieval, handling, and processing, throughout WSD.

FH has defined a systematic work control process that includes the use of enhanced work planning, AJHAs, operating procedures, work instructions, and work packages. In most cases, this process has been implemented correctly and is effective in communicating the hazards and necessary controls for discrete work activities. (See exceptions later in this section.) The Independent Oversight team identified examples across WSD where effective implementation of hazard controls was observed:

- Operations procedures and work instructions used to control many activities were generally detailed and complete. In most cases, operations activities and maintenance work was governed by detailed written procedures and/or work instructions tailored to the work. Because hazard controls are not always incorporated into work instructions (see later discussion), some facilities, such as T-Plant, compensate by listing the accompanying AJHA as a required document in the special tools, equipment, and materials section of the procedure. In other cases, a series of notes were provided that identified hazards and provided controls.

- At most facilities, postings were used effectively to communicate hazards and controls. For example, CWC warehouse entry postings are comprehensive and address the potential hazards and required controls for entry into the buildings. Postings also identified specific hazards and needed controls for personnel access to the drum storage areas at CWC and the TRU package transporter loading areas at WRAP. In addition, CWC management requires that verbal authorization be granted every day before operators initiate any drum moving activities in the storage warehouses.

- Heat stress identification and monitoring was provided at WSD facilities, along with training, procedures and readily available bottled water supplies. Procedures and charts were available that defined such minimum controls as work/rest regimes and water replacement schedules.

- The EJTA process was effective in ensuring that routine job-related hazards were identified for specific workers and that appropriate training and medical monitoring was scheduled and performed. For example, training provided to a T-Plant lead operations employee working in the shipping and receiving area and an instrumentation and control technician at WRAP included all general hazards encountered with their job tasks in their training profile.

- Use of the Access Control Entry System electronic RWP access control process at all facilities minimizes the potential for unqualified workers to sign in on RWPs by real-time cross-checking against many worker training requirements. For example, the system will not allow a worker with expired or insufficient radiation worker training to sign in on an RWP that requires the training.

- Most AJHAs for complex work were comprehensive, accurate, and complete. For example, the standing AJHA developed in support of the *Management of Solid Waste in CWC* procedure provided a detailed hazard listing and specified the specific controls needed to mitigate the hazards.

- T-Plant has provided appropriate procedure precautions and limitations to ensure that limits on hydrogen in newly vented containers are met. T-Plant uses direct reading instruments coupled with an appropriate technical basis to ensure that the hydrogen concentration is below the SWOC TSR limit of 15 percent and the management-directive-invoked limit of 5 percent.

- Before T-Plant construction personnel working above a six-foot elevation were allowed to tie off on facility structures, plant engineering evaluated the tie-off structures to ensure that they could support the weight of the workers.

Most work activities within WSD involve some degree of radiological hazards, and in most cases implementation of radiological controls is conservative and appropriate (exceptions discussed later). Examples of effective radiological hazard controls were noted in all facilities reviewed.

- There is ample radiological protection support at WRAP, and RCTs are proficient in conducting and documenting surveys in support of the radiological control program. Contamination control efforts are generally effective and comprehensive. For example, personnel hand and foot monitoring is required when exiting all areas where radioactive materials are present or stored, including areas that are not posted as radiological buffer areas (RBAs). Radiological job coverage is provided for many activities, and expectations for RCT actions are often documented in task-specific procedures, such as those for TRU glovebox operations and non-destructive assay survey and leak testing. Surveys and monitoring performed in support of radiological work was performed appropriately and was documented on required survey forms in a complete and legible manner.

- At T-Plant, because of ALARA considerations and incomplete radiological characterization, management conservatively requires RWPs and radiological surveys for all work performed above six feet to assess radiological conditions before initiating work activities.

- Radiological controls established for retrieval activities at 218-W-4C included appropriate dose rate and contamination controls for the drum retrieval and survey locations, as well as perimeter and breathing zone radiological air sampling. Dose rate controls included use of electronic dosimetry and specific ALARA measures specified in the RWP for handling high dose rate drums and for working in posted high-radiation areas. Contamination controls included contamination area boundary demarcation through use of a radiological boundary indicator (i.e., a chain) and postings, and use of radiological PPE when working in a contaminated area. Air sampling was sufficient and consisted of a network of retrospective radiological air samplers placed to be representative of the workers' breathing zone and down wind at the boundary of the contamination area.

While the Independent Oversight team observed many positive aspects of hazard control implementation, systematic weaknesses were evident across WSD in application of the FH AJHA process, including inadequate linkage between hazards and controls and ineffective specification of controls. In particular, many AJHAs, procedures, and other administrative hazard controls were not sufficiently clear and specific, and did not contain sufficient detail of the expected hazardous conditions and accompanying required controls. Consequently, the controls were not sufficient to fully ensure worker protection in all cases. There were also differences between controls presented in AJHAs and those appearing in accompanying procedures and work instructions, and in some cases, controls were not incorporated in any work documents. These inconsistencies indicate that work planners and supervisors are not always using the intended FH work management and AJHA processes during work package and procedure development. Although FH received a finding from Richland Operations Office in June 2005 that identified cross-cutting concerns regarding FH work planning processes for identifying hazards and implementing controls in work instructions (see Appendix D), deficiencies observed during this inspection indicate that FH line organizations have made only limited improvement in implementation of AJHA controls. Implementation deficiencies were noted in all facilities reviewed. Representative examples of the identified deficiencies for each facility include:

Low Level Burial Grounds

- SWSD waste retrieval activities at the LLBG include workers within a contamination area who use an impact wrench and mallet to place rings on drums without any requirement for hearing protection for the operator or other individuals in close proximity. The AJHA, under "Powered Hand Tools," states "Hearing Protection - As determined by Industrial Hygiene," as the only control. However, noise dosimetry data for individuals actually operating the equipment has not been collected by Industrial Hygiene. Although one sample of noise dosimetry was collected for an Industrial Hygiene technician working in the area during retrieval operations, and the sample analysis indicated an average noise level of 80 dBa that was deemed acceptable and therefore required no hearing protection, the analysis did not evaluate the exposure to the maximally exposed worker.

- Some AJHAs for SWSD waste retrieval activities provide controls for chemical hazards, such as "Keep Material Safety Data Sheet and/or chemical inventory on hand," "identify significant chemical products," and "Waste handling and disposal to be managed in accordance with SW-100-134," but do not provide adequate tailoring of the material safety data sheet controls to specific work activities to ensure that workers know the proper controls, such as required PPE.

Central Waste Complex

- The CWC procedure for the management of solid waste describes allowable loads for standard wood and steel pallets but does not specify design (or inspection) criteria for the varying pallet designs (the Independent Oversight team observed more than six types of pallets in use at CWC). The procedure also allows for a maximum load per "standard pallet" as 4,000 pounds for wood pallets. However, there is no definition of a standard pallet or what specific type of pallet is needed (3 or 4 stringer design, 1 by 4 or 2 by 6 inch deck boards) to be able to support the 4,000-pound allowable load. In addition, the 4,000-pound limit does not specify whether it is for one pallet with 4 drums or if it can be interpreted to allow 4,000 pounds per pallet stacked three high, resulting in a 12,000-pound load allowed for the lowest pallet. The procedure also allows a load limit of 23,000 pounds for metal pallets, but Hanford WSD uses two types of metal pallets, and only one of the two can support the 23,000-pound load limit. Three examples of pallet failures resulting in reportable occurrences have occurred across the DOE complex over the last three years, including two at Hanford.

T-Plant

- The T-Plant AJHA for "Shipping, Receiving and Relocating Waste Containers" specifies "Foot Protection – Safety-toe shoe/boot (American National Standards Institute Z41) when moving drums" and "Foot Protection - Substantial leather-upper shoe/boot." The drum handling supervisor at the shipping/receiving pad did not consider steel toe work shoes as required if the fork truck placed the drums on a pallet or if personnel only slid drums confined to that pallet. The supervisor narrowly interpreted drum handling as actual tipping or placing drums on a handcart, and no clear definition of drum handling was provided.

- The T-Plant AJHA for the August 2006 operations special procedure for "Drum Venting in the 221-

T Tunnel" states that the "Waste forms include combustibles, such as oil," with an applicable control of "Company Fire Protection Engineer review required," but the AJHA listing of required permits was not updated for the planned activity to document that a fire permit providing additional controls was required. A fire permit was required and was established for this activity.

Waste Receiving and Processing Facility

- The TRU waste glovebox sorting procedure specifies the use of non-sparking devices if flammable vapors are suspected. However, neither this hazard or control are contained in the AJHA, nor are the criteria for suspecting flammable vapors identified. For example, facility management indicated that all drums are vented and sampled for vapors prior to receipt at WRAP and that, in their opinion, the control was not needed, even when processing F-Listed waste streams.

- The hazard controls in the AJHA for the darting process conducted within the WRAP storage building are deficient in several respects. Although the AJHA states that "industrial hygiene review and determination of additional controls/personal protective equipment is required," there is no record of Industrial Hygiene involvement in the review or approval of the AJHA. A second control in the AJHA is to "evaluate and record the dust composition in the 'Controls by Task' screen." The meaning of this control is not clear, and therefore has not been performed. A third unclear control in the AJHA is "ventilation/engineering controls." While a local ventilation unit is used and referenced in the procedure, the AJHA lacks sufficient information on the specific airborne hazard (e.g., particulate dusts, organic vapors). Facility management indicates that the use of this ventilation was instituted for worker comfort only, but this stipulation is not reflected by the AJHA or procedure. In 2004, there was a first-aid case associated with darting operations in WRAP. A number of additional controls were recommended as a result of this event; however, their disposition has not been formally documented or incorporated into the AJHA or procedure.

FINDING #C-3: WSD has not ensured that AJHA controls are sufficiently concise, tailored, and linked to the hazard for which the control was intended to mitigate, and are sufficiently integrated into procedures and work instructions so that worker understanding and safety are maintained. (DOE Policy 450.4, *Safety Management System Policy)*

In addition to the AJHA concerns addressed above, a 2005 FH independent assessment identified weaknesses related to implementation of the WRAP radiological control program. This Independent Oversight inspection identified continuing weaknesses of a similar nature in radiological control implementation at WRAP, primarily relating to airborne radioactivity controls and radiological work planning for TRU glovebox processing activities. These concerns are outlined below.

TRU glovebox waste processing activities at WRAP typically represent the highest radiological risk to workers at the facility because of the need to routinely transfer waste in and out of the glovebox system. This transfer is accomplished by mating and non-mating drums via specially designed transfer ports, which theoretically maintain the sealed integrity of the glovebox and prevent any radioactive material from escaping during the transfer. However, when waste drums are removed from these exit ports, process history has demonstrated that the port seals do not always fully prevent the release of radiological contamination to the room, resulting in potential worker exposure to low levels of airborne TRU materials. WRAP management has expended much effort to understand and better refine the process to minimize potential releases, and to ensure that potential intakes are monitored through the use of lapel sampling and bioassays. However, inadvertent releases of TRU material continue to occur, as evidenced by occasional elevated lapel and/or job-specific air sample results following the work.

Lapel sampling records confirm periodic indications of airborne radioactivity in excess of one derived air concentration-hour (DAC-hr), which is the FH trigger level for further review. These events are appropriately tracked and evaluated by facility management (i.e., trending, process modifications, and special bioassays). Results of follow-up bioassays have confirmed the expected low magnitude of corresponding internal doses, consistent with what would be expected for these intakes. However, in response to lapel data exceeding one DAC-hr, WRAP has not implemented other required radiological controls specified in the FH Radiological Control Manual. For example, any positive and confirmed lapel result in excess of one DAC-hr for a ten-hour shift is also evidence that the area should be formally evaluated and may need to be posted and controlled as an airborne radioactivity area (ARA). This is because one DAC-hr of radioactive material (~3pCi for Pu) could not possibly be collected on a sample filter if the concentration had remained below 0.1 DAC during the sampling (0.1 DAC times 10 hrs = 1 DAC-hr). 0.1 DAC is the FH air concentration that requires posting and control as an ARA. ARA controls specified in FH procedures normally include the use of respiratory protection unless appropriate variances have been established (see below). Contrary to these requirements, the WRAP Room 107 process area was not and is not routinely posted and controlled as an ARA during TRU glovebox processing and load-out operations. WRAP radiation control personnel indicate they do not use lapel air sampling data to evaluate airborne concentrations for posting and ARA control purposes. However, this approach does not meet FH procedural requirements and is not documented or authorized by any WRAP or FH procedure or technical basis document (see Finding #C-4).

There is an allowance in the FH procedures to use the less restrictive regulatory criteria stated in 10 CFR 835 as the definition of an ARA, provided projects or activities that elect to do so develop a technical equivalency determination. This process is outlined in Article 113 of the Radiological Control Manual and requires involvement and review by senior FH radiation control management before implementation. However, the WRAP has not developed a technical equivalency determination to support lack of ARA postings and controls, nor has it formally consulted with the FH SME and regulatory interpretive authority for a determination whether past lapel data may necessitate that this area be posted and controlled as an ARA under the regulatory definition itself. Under 10 CFR 835, an ARA is defined as any area where "an individual present in the area without respiratory protection could receive an intake exceeding 12 DAC-hrs in a week." (See Finding #C-4.)

FINDING #C-4: FH and WSD have not properly evaluated the applicability of certain required airborne radioactivity controls during TRU glovebox load-out operations at WRAP, or followed established FH processes to ensure that an appropriate technical basis for current practices has been established and approved by senior FH radiological control management. (FH Radiological Control Manual)

The Independent Oversight team also identified systematic problems with radiological work planning for TRU glovebox operations at WRAP. These problems include inadequate specification of radiological controls through the RWP, radiological risk screening, and ALARA management worksheet processes, as well as inadequate integration of these processes with the AJHA system. For example, the AJHA for operations procedure WRP1-OP-0726 lists RWP WP-007 as the controlling RWP for glovebox load-out. The corresponding ALARA management worksheet for this procedure was screened as high-risk radiological work. Specific radiological work planning and procedural deficiencies associated with this work include the following:

- RWP-WP-007 is listed as a general RWP in violation of FH requirements for high-risk radiological work. The scope of work authorized by RWP-WP-007 is much broader than what the operating procedure allows.

- The radiological controls for this high-risk radiological work were not included into the work instruction as required by HNF 135536, *Radiological Work Permits*. For all medium- and high-risk radiological work, a job-specific RWP is required and shall not be approved and issued until the ALARA review is completed and the radiological requirements are placed into the work document.

- The technical work document number block on the RWP is marked "As Applicable," contrary to FH requirements to specify the applicable specific work documents.

- The RWP ALARA review and pre-job briefing blocks are incorrectly checked as not required, in conflict with the FH requirements for high-risk radiological work. As a result, required weekly formal pre-job briefings have not been performed during this work.

- The operations procedure specifies certain conditions under which respiratory protection should be used, which are in conflict with RWP WP-007, which does not specify respiratory protection. Management indicates that another RWP (WP-535) is used before donning respirators; however, that RWP is not referenced by the AJHA, and the procedure lacks any instruction concerning the need to use or switch to a different RWP.

Other examples of inattention to detail and failure to implement radiological work planning processes as required include:

- The AJHA for WRPI-OP-0725 lists two RWPs with different controls for the work, but the AJHA, procedure, and ALARA management worksheet do not specify when to use each RWP.

- The FH radiological risk screening form for OP-725 incorrectly states that RWP WP-007 is screened as low risk, when it actually screened as high risk for drum exits.

- The ALARA management worksheet for WRPI-OP-725 lists RWPs 007 and 034, which have different authorized tasks and controls. The worksheet is inadequate because it does not address the scope of work covered by RWP-WP-034, such as decontamination in a respirator.

- The AJHA for WRPI-OP-0732 for decontamination of glovebox surfaces lists two RWPs with different controls for the work, but neither the AJHA procedure nor the ALARA management worksheet specifies the conditions under which each RWP must be used. The risk screening form screened the work as medium risk based on contamination levels less than 1,000 times the applicable threshold values; however, the ALARA management worksheet lists the contamination levels in excess of 1,000 times the threshold values, which would screen the work as high risk.

FINDING #C-5: WRAP has not always applied sufficient rigor to radiological work planning activities as needed to ensure that radiological work control documents are tailored to specific work activities, have been properly screened for risk, contain accurate information, and are properly integrated with each other and the FH work control and AJHA processes. (DOE Policy 450.4, *Safety Management System Policy,* and 10 CFR 835)

As discussed previously, similar programmatic weaknesses in radiological control implementation were identified in a 2005 FH independent assessment. All corrective actions have been closed; however, they were not fully effective, as evidenced by the continuing deficiencies. (See Appendix D.)

Some less systematic radiological control weaknesses were identified at SWSD. For example, radiological monitoring conducted at the LLBG lacked appropriate documented technical bases or rationale**.** The WSD waste retrieval project radiological surveys conducted in support of down-posting of radiological areas provides no guidance for release surveys from the RBAs for such items as cranes or earth moving equipment with outriggers and tires, which have significantly disturbed the loose soils over which they traverse. Additionally, the technical basis for monitoring and determination of removable contamination on soil surfaces in contamination areas and RBAs as well as monitoring and determination of alpha contamination on wet soil surfaces in contamination areas and RBAs is either undocumented or unknown to health physics technicians conducting actual surveys.

Summary. FH has defined a systematic work control process that includes the use of enhanced work planning, AJHAs, operating procedures, work instructions, and work packages, to control workplace hazards. When used correctly, this process appropriately communicates the hazards and necessary controls for discrete work activities. However, WSD has not ensured that this process is used effectively and is consistently implemented for all work activities so that controls are clearly defined, address all workplace hazards, and are properly integrated into work instructions. At the WRAP facility, there are continuing weaknesses in radiological work planning and evaluation and application of radiological controls for airborne radioactivity associated with TRU glovebox waste processing. Similar weaknesses had been previously identified but not adequately corrected.

Core Function #4: Perform Work Within Controls

Readiness to perform work within WSD is implemented on a daily basis using plan-of-the-day schedules, morning meetings, crew briefings, and pre-job briefs. A plan-of-the-day meeting is conducted each morning at each facility to review the scheduled work activities for the day, and discuss any changed conditions. WSD management and ES&H were present at each of their respective plan-of-the-day meetings. The plan-of-the-day meeting is also one of several mechanisms for authorizing work activities. After a work activity has been planned and the operational procedure or work package is reviewed and approved, a pre-job briefing is normally conducted by the responsible person in charge or line supervisor. Pre-job briefings may be formal or informal, depending on the hazard classification of the work. Pre-job briefings were well attended, informative, and comprehensive, and the emphasis on performing work safely is evident. WSD pre-job briefings addressed individual work assignments, the operational status of the facilities, upcoming individual training requirements, radiological controls for each activity, and daily hazards (e.g., heat stress, hoisting and rigging). Some pre-job briefs reemphasized potential hazards, ALARA considerations, and the importance of maintaining awareness of location of other personnel during drum movements and venting evolutions. Additionally, the pre-job briefs often reviewed RWP requirements or prerequisites (i.e., respirator qualifications and Access Control Entry System database verification).

In most cases, WSD workers and their supervision continually stress and maintain a safe work environment, and most WSD operations and work activities were conducted safely and in accordance with the controls specified in work documents. TRU waste drum repackaging activities at the T-Plant were performed in accordance with procedures and exhibited good teamwork, with no observed safety concerns. As examples, operators performed thorough verification of glovebag integrity; operators frequently confirmed glovebag negative pressure; RCTs recognized and promptly responded to a flow failure on an operator's lapel breathing zone sampler; and operators consistently retracted the box top opener blades before setting them down to protect the integrity of the glovebag floor. At WRAP, workers performed many work activities safely in accordance with established requirements and controls. Workers donned appropriate work clothing and PPE and were diligent about observing facility rules and postings. Operators performing TRU package transporter loading followed the safety requirements for the work being performed. Work activities involving bridge and mobile crane inspections were effectively performed, and lockout/tagout of energized non-destructive evaluation equipment was performed safely, in accordance with the lockout/tagout requirements. The waste accumulation areas at WSD facilities are generally properly managed. For example, waste handlers in the material storage area at WRAP used two properly labeled 55-gallon drums that were kept locked so that the containers were under the control of the operator. WSD workers are also not hesitant to identify unsafe work conditions or to exercise their stop-work authority if working conditions appear to be unsafe. However, in some cases, work activities were not performed in accordance with safe work practices or requirements identified in AJHAs. For example, crane support for placement of LLMW into a trench was performed in a manner that increased the potential for an injury. During placement of the drums of LLMW, a drum being placed into the trench bumped into another drum that was being labeled by the workers. The workers had their heads down while working on the first drum and were not focused on the movement of the second drum. This operation posed additional risk because of the use of a spotter to accomplish a "blind pick," which was used because there was a structure between the crane operator and the location where the drums were being placed. (See Finding #C-6.)

In some cases, workers did not follow radiological controls established for the WSD Waste Retrieval Project RBA, including those required by various RWPs and postings for work within the area, as further described below. (See Finding #C-6.)

- RWPs for work in the RBA, (i.e., SWSD 203) state that drinking water is allowed in the RBA if certain conditions are met (gloves are surveyed and then removed, and hands and face are surveyed before drinking); however, observed workers often did not conduct any survey before drinking. Following this observation by the Independent Oversight team, SWSD held a Deficiency Evaluation Group meeting and assigned several corrective actions to address this issue.

- Hand and foot surveys are required prior to exiting the RBA by both RWPs and postings; however, workers who self-survey frequently survey incorrectly (i.e., only alpha surveys are made by some individuals); alpha and beta-gamma surveys are often made at excessive scan rates; no consideration is given for alpha absorption when surfaces being monitored are moist or wet; and individuals survey their feet then step back into the same (often soil covered) portion of the RBA floor (prior to exiting the RBA, which is not in accordance with good health physics practices or with their training).

- Workers are allowed to chew tobacco, gum, sunflower seeds, or like products within the RBA even though smoking and eating is prohibited, because there is a caveat that workers are not allowed to place these products into their mouths within the RBA. However, workers were observed wiping their unmonitored hands over their mouths after spitting these items or fluids out. This condition was also the subject of a prior issue identification form issued in June of 2006 on the lack of guidance on chewing in the RBA. Although efforts to resolve this issue are ongoing, resolution is not complete, and the poor radiological practices continue.

- At WRAP, self-surveys when workers removed hands from gloveboxes were often too quick for instruments to detect contamination and did not cover exposed arm surfaces when reaching inside gloves, as required. In another instance, RCTs in the RBA unnecessarily handled or leaned on drums removed from the drum port before smear results were obtained.

At the WSD LLBG Waste Retrieval Project, 218-W-4C trench excavation, some activities were not performed in accordance with FH or Occupational Safety and Health Administration (OSHA) requirements. While the majority of the trench excavation at 218-W-4C is conducted and maintained in accordance with OSHA and WSD requirements, several areas did not meet minimum slope criteria, which could impact worker safety. The soil composition of the LLBG as determined by WSD is uncohesive, requiring a slope of 1.5 horizontal to 1 vertical at a minimum. However, a few areas were steeper than the required sloping, with no other compensatory measures to prevent loss of trench face or other hazards to workers. Workers used the slope face as an access and egress point to reach work areas, creating a potential fall hazard. Workers frequently lost footing when traversing slope faces as the soil cohesiveness is low, further increasing the risk of injury to these or other workers resulting from a fall or loss of slope face. Following this observation, the WSD excavation SME stated that it is WSD's expectation that slope faces are not used to traverse the excavation. The SME also stated that this was considered within the skill of the worker and may be covered in training; however, no specific reference could be cited in FH procedures. Additionally, soils from trench excavation activities were placed within two feet of the surface edge of the excavation in a few locations, contrary to OSHA requirements. OSHA states that the basis for the two-foot requirement is because the weight of the spoils can cause a cave-in, or spoils and equipment can roll back on top of workers, causing serious injuries or death. Furthermore, some slope faces were undermined by walkways dug into the slope or other disturbances at the bottom of the slope excavation interface. (See Finding #C-6.)

The CWC is not meeting the requirements specified in the Hanford Solid Waste Acceptance Criteria (HNF-EP-0063), which states, "Newly generated waste shall be stored on non-combustible pallets (per HNF-21239, FHA). For this section, newly generated waste is defined as waste received at the CWC after October 1, 2002. Metal pallets will be used for any waste received after this date. Wooden pallets will only be accepted at the facility on a case by case basis to support transportation and/or special handling requirements (an exception to this criteria will be required)." A fire hazard analysis (FHA) also recommended discontinuation of the use of wooden pallets at CWC since 2003. CWC management has resisted conversion to metal pallets for valid reasons (the steel drums shift easily on metal pallets, increasing the risk of unstable loads and pinch points for workers, and the metal pallets scrape the epoxy floor paint required by Washington State as a secondary containment) and CWC management within the FHA implementation plan addressed the continued use of wooden pallets; however, EP-0063 has yet to be revised. (See Finding #C-6.)

Other controls not being followed included hearing protection not being used for forklift and crane operation as required by the AJHA. Similarly, hearing protection in the vicinity of an air sampler at WRAP was not donned, as required in the AJHA. (See Finding #C-6.)

These examples do not reflect willful or intentional violation of requirements or procedures; rather, they reflect a lack of attention by both management and workers to governing procedures and requirements, including management expectations to be familiar with and follow governing procedures or requirements. In some of the cases observed, workers may perceive the risk to be very low for the apparently simple and repetitive nature of the tasks performed, and consequently may not believe the identified control to be necessary to protect them or their co-workers, or even recognize that a hazard exists. Consequently, workers and managers have established some practices that are not in accordance with established expectations or regulatory requirements. Nevertheless, the current level of procedure or ES&H requirement compliance does not meet FH or DOE conduct of operations expectations for Category II non-reactor SNM facilities, and indicates the need for additional management attention in this area. (See Finding #C-6.)

FINDING #C-6: WSD workers do not always meet requirements in work documents or operating procedures. (FH procedures, conduct of operations requirements, DOE Policy 450.4, *Safety Management System Policy*, and DOE Order 440.1, *Worker Protection Management for DOE Federal and Contractor Employees)*

Summary. The majority of work activities in WSD are conducted safely in accordance with established controls. Worker experience and skill in performance of waste retrieval and management duties contribute to the safe performance of work. Most identified controls are adequately followed in the course of performing work. However, for some work activities, workers' perception of low risk, and lack of attention to requirements, including procedures, has resulted in the failure to meet some health and safety requirements. Additional attention to detail is needed to ensure that work activities are conducted in accordance with postings, AJHA requirements, operating procedures, and FH requirements to assure that workers do not inappropriately assume additional risk.

C.3 Conclusions

FH has defined a systematic work control process that includes the use of enhanced work planning, AJHAs, operating procedures, work instructions, and work packages, to control workplace hazards. When used correctly, this process appropriately communicates the hazards and necessary controls for discrete work activities. The appropriate work documents sufficiently describe the planned activity, scope, schedule and requirements, and mechanisms for identifying and analyzing activity-level hazards are generally adequate. Many work activities in WSD are conducted safely in accordance with established controls. Worker experience and skill contribute to safe performance of work. However, the Independent Oversight team identified one problem with the work control process and several problems with work control implementation. The JHA process lacks sufficient clarity on expectations for classifying skill-based work. FH has not ensured that the work control process is used effectively and is consistently implemented for all WSD work activities so that controls are clearly defined, address all workplace hazards, and are properly integrated into work instructions. In addition, there are continuing weaknesses in radiological work planning and evaluation and application of radiological controls for airborne radioactivity. For some work activities, insufficient rigor and attention to requirements, including procedures, has resulted in a failure to meet some health and safety requirements. Similar programmatic weaknesses had been identified by RL and FH independent assessment but not adequately addressed, as evidenced by the continuing deficiencies. Increased management attention is needed to ensure that work activities are planned and conducted in accordance with FH requirements so that all hazards are identified and analyzed, appropriate controls are developed and implemented, and workers perform the work in accordance with the established hazard controls and requirements.

C.4 Ratings

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

C.5 Opportunities for Improvement

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

1. **Increase emphasis on improving implementation of the FH JHA process to ensure that all workplace hazards are adequately identified and analyzed, including hazards associated with skill-based work and those currently requiring documented hazards analysis.** Specific actions to consider include:

   - Determine the root causes for the failure of some AJHA hazard identification forms to include hazards fundamental to the work and provide retraining of work planners to revisit expectations on proper completion of AJHAs.

   - Revise the AJHA listing of "Known or Potential Hazards" to include a category for chemical vapors or fumes.

   - Ensure that all work has an associated documented hazards analysis that can be reviewed prior to work. For skill-based work, use a baseline or standing AJHA to analyze all hazards associated with the task, and identify all controls, with justification that the controls are within the skill of the worker. Require that supervisors and planners review the baseline AJHA against the specific area to determine whether additional or alternate controls are required that would necessitate additional planning. Review the set of baseline AJHAs on a periodic basis (e.g., every three years) to identify changes or improvements.

   - Consider adding a requirement for a work task evaluation by appropriate SMEs when using a standing AJHA in order to address unique task hazards.

   - Increase the frequency and rigor of assessments by FH and WSD to evaluate implementation of the JHA process, including effectiveness of corrective actions.

2. **Increase emphasis on improving the quality of AJHAs and use of the AJHA tool so that identified controls are sufficiently concise, tailored, linked to specific hazards, and sufficiently integrated into procedures and work instructions.** Specific actions to consider include:

   - Expedite planned approval of new guidance and requirements on the selection and placement of specific hazard controls identified through the JHA and AJHA processes that must be directly incorporated into work instructions.

   - Revise the AJHA process guide to include more detail on expectations for completion of AJHA document fields, including linkage of hazards and controls and expectation as to the level of specificity for controls. Include more discussion on use of the notes section and requirements for adequate breakdown of work by using AJHA subtasks.

   - Develop lessons-learned training materials and provide additional training of work planners and supervisors on proper use and completion of AJHA.

   - Increase the frequency and rigor of assessments by FH and WSD to evaluate implementation of the JHA process including effectiveness of corrective actions.

3. **Increase the rigor associated with radiological work planning at WRAP to ensure that radiological work control documents are accurate, properly screened and tailored to work, and prepared in accordance with FH radiological control and JHA requirements.** Specific actions to consider include:

   - Determine the root causes for the shortcomings in radiological work planning documents at WRAP, and provide retraining of work planners on expectations and Radiological Control Manual requirements.

- Consider developing additional radiological procedures to outline expectations in areas currently implemented through professional judgment, such as completion of ALARA management worksheets and linkage to RWPs.

- Revise the RWP procedure to clarify expectations concerning integration of radiological work documents and JHAs.

- Increase the frequency and rigor of assessments by FH and WSD to evaluate implementation of radiological work planning, including effectiveness of corrective actions.

4. **Revisit the application of airborne radioactivity controls associated with TRU glovebox operations at WRAP to ensure that all aspects of implementation meet Radiological Control Manual requirements and FH senior management expectations.** Specific actions to consider include:

   - Consult with senior FH radiological control management and the regulatory interpretive authority concerning the implications of past air monitoring data and whether changes to current radiological control practices are required. If not, execute the Radiological Control Manual requirements for performance of a technical equivalency determination to document the technical basis for posting and respiratory protection practices.

   - Review and evaluate existing site and facility air monitoring procedures to determine where changes are needed. At a minimum, include the criteria and objectives for implementation of lapel air sampling, including data quality objectives, sensitivity and minimum detectable activity requirements and implications, relationship and use of existing "rule of thumb" FH lapel air sample data worksheets, and related technical implications.

   - Revise WSD facility air monitoring technical basis documents to address use of lapel air sampling.

5. **Review all radiological monitoring practices for exiting RBAs at the SWSD Waste Retrieval Project to determine the appropriate technical basis for radiological controls, and ensure compliance with good health physics practices.** Specific actions to consider include:

   - Develop a technical basis for instrumentation and radiological monitoring equipment, including survey instruments and self-survey practices. Correct any deficiencies and/or establish the justification for any anomalies.

   - Develop a technical basis for RBA radiological controls, including survey requirements, and verification surveys for materials (e.g., vehicles, earth-moving equipment, and cranes) or personnel.

   - Consider revising self-survey practices and redesigning the monitoring station or using hand and foot monitors to assist workers in ensuring that appropriate surveys are conducted to meet sensitivity requirements to detect TRU contaminants.

   - Review RBA exit requirements and survey stations to enable workers to efficiently perform proper surveys and exit the area properly after surveys.

   - Establish a WSD-wide policy to address chewing tobacco, gum, and sunflower seeds or like products within the RBA, consistent with FH and good health physics practices.

6. **Increase attention to worker and supervisor awareness of conduct of operations expectations and attention to detail to ensure compliance with all requirements contained in FH manuals, work documents, and work instructions.** Specific actions to consider include:

   - Solicit input from workers to identify improvements to manuals, work documents, and work instructions to remove complicated or conflicting requirements that make compliance difficult.

- Provide incentives to workers to self-identify performance deficiencies to their co-workers.

- Determine whether special controls (e.g., requirements for working with trenches and excavations) are adequately addressed by training, posting, and existing procedures to ensure that both task-specific controls (e.g., access and egress) and special controls (e.g., maintaining slopes, spoil pile setbacks and minimization of slope undermining) are integrated into the work planning process.

- Enhance the application of behavior-based safety and human performance improvement programs.

7. **Revisit certain aspects associated with hazards analysis and specification of controls associated with pallet drum storage at the CWC.** Specific actions to consider include:

   - Re-evaluate the FHA calculation for the CWC "Analysis of fire propagation via wood pallets," taking into account the increased combustible material contained in the new 2 by 6 wooden pallets. Initial calculations utilized the combustible content for the 1 by 4 wooden pallets with only three 2 by 4 stringers. The new pallets utilize 2 by 6 deck boards on four 2 by 4 stringers, nearly tripling the lumber content of the initial pallets.

   - Analyze and develop acceptance, inspection, and design criteria for wooden and metal pallets utilized at the CWC. Such factors as static and dynamic loading limits, design, and effects of weathering on structural integrity should be determined and properly implemented in the CWC operating procedure SW-100-143, *Management of Solid Waste in CWC*. Any acceptance or inspection criteria should be included in the daily CWC inspection procedure as well.

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

D.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight evaluated DOE Federal and contractor feedback and improvement processes at the Hanford Site as they apply to the Waste Stabilization and Disposition Project (WSD). The Independent Oversight team examined three areas:

- The Office of Environmental Management (EM) feedback and improvement processes, including the employee concerns program (ECP), assessments, and issues management as applied to the Hanford Site WSD (see Section D.2.1)
- The Richland Operations Office (RL) feedback and improvement processes, including assessments, self-assessments, the technical qualification program (TQP), the Facility Representative (FR) program, and issues management as applied to the Hanford Site WSD (see Section D.2.2)
- Fluor Hanford, Incorporated (FH) feedback and improvement processes, such as the contractor assurance system assessments, corrective action and issues management, injury and illness investigation and prevention, lessons learned, the ECP, and institutional processes as applied to FH's activities at the Hanford Site WSD (see Section D.2.3).

Independent Oversight interviewed EM, RL, and FH personnel and reviewed various program documents and assessment reports. Feedback and improvement processes at the activity level are also discussed in Appendix E for the selected T-Plant essential safety systems, and the results are considered in the evaluation of RL and FH feedback and improvement programs.

D.2 Results

D.2.1 EM Feedback and Improvement

Independent Oversight performed a review of EM Headquarters in June 2006 as it applied to EM activities at Oak Ridge National Laboratory (ORNL). The review of EM activities at ORNL showed that EM had effective communications with the operations office, performed adequate operational awareness activities, and had clearly defined responsibilities and authorities, but that additional attention was needed in such areas as training and qualification programs, ECP, and certain aspects of assessments. EM will address the findings from the ORNL review in accordance with DOE Order 470.2B, *Independent Oversight and Performance Assurance Program*, and will consider the opportunities for improvement in the Independent Oversight report.

Because of the short time period between the ORNL review and this review of the Hanford Site WSD, Independent Oversight did not repeat the review of most EM Headquarters activities. Instead, Independent Oversight focused on evaluating communications between EM Headquarters and RL and whether EM roles, responsibilities, and authorities were adequately defined and understood as they relate to the Hanford Site WSD.

Independent Oversight reviews of processes and interviews indicated that EM and RL have established and implemented effective communication mechanisms. Delegation of safety management roles, responsibilities, and authorities are also adequately defined in accordance with a January 2006 memorandum from EM to RL. Within EM, the Chief Operating Officer (EM-3) serves as the senior EM official providing day-to-day operational oversight, feedback, and direction to the RL manager, who is responsible for direction and oversight of FH.

D.2.2 RL Feedback and Improvement

Roles and responsibilities for ES&H and quality assurance are generally well described in the Richland Integrated Management System (RIMS) and the RL Quality Assurance Program Plan. RIMS documentation of process descriptions and procedures, for the most part, forms a sound foundation for the communication and understanding (by RL managers and staff) of safety management roles and responsibilities. RL completed a gap analysis to the requirements of DOE Order 226.1, *Implementation of DOE Oversight Policy,* and forwarded the results to EM Headquarters on May 30, 2006. RL identified few gaps and reported that "RL is confident we will implement DOE O 226.1 by September 15, 2006."

Assessment program. RL has an assessment program in place, assessments are performed, issues are identified, and issues are entered into the Richland Issues Tracking System (RITS). The integrated evaluation plan is prepared in accordance with the RIMS Oversight Planning Process. The integrated evaluation plan is developed annually, before the start of each fiscal year, and is updated quarterly throughout the year. The integrated evaluation plan provides a list of contractor oversight activities (assessments, surveillances, and operational awareness items); integrated project team oversight assessments and operational awareness activities; independent assessments performed by the Organizational Effectiveness and Communications Division; and self-assessments (management assessments of RL processes and procedures) planned for a given year.

The RL Oversight Plan in RIMS documents directive-required assessments and functional area oversight, with RL-assigned periodicities. The Oversight Plan omits a few directive-required assessments (i.e., transportation and packaging assessments as required by DOE Order 460.2A, DOE Order 460.1B, and DOE Order 461.1A, and occurrence reporting and processing as required by DOE Manual 231.1-2). Additionally, DOE Order 226.1-specific assessments (i.e., implementation and effectiveness of contractor assurance systems, regular reviews of effectiveness of contractor issues management and corrective action tracking) have not been captured in the Oversight Plan. However, RL demonstrated that some directive-required assessments are accomplished and documented.

RL does not have a multi-year schedule to ensure that assigned periodicities for contractor oversight or management assessments of RL processes and procedures (see discussion under "Self-Assessment" section, below) are met. RL could not readily demonstrate that they met requirements for performing all required assessments at the defined periodicity. RL self-identified this issue, with a corresponding overdue action in RITS. RL recently developed an informal tool to track these periodicities, but the tool has not yet been fully populated.

FINDING #D-1: RL has not implemented a defined process that ensures that all required assessments are listed and are conducted at the required periodicity. (DOE Order 226.1, *Implementation of DOE Oversight Policy)*

Self-assessment. RL has conducted some high-quality self-assessments, and issues are being identified. However, the RIMS self-assessment procedure is not effectively implemented. RL personnel do not consistently follow the procedure and have indicated to the process owner that the process is too arduous, too inflexible, and difficult to use. Corrective action plans are not always complete, and not all corrective actions from self-assessments are entered in RITS (i.e., TQP and ECP self-assessments). The RIMS self-assessment procedure requires that each organization fully self-assess the entire scope of work performed every three years. RL does not have a system in place to track this requirement (see "Issues Management/Corrective Action Tracking" section below). Additionally, the RIMS self-assessment procedure does not establish adequate requirements for performing causal analysis or extent of condition determinations for RL-identified management assessment issues.

FINDING #D-2: RL has not implemented a fully effective self-assessment program. (DOE Order 226.1, *Implementation of DOE Oversight Policy*)

Technical qualification program. RL recognizes that its TQP requires improvement and continued senior management attention. A July 2006 RL self-assessment of the TQP identified several significant deficiencies in the current TQP. The self-identified deficiencies included failure to publish monthly qualification reports, TQP subject matter expert (SME) lists that were not up to date, and failure to maintain the office- and/or facility-specific qualification standard program.

RL has drafted a new *RL Technical Qualification Program* that includes a plan and procedure to address these deficiencies. However, the draft procedure does not address several requirements of DOE Manual 360.1-1B, *Federal Employee Training Manual*, and DOE Manual 426.1-1A, *Federal Technical Capability Manual* (i.e., linkage to position descriptions and individual development plans, linkage to an annual training plan, administration of oral and written examinations, approval and documentation of equivalencies, and conduct of internal and external program assessments). The Hanford Federal Technical Capability Program Plan (the current program plan) requires the designation of an Office Training Coordinator and requires monthly qualification status reports to be published and routed to RL senior management. Although these are not directive requirements, these practices communicate management commitment to an effective TQP across the organization.

RL has also drafted an *RL Staffing Plan* that identifies RL technical personnel who have been designated by the RL manager for participation in the TQP. The staffing plan indicates that there are a number of technical personnel responsible for functional areas as SMEs who lack documentation of technical qualification. Other technical personnel who have duties that would require participation in the TQP are not designated to participate (e.g., technical personnel in the Organizational Effectiveness and Communications Division, decontamination and decommissioning, environmental management, and waste management). In addition, individual development plans have not been kept current, and RL position descriptions for personnel required to participate in the TQP do not have the required notation in accordance with DOE Manual 360.1-1B. RL intends to develop a gap analysis and a corrective action plan as part of the implementation of the new TQP. RL also intends to fully assess the program again upon completion of corrective actions.

FINDING #D-3: RL has not implemented an adequate technical qualification program for subject matter experts. (DOE Manual 360.1-1B, *Federal Employee Training Manual*, and DOE Manual 426.1-1A, *Federal Technical Capability Manual*)

Facility Representative program. The RL FR program is a mature, well-managed, and generally well-documented program. The FR qualification procedure (FRI 0014) describes a strong program for the training and qualification of RL FRs. Records reviewed by Independent Oversight complied with the implementing procedure. The FR process to develop quarterly master oversight plans and the resulting plans are effective. FRI 005, *Master Oversight Plans*, describes a structured approach to obtaining management concurrence and approval of FR oversight of specific projects. The master oversight plans appropriately consider past facility performance (e.g., assessments, operational awareness, occurrence reports), planned operational activities for each of the facilities, expected back shift coverage, routine oversight, closure of operational awareness issues, and planned surveillances and formal assessments. The master oversight plan is also incorporated effectively into the integrated evaluation plan on a quarterly basis.

FR core surveillances reviewed by Independent Oversight were performed and documented with appropriate rigor, and significant issues (concerns, findings, or observations) have been identified. RL appropriately identified rollup concerns and required the contractor to develop formal corrective action plans. In accordance with RL processes, the RL lead assessor validated closure for over one-third of the FR findings and observations. RL has a generally adequate process for gathering and reporting quarterly FR performance indicator data; however, individual FRs document the data differently, from daily logs or calendars to reconstruction (using timesheets and operational awareness entries) of hours at the end of the quarter.

Operational awareness. The operational awareness database is used effectively to support weekly, monthly, and quarterly oversight reporting to EM and RL senior managers, and the data is used effectively to shape the RL oversight program. For example, any issues identified as significance category 3 or above must be addressed in the next master oversight plan.

Although the operational awareness database process is generally effective, RL has not developed and issued a RIMS process description or procedure that details how operational awareness data is to be managed and used. RL has a RITS action to address the informal nature of the process, and is working to develop and implement a new and improved web-based process. In addition, there are some inconsistencies in the identification of issues (concerns, findings, and observations), and significant variations in the technical rigor of entries.

Issues management/corrective action tracking. RL's primary tool for tracking issues from identification to final verification and closure is the RITS. RITS is a computer database that contains fields for issue identification, issue source, responsible individual, specific corrective actions, due dates, and current status. RL RITS data entry, periodic reporting, and periodic self-assessments are expert-based and not sufficiently formalized; desk instruction CI-001, dated October 30, 2003, does not reflect the current organization or process and does not address periodic reporting. Some reports are available, but they are limited and are not user-friendly (i.e., a user is not able to specify a date range to minimize the size of a report). These reports have not been regularly disseminated over the past year. Because most RL technical staff members do not have access to RITS, the data is not readily available for trending and shaping the oversight activities. Also, RL senior managers do not have a reliable mechanism to know whether corrective actions are completed on schedule.

For most issues identified by RL assessments, there was a corresponding item in RITS. However, RL corrective action plans are not always complete (e.g., a TQP self-assessment did not have a complete corrective action plan), and not all corrective actions for assessments are entered in the issues tracking system (e.g., corrective actions for the ECP reviews of contractors and ECP self-assessment were not entered).

The closure basis for corrective actions is not consistently documented, as required by the RIMS corrective action process description. Although RITS was designed with the capability to document objective evidence in support of closure of issues, this capability is not used. Instead, the RITS database administrator saves emails from RL lead assessors directing closure; these emails sometimes do not contain documentation of objective evidence reviewed in support of closure.

There are a number of weaknesses in the RIMS corrective action management procedure. The procedure requires a corrective action plan if "The program or activity assessed requires significant improvement" or where "major deviations in expected results, cost, or schedule may occur." However, the terms "significant" and "major" are not defined, and criteria for evaluation are not provided, leaving the decision to lead assessors and their supervisors during the internal review of the assessment report. In addition, RL lead assessors are cautioned, "Due to the level of effort and cost associated with developing corrective action plans, use discretion when requesting a corrective action plan." The net effect of the ambiguities in the procedure and the cautions is that few RL assessments result in a contractor being required to develop a corrective action plan for DOE approval. When corrective action plans are not required, causal analysis and extent-of-condition determinations are not required by RL. Similar ambiguities in terminology are evident in the section of the procedure that addresses closure by the RL lead assessor, which is an alternative for issues that are determined to not require a corrective action plan.

Because of the weaknesses in the procedure and its implementation, the RL approach for closing findings and validating the effectiveness of corrective actions does not fully meet the DOE Order 226.1 requirement that "DOE verifies that contractor corrective actions are complete and effective in addressing deficiencies before they are closed out in the issues management system." In addition, for issues other than those required to be tracked on the Headquarters Corrective Action Tracking System (CATS), few effectiveness reviews are conducted by RL. DOE Order 226.1 requires that "DOE line management must validate that contractor corrective actions have been implemented and are effective in resolving deficiencies and preventing recurrence."

FINDING #D-4: RL has not ensured that its issues management and corrective action tracking processes adequately identify issues and corrective actions, track them to closure, and are effective in resolving deficiencies and preventing recurrence. (DOE Order 226.1, *Implementation of DOE Oversight Policy)*

Performance measurement. RL processes (e.g., *Performance Evaluation and Reporting, and Conditional Payment of Fee*) and quarterly performance reviews demonstrate that RL regularly monitors and reports on contractor performance. RL safety metrics include Headquarters reporting requirements of total recordable case (TRC) rates and days away and restricted time (DART) rates, but also include local tracking of recurring events, electrical safety events, radiological events, and several others. Other metrics include contractor project performance and incentive milestones. Additionally, cost/schedule variance metrics and tri-party agreement milestones are appropriate to communicate program performance and ES&H performance data to EM senior management. Some of these metrics have demonstrated improvement over the last several years (e.g., improvement in TRC and DART rates). For each of the last four years, RL has used these metrics to identify some ES&H concerns and reduced FH's fee, indicating that ES&H is a management priority in contract performance evaluations. Monthly/quarterly evaluation and reporting is not being accomplished in accordance with the RIMS procedure, because of recent changes directed by EM Headquarters; RL plans to revise the appropriate procedures to reflect EM direction.

Lessons learned. RL has a RIMS management system description in place for lessons learned, but a procedure assigning roles and responsibilities has not been developed or implemented. There is no formal, coordinated or screened process by which RL technical personnel receive appropriate lessons learned (other than individual initiative to seek them out on lesson-learned websites). RL is in the process of identifying Federal requirements and incorporating the contractor requirements document of DOE Order 210.2, *DOE Corporate Operating Experience Program*, June 12, 2006, into contracts. RL also plans to develop and implement a formal process and assign roles and responsibilities, as required by the new order.

Employee concerns program. RL has established an ECP pursuant to DOE Order 442.1A, *Department of Energy Employee Concerns Program*, for identification and resolution of concerns raised by the Hanford workforce, except for workers at the tank farms and at the waste treatment plant who are under the Office of River Protection ECP. The Independent Oversight team reviewed the RL ECP to assess its effectiveness and compliance with order provisions and reviewed the disposition of 16 of the 106 cases processed by the Richland Special Concerns Office in 2005 and 2006.

Workers are adequately informed of this program through bulletin board postings, an ECP web page, and regular briefings of the Federal staff. A telephone hotline provides ECP information and a mechanism for recording concerns 24 hours a day, seven days a week. The level of use of the ECP indicates that efforts to make employees aware of the ECP option have been successful.

The ECP is administered through the Special Concerns Office located in the Richland Federal Office Building, which is open to concerned individuals. Office hours are posted, but during this inspection, the office and its telephones were not consistently manned during these hours, and contact numbers provided by the hotline were not always answered.

In general, ECP case files are complete, well organized, and contain the documents required by DOE Order 442.1A. Verbal concerns are well documented by the ECP staff. Files for concerns referred to other organizations contain investigation results and copies of correspondence with concerned individuals. Investigations are adequate to support the conclusions of "substantiated" or "not substantiated," and corrective actions are appropriate in most cases. Cases referred to and investigated by the Special Concerns Office are processed and closed in a timely manner. Quarterly reports are issued as required.

Information in case files indicates that the confidentiality of concerned individuals has been adequately protected. Concerns are reported and classified in case files as "Confidential" or "Anonymous" pursuant to the RL ECP procedure. For the cases reviewed during this inspection, the Special Concerns Office followed procedures for protecting the identity of individuals requesting anonymity and by releasing the identity of those requesting confidentiality only when there was a need to know. The need to know was apparent based upon the nature of the concerns but was not documented in the files.

The Special Concerns Office processes concerns by investigating them or by referring or transferring them to other organizations pursuant to the process requirements and guidance in DOE Order 442.1A, DOE Guide 442.1-1, *Department of Energy Employee Concerns Program Guide,* and an RL employee concerns procedure posted on the RIMS website. Employee concerns can be dispositioned by investigation by RL, referral to another organization having jurisdiction, or by transfer. Investigations and referrals are tracked to closure by RL. For transferred concerns, RL closes the cases and transfers responsibility for resolution and communication with concerned individuals to other organizations. The Special Concerns Office refers or transfers most concerns to other organizations for review. The 106 cases processed between January 2005 and August 2006 resulted in the identification of 245 individual concerns. Of the 245 concerns, 116 were referred, 116 were transferred, and 13 were investigated by the Special Concerns Office. The Special Concerns Office assesses corrective actions and provides feedback to concerned individuals for concerns that it investigates or refers, but this review is not required for cases that are transferred. Nine of the 16 cases selected for review during this inspection were transferred. The transfer of some cases was inconsistent with the ECP objective and process requirements specified in Sections 1 and 4 of DOE Order 442.1A in that it did not assure independent, objective evaluation. For example:

- A concern that a DOE contractor manipulated safety numbers to give a false impression that it had improved safety was transferred to the contractor based on the rationale that, "This is a management issue and therefore is not within RL Special

Concerns Office jurisdiction." This rationale does not appear to be sound in that transfer may not provide adequate assurance that the review will be sufficiently independent or objective. In this case, the contractor determined that there was no evidence to support the concern and closed the case. The RL manager subsequently received an anonymous letter expressing a similar concern on July 11, 2006.

- A concern that the management for one site contractor had created an environment of fear and hostility was transferred to that contractor for investigation based on the rationale that it was "an employee/employer-related issue and is therefore outside RL Special Concerns Office jurisdiction." Investigation of employee/employer issues that may impact ES&H should not be outside Special Concerns Office jurisdiction, and investigation of such issues by the accused organization represented a possible conflict of interest. In this case, records and interviews indicate that the contractor's investigation was adequate.

- A concern that an employee was laid off for raising safety concerns was transferred to the contractor that allegedly laid off the individual based on the rationale that "This is a management issue and is therefore outside RL Special Concerns Office." Retribution for raising safety concerns is contrary to DOE Order 440.1A, and should be within the scope of the ECP. Investigation by the contractor that laid the employee off could represent a possible conflict of interest. The contractor had no record of receiving or investigating this concern.

The RL ECP procedure states that all concerns outside the ECP office's jurisdiction are to be transferred. It also defines jurisdiction as "responsibility of the ECP Office to ultimately resolve." This limited definition of jurisdiction results in the transfer of about half of incoming concerns.

> **FINDING #D-5:** RL has not established disposition criteria for employee concerns that are adequate to ensure independent, objective evaluations. (DOE Order 442.1A, *Employee Concerns Program*)

DOE Order 442.1A and DOE Guide 442.1-1 do not provide clear and consistent criteria for transferring concerns. The order states that concerns must be transferred to another DOE or contractor organization with jurisdiction over the issues when those issues are outside the scope of the ECP. However, it does not adequately define the scope of the ECP. The order requires cases to be closed by the ECP when they are transferred. The guide adds that concerns may also be transferred based on type or complexity. The need for DOE involvement in such matters as performing independent investigations, reviewing corrective actions, and providing feedback to concerned individuals is not included in the transfer criteria.

The employee concerns manager assesses the effectiveness of the RL ECP annually as required by DOE Order 442.1A. The most recent assessment, which was conducted in August 2005, identified two opportunities for improvement and described planned corrective actions that were tracked and completed. The RL Organizational Effectiveness and Communications Division also identified four observations about the ECP program during an inspection in January 2005. These observations were disputed by the Special Concerns Office, and corrective actions were not taken or tracked. The RL employee concerns manager inspects ECPs administered by prime contractors at least every three years. FH and two other contractor programs were reviewed by RL in 2005, but corrective actions to address opportunities for improvement and observations identified during these inspections were not tracked or assessed. The RL review of the FH ECP failed to identify the significant deficiencies identified by the Independent Oversight team, as discussed in Section D.2.3 of this report. (See Finding #D-4.)

D.2.3 FH Feedback and Improvement Programs

Assessments. FH has established a comprehensive and generally robust self-assessment program comprised of safety inspections and walkthroughs, management self-assessments, and independent team assessments of safety programs and performance in site organizations, projects, facilities, and functional areas. The requirements and processes for this assessment program are described in procedures and include the development and maintenance of a master integrated evaluation plan for managing most assessment activities. This plan provides controls for effectively selecting, compiling, coordinating, scheduling, and monitoring the completion of independent and management assessment activities. The FH assessment program has generally resulted in an appropriate spectrum of compliance and performance evaluations of functional areas, facilities, and work activities;

verification of corrective actions; and action plan effectiveness reviews.

FH has established and implemented a robust independent assessment program managed by the Operations Assurance-Assessments function within the Regulatory Compliance organization. Approximately 30 internal independent assessments and surveillances are performed annually. These assessments have appropriately addressed key safety functions, organizations/projects/facilities, and safety issues of interest to management and were generally rigorous, with well-written reports that identified substantive issues and opportunities for improvement.

Although often less rigorous than independent assessments, projects, subprojects, and functional organizations conduct numerous management self-assessments of program adequacy and implementation and safety issues of interest to management. In the WSD, these assessments included routine (planned and scheduled) formal senior management inspection tours in WSD facilities with workers from other facilities/subprojects. These management inspections provide opportunities for direct interaction between workers and management and worker exposure to processes and practices at other facilities. Assessment coordinators in the Operations Assurance organization are assigned to FH projects to facilitate development and maintenance of management assessments and the integrated evaluation plan, and provide feedback on the quality of each management assessment. The coordinators evaluate and grade assessments against 18 criteria and provide numerical scores and narrative reports to functional, project, and subproject managers to promote more effective assessment efforts.

Routine, documented facility condition inspections are conducted in each project/subproject/facility by facility managers and staff, assisted by safety and health personnel. Each subproject has established the processes to conduct these inspections and manage the correction of deficiencies.

Although most assessment activities have been effective in evaluating programs and performance and driving improvement, there are several opportunities to improve implementation. Some functional areas have not been evaluated or have not been adequately assessed. For example, no assessments of the processes and implementation of injury and illness investigations have been performed. Annual ECP assessments have not identified process and performance weaknesses (discussed later in this section). As identified in FH self-assessments, opportunities to observe work in connection with assessment programs have still not been used to full advantage. Some management assessment reports did not identify findings that fully address the issues raised by the assessment text, and the scope or techniques used did not clearly reflect the assessment activities that were actually performed, typically overstating the observation of work and evaluation of integrated safety management (ISM) system elements.

Management of safety issues. FH has established and implemented an effective corrective action management system (CAMS) for documenting, investigating, reporting, and managing corrective actions for safety issues, including incidents and events. Safety deficiencies are evaluated and corrected and formally tracked to closure. Issues are categorized according to significance and are managed using a graded approach. Issues may be categorized as significant or low-threshold issues. Low-threshold issues are further categorized as issues for which no action was or is to be taken (which remain in the database for trending purposes only); deficiencies involving a noncompliance with a requirement; and opportunities for improvement. Significant issues require an extent of condition review and determination of root causes, and low-threshold deficiencies require determination of the apparent cause(s). FH has established a robust tracking system for documenting issues, analysis, corrective action plans, and closure information that supports effective management of issues and facilitates data analysis. WSD has continued to effectively employ a prior program requirement to conduct team classification evaluations of all levels of findings and opportunities for improvement. This process includes direct involvement of project and subproject senior managers in issues management and includes institutional corrective action management staff as well as project personnel.

FH has also developed robust processes for performance analysis and performance indicators that fulfill the requirements of DOE Manual 231.1-2, *Occurrence Reporting and Processing of Operations Information*, and contractual requirements. Performance analysis consists of structured reviews of data from events; incidents; other issues tracked in the CAMS deficiency tracking system; safety and health performance metrics; and such other information as DOE operating experience reports, lessons learned, and Defense Nuclear Facilities Safety Board (DNFSB) reports, and involves functional area managers, safety and health staff, and Quality Assurance personnel. Quarterly analysis is performed by various organizational elements (i.e., a data analysis working group in Quality Assurance, a committee of functional area managers, and individual functional area managers) to identify recurring events/issues that require reporting to the DOE Occurrence Reporting and Processing System and adverse or emerging trends that require enhanced monitoring or corrective actions. Quarterly reports of the results of this performance data analysis and actions taken are issued and forwarded to RL. These processes have been effective in identifying adverse trends, anticipating emerging issues, identifying reportable recurring events, and initiating corrective actions.

Although FH has established and implemented effective processes to manage safety issues that are evaluating and correcting deficiencies, several opportunities exist to improve implementation of the FH CAMS.

Actions taken to address work planning process deficiencies have not been timely or fully effective. The Quarterly Data Analysis Working Group performance analysis had identified work management as a target area for further assessment in August 2004. In June 2005, two RL surveillances were issued that identified cross-cutting concerns with FH work planning processes for identifying hazards and implementation of controls in work instructions, as well as concerns with feedback mechanisms (post-job reviews), incomplete work record entries, and electrical work management. These findings were similar to those discussed in Appendix C of this report. These surveillances resulted in identification of ten "Significant Issues" in CAMS to address the weaknesses in identifying hazard concerns and findings from the RL surveillances. These issues resulted in over 30 actions, most of which are now complete. One of the initial corrective actions was to conduct an assessment of the adequacy of field work at each project to determine whether it was performed in accordance with requirements, although it appeared there was sufficient evidence of noncompliance detailed in the RL reports and FH internal assessments. This new assessment was not completed for over six months after the issues were raised by RL. Other actions included issuance of an implementation plan addressing training, updating procedures, developing guidance, and modifying the automated job hazards analysis (AJHA) tool. An effectiveness review is scheduled for March 2007. The assessment of field work, conducted in January 2006, identified 20 issues, including a lack of knowledge of the AJHA tool and requirements; work not properly released; less than adequate justification for controls; inadequate incorporation of hazard controls into work instructions; AJHAs not including all hazards; and controls that required additional analysis to be recorded in the "controls by task screen" were omitted "in most cases." The issues identified by FH were similar to those identified by the RL surveillances and resulted in termination of the assessment before all projects were evaluated.

Although these problems have been properly identified as significant issues and have resulted in many appropriate corrective actions, management of these issues has been neither timely nor fully effective in the following ways:

- The numerous work control weaknesses discussed above were identified by the FH Quarterly Data Analysis Working Group in 2004 and again in 2005 by RL "core" surveillances (i.e., cross-cutting, multi-project reviews) conducted by FRs and SMEs. However, many of the actions to address these systemic issues were not due for action until after analysis of another self-assessment of field compliance, without sufficient consideration of compensatory actions to ensure the safe performance of work activities before completion of longer term actions.

- The action to issue guidance on the incorporation of hazard controls into work instructions is not due for completion until September 15, 2006, over 15 months after RL identified the issue.

- Some of the issues identified by the FH self-assessment, such as the AJHA tool and Waste Receiving and Processing Facility (WRAP) radiological controls, were improperly classified by project personnel. For example, inadequate incorporation of hazard controls into work instructions was classified only as an opportunity for improvement. Many of the issues identified by the FH self-assessment were screened out of CAMS by project managers, and no action was taken. For example, managers screened out instances in which personnel involved in AJHA development were not knowledgeable of the AJHA tool.

- For one issue (i.e., not documenting analysis in the specific task screen section of the AJHA), the only corrective action was to counsel AJHA preparers to fully specify hazard controls. In addition, there were no actions taken to identify or address the existing incomplete AJHAs governing ongoing work activities. For example, the FH self-assessment identified deficiencies identified in the WRAP drum filter installation (i.e., darting) AJHA that still exist.

- As discussed in Appendix C, work planning and control implementation and AJHA deficiencies still exist.

FH has not been sufficiently aggressive in addressing this significant issue and ensuring that line management are responsible and accountable for effective implementation of ISM Core Functions #2 and #3 in work planning and for timely corrective actions. Ineffective corrective actions and recurrence controls for deficiencies in the WRAP radiological control program were also identified by an FH independent assessment conducted in 2005. (See Findings #C-1, #C-2, and #C-3.)

FINDING #D-6: FH is not consistently effective in rigorously addressing safety issues and employee concerns to ensure that all elements of deficient or potentially deficient conditions and performance are thoroughly evaluated, with appropriate corrective and preventive actions implemented in a timely manner. (DOE Policy 450.4, *Safety Management System Policy*, and DOE Order 226.1, *Implementation of DOE Oversight Policy)*

Injury and illness investigation and prevention. FH's record for Occupational Safety and Health Administration (OSHA) TRC and DART rates is the second best of eight EM sites and generally shows improving trends. These rates are also better than overall DOE complex averages.

Reporting and management requirements for FH employee occupational injury and illnesses are governed by an accident/incident investigation and reporting procedure. This procedure specifies prompt reporting of any work-related injuries or illnesses no matter how minor, and documentation of the details of the incident and its investigation is required to be issued within three days on an event report (not an event report for submission to the DOE Occurrence Reporting and Processing System) by supervisors, the worker, and the ES&H representative. Safety and health personnel matrixed to the projects, designated as records specialists and case managers, oversee the classification, recording, and reporting of injuries in accordance with the DOE Computerized Accident/Incident Reporting System (CAIRS) and OSHA reporting requirements. The event reports provide the basic information required for completing DOE Form 5484.3, required for CAIRS reporting, including incident details, analysis of causes, and actions to prevent recurrence. In general, case files reviewed by the Independent Oversight team were complete and retrievable. A review of the types of injury/exposure case descriptions for the past two years indicates that the threshold for reporting incidents to supervisors and receiving medical evaluation is generally low, with many minor incidents being reported and evaluated, including paper cuts, bug bites, bumps, and scrapes. In 2006, FH health and safety personnel initiated corrective actions to address the number one type of occupational injury reported by FH workers, sprains and strains, in the form of seminars on techniques for preventing musculoskeletal injuries.

However, process weaknesses and deficiencies in the investigation of injuries and exposures and the determination and management of corrective and preventive actions are limiting the effectiveness of this program. A sample of occupational injury and illness case files examined by the Independent Oversight team revealed the following inadequacies (see Finding #D-6):

- Causes documented in event reports typically fail to consider/address ISM system elements. Although the form has a block to indicate whether an AJHA existed for the work, and the procedure specifically states that the AJHA is to be reviewed and revised as applicable, the analyses do not normally address the adequacy of the AJHA. Other ISM work planning elements, such as adequacy of procedures or pre-job briefings, were not addressed for incidents where these elements appeared to be relevant. For example, three persons suffered respiratory irritation, headache, and swelling of the lips and throat from inhaling dust from the top of radwaste drums, but the adequacy of the ISM elements, such as the AJHA, work procedures, pre-job briefings, and supervision, was not addressed in the event report.

- In some cases, the documented causes appeared to be inaccurate or failed to accurately identify the apparent causes. In other cases, the cause code block was not completed. For instance, when an "inexperienced" worker was injured because a turnbuckle and chain swung around and hit him in the head during removal from a waste container while his "experienced" coworkers were down in a trench, the cause was simply that he was an inexperienced worker. The report did not address why the worker was put in a position to do something he was not qualified to do; the adequacy of training, supervision, and pre-job briefings; and the adequacy of the AJHA. In another example, the cause code for an injury in which a heavy piece of equipment fell off a cart when it struck the side of a ramp was coded as personnel inattention to detail; however, the specified causes were design related (i.e., a top heavy cart and equipment not secured to the cart).

- The event report form has a block for actions taken, but not for actions planned. The procedure-required 72 hours limit for submittal of the event report could adversely affect a thorough analysis and the determination and documentation of all needed corrective and preventive actions. Typically, this block is filled out with both actions taken and planned, but often leaves the final status inconclusive, with such statements as "additional actions are pending." There is no indication that open corrective/preventive actions are entered into the formal CAMS, nor are reports updated to indicate completion. The procedure requires only that supervisors track open corrective actions to completion and notify the project safety and health representative when closed, but safety and health representatives are not being notified of completed actions, and there are no established processes for either party to track or document the completion of corrective/preventive actions.

- In some cases, the specified actions did not address the identified causes or address all aspects of the incident. For example, in the exposure incident described above, identified corrective actions did not require testing to identify the material aspirated during the drum handling work that resulted in the medical conditions, and no such tests were performed.

- In two injury cases reviewed, no event report was completed. In another case, the event report had no signatures or dates. An event report for an incident occurring in March 2005 was not signed off by supervision and the safety and health representative until December 2005, and the injured worker did not sign off because he had transferred to another location.

- WSD has never identified or documented near miss incidents on the event report form, although it is required by the FH procedure.

- Although there is a variety of analysis and trending of injury and illness data and routine assessment of CAIRS data accuracy, only one limited-scope self-assessment of program implementation has been performed in recent years. The July 2005 assessment, responding to RL-identified concerns with occupational injury and illness record keeping only evaluated whether case files contained the types of required documentation (e.g., event reports and case summaries), and did not evaluate the quality of the documents or the adequacy of investigation and analysis.

Operating experience/lessons learned. FH has established and implemented a lessons-learned program that is screening and sharing external lessons learned; identifying internal lessons learned and sharing them with the DOE complex; and applying lessons learned to make facilities and work activities safer. Many sources of lessons learned are being screened for applicability to FH activities at the institutional level, including commercial product recalls, which are distributed by the institutional lessons learned manager and ES&H staff. Independent Oversight observations of training, pre-job briefings, work documents, safety meetings, and various documentation reflect the review and application of lessons learned. FH has issued and posted approximately 30 lessons to the RL/Hanford website in the first eight months of 2006 and transmitted approximately 16 lessons that were posted on the DOE Headquarters database in the last 18 months. The RL/Hanford lessons-learned database, which also includes lessons learned from other Hanford contractors, is a user-friendly, searchable source of local and complex-wide lessons learned.

Although many lessons learned are identified, disseminated, and applied, the implementation of the program lacks sufficient rigor and documentation to demonstrate the extent or adequacy of screening, evaluation, and application of pertinent lessons learned. There is little evidence of applicability and technical reviews by functional area SMEs at the institutional level and by WSD line organizations, and little evidence of actions deemed necessary and of actions taken. Responsible institutional and project personnel recognize that process implementation controls are not adequate and must be improved to meet the requirements of the new DOE Order 210.2. In addition, there was no evidence of review, dissemination, or action for several DOE Alerts from 2004 and 2005 and a 2006 lesson from the DOE database, all of which appeared pertinent to WSD activities. The electrical safety series of DOE-EH just-in-time reports from 2004 (related to excavation, blind penetrations, energized work, etc.) were posted to the electrical safety website, but not disseminated formally to project lessons-learned coordinators. Although the Level 1 institutional procedure adequately describes the FH lessons-learned program, WSD had no project or subproject level implementing procedures or instructions describing local processes for managing lessons learned.

Issues related to inadequacies in documenting and tracking actions were identified in a December 2004 management self-assessment, but were not effectively addressed. A July 2005 self-assessment using the DOE-STD-7501-99 criteria and grading system appropriately identified two criteria at the lowest rating (i.e., a lack of performance measures and a lack of formal assignment of responsibilities and completion dates for corrective/preventive action). However, these deficiencies were rolled into a collective opportunity for improvement and closed, with the indication that the lessons-learned program would be improved when the requirements of the planned DOE Order 210.2 were implemented. This order was issued in June 2006, but RL has not yet incorporated it into FH's contract, and the program weaknesses remain over one year after identification. (See Findings #D-4 and #D-6.)

Employee concerns. FH has established formal and informal processes for employees to express safety concerns that provide for evaluation and resolution of safety issues and other concerns. In general, evaluations and resolutions are timely and appropriate. RL has supplemented the contractor requirements document of DOE Order 442.1A and included the requirement for a contractor ECP in the FH contract. A comprehensive website describes the formal ECP and FH policies and management expectations. Information on this formal concerns program is provided in initial and refresher general employee training. Concerns can be communicated online, by calling a hotline number or the employee concerns office, or in person to the program staff. Concerned individuals can report concerns anonymously or request confidentiality. RL refers some concerns to FH for investigation, for which ultimate resolution and management remains in the control of RL, and other concerns deemed to be outside the jurisdiction of RL are transferred to FH for management and closure. Numbered case files are established for each concern, and hard copies of supporting documentation and pertinent key information are maintained in a computer database.

Employees can also communicate safety concerns for resolution using a less formal safety suggestion/concerns process administered by Employee Zero Accident Councils (EZACs), as described in an FH requirements document. This program provides an easy and effective means for reporting and getting resolution to safety concerns at the facility/project level. Issues are being maintained in computerized logs in each WSD subproject, with documented actions that are tracked to closure as required by the requirements document. In addition to many routine maintenance-type issues, some significant process and facility condition suggestions/concerns are communicated and addressed in WSD using this program.

Approximately 200 concerns were addressed in both fiscal year (FY) 2004 and 2005, and approximately 140 concerns have been received in the first 11 months of FY 2006. Approximately 25 of the FY 2006 concerns were categorized as safety-related. Approximately 10 percent of all concerns in 2005 and 2006 were substantiated or partially substantiated. (See discussion of resolution categorization below.)

There is no evidence that resolutions to concerns were significantly deficient or that concerned individuals were not treated fairly or were discouraged or unsatisfied with the resolutions. However, there are weaknesses and omissions in the documentation in formal employee concerns case files. The Level 1 FH procedure describes the overall program but provides few details on the process for managing concerns, and no implementation procedures have been issued. For example, there are no expectations for collecting or recording supporting documentation, no discussion of anonymity or confidentiality or communication of final resolution with the concerned individual, and no mention of the transfer or referral of concerns from RL or associated protocols and processes. (See Section D.2.2 for discussion of weaknesses in RL transfer criteria; also see Finding #D-6.)

Although there are no specific RL or DOE requirements for what must be in an employee concern case file, in most cases ECP file documentation packages lacked sufficient rigor, accuracy, and formality to fully establish that the concerns were appropriately dispositioned. Case files do not have chronological logs, documentation of concerned individual interviews was poor, and conclusions/summaries do not generally identify the applicable requirements and actual conditions or level of compliance. In many cases, the method used to communicate the concern is not identified, and the exact wording of concerns is not always clearly documented; additionally, there is no evidence that the details about the concern have been clarified with the concerned individual. Investigation and closure information was sometimes insufficient, with little objective evidence, and no evidence that the resolution had been communicated to the concerned individual. In several cases, the evaluation and disposition were conducted by personnel or organizations other than the ECP staff without rigorous monitoring and verification/validation by the ECP staff to ensure that concerns were accurately characterized, rigorously evaluated, and appropriately resolved. Files often did not contain an adequate level of detail and/or justification for conclusions, and contained little evidence of actions taken. In several cases, the concerns were closed and categorized as "not substantiated," when evidence in the files indicated that the conditions and concerns cited by the worker were accurate. In other cases, a disposition category – "information provided" – was used when evidence indicated that the concern had been substantiated or partially substantiated. The inconsistency and inaccuracy of categorizations and the frequent use of the "information provided" category render statistics on concern validity indeterminate. In some cases, the specific concern or elements of a concern were not sufficiently addressed in the documentation. For example, a concern related to the failure to promptly suspend adjacent work activities when a communication line was severed by moving equipment was closed based on the corrective actions to an Occurrence Reporting and Processing System report, which did not address any issue related to failure to suspend work. (See Finding #D-6.)

Although generally effective in resolving safety concerns, the EZAC process has no procedure controls describing implementation of the high-level requirements document. For example, although the requirements document cites an expectation that issues are tracked to closure, there is no linkage to when/whether an issue should be managed in the more formal ECP or using the formal corrective action management program that would address such elements as extent of condition and causal factors. In some cases, resolution of some WSD employee zero accident safety log issues have not been timely, and/or logs have not been maintained current. For example, a number of safety issue/suggestions from 2005 remain open, and issues have been logged for over four months without documented evaluations or actions. (See Finding #D-6.)

Annual self-assessments and RL assessments have not identified and resolved the above weaknesses in the FH ECP. (See Findings #D-1, #D-2, and #D-3.)

Other feedback and improvement processes. Several other programs and management initiatives provide avenues for worker feedback and result in safety improvements for conditions, processes, and activities for FH projects and operations:

- Zero Accident Councils at the institutional level (President's Council) and the project/facility level (Employee's Councils) that meet monthly or more frequently provide an effective means for communicating safety issues and initiatives between workers, union safety representatives, the FH safety and health staff, and management. Safety issues and lessons learned are identified, discussed, and addressed.

- Several FH and WSD safety-related initiatives are being piloted in WSD subprojects, including the Human Performance Improvement training and a work observation program (behavior-based safety). These programs are providing improvements in event analysis and providing real-time safety feedback on safe/unsafe work behavior.

- As part of the voluntary protection program, each WSD subproject develops formal annual safety improvement plans, and actions are formally tracked to completion.

- An additional lessons-learned/feedback mechanism is provided by the FH Health and Safety organization through safety information bulletins posted on the intranet and on site bulletin boards. In 2005, 14 bulletins were issued, and 4 have been issued to date in 2006 addressing such issues as working with sharps, mounting and dismounting from heavy equipment, elevated work platforms, reporting safety concerns, application of the graded approach to AJHAs, and forklift safety. Monthly "safety leadership meetings" with safety and health institutional and field supervisors and management communicate ongoing and emergent safety initiatives and procedure/process changes, details on incidents, and lessons learned.

FH activity-level feedback and improvement processes. Various feedback mechanisms are incorporated into the FH work control processes or are implemented primarily by facility managers, supervisors, and workers at the activity level. The specific processes reviewed by Independent Oversight included such activities as pre-job briefs, post-job briefs, and plan-of-the-day meetings.

FH has established clear requirements and expectations for work management feedback and improvement in such procedures as HNF-PRO-12115, *Work Management*, HNF-PRO-079, *Job Hazard Analysis*, and HNF-GD-14047, *Pre-Job Briefing and Post-Job Review Guide.* In general, implementation of the activity-level feedback and improvement program is effective and has led to improvements in safety processes. For example:

- WRAP management has routinely solicited worker input and used it to evaluate and refine transuranic drum load-out practices. In response to past concerns and releases, many design and process changes have been implemented, which have reduced the frequency of airborne releases that occur during these operations.

- Central Waste Complex (CWC) operators historically were assigned one or two drum movement campaigns per day. For each campaign, operators were required to locate and segregate specific drums in preparation for drum shipment or testing, frequently resulting in additional movements of some drums during subsequent campaigns. As a result of worker feedback, management increased the number of campaigns assigned at a time, allowing the operators to greatly reduce their exposure to radiation and the hazards associated with repeated forklift and drum movement operations by minimizing the number of moves necessary to support the assigned campaigns.

- The T-Plant Complex benchmarked its drum waste processing activities against those at another site (Savannah River), which resulted in improvements in facilities and procedures. Further, based on feedback from workers, ES&H representatives, and line management over the past year, improvements have been made that have reduced the potential for worker exposures and mishaps. For example, the use of a mechanical drum handler to lift the drums to a working level has reduced ergonomic issues, the recent installation of a removable collar around the drums has reduced worker exposures to radiological contamination and organic vapors, and the ribbon placed in the transparent exhaust tubing from the glovebag confirms exhaust ventilation flow.

- Observed plan-of-the-day and plan-of-the-week review meetings were effective mechanisms for discussing work accomplished, problems encountered, and planned resolutions.

- The observed T-Plant EZAC meeting included representatives from management, ES&H and the bargaining unit, which provided an effective forum for discussing safety topics and concerns.

- In response to worker perceptions, in early 2006, WRAP safety, management, and labor redesigned the EZAC and increased emphasis on identifying and correcting safety concerns. The WRAP EZAC is now well represented by bargaining unit personnel, exempt staff, and management, and is an effective mechanism for workers to identify and communicate safety concerns to plant management and ES&H.

- T-Plant held an all-hands meeting where the facility manager provided an update of information of interest to the workers, and the workers were able to ask and receive management responses to their questions and informal feedback. Workers actively participated and raised pertinent safety questions that were appropriately addressed.

There have also been a number of instances in which WSD personnel suspended work to resolve potential safety issues or questions. As examples:

- The T-Plant maintenance activities for a crane cable reel replacement were suspended twice to address safety issues by appropriately using the work order change process. The first suspension followed discovery of asbestos-insulated wiring in a junction box that was not addressed in earlier hazards identification and control, and the second suspension followed discovery of unplanned interference from a stationary light fixture.

- A lockout/tagout for the life safety code upgrade project was appropriately suspended until an identified error in plant drawings (breaker panel designation not consistent with drawings) was resolved.

- During CWC surveillance, stacking, binding, and loading of 13 drums for transport to T-Plant, one of the drums appeared to be bulging and did not pass the "straight edge test." The safety basis technical advisor was called to determine how to handle the drum, and concluded that the drum was not bulging due to gas buildup and could be shipped; however, the shipper representative checked and noted that WSD procedures do not allow acceptance of a potentially bulging drum without additional bracing. Shipping documentation was corrected, and the suspect drum was returned to the CWC warehouse. CWC subsequently performed the required actions regarding the potential bulging drum, including installing the retention device and enclosing the suspect drum in an over-pack for shipment to T-Plant for venting.

- No AJHA was prepared for servicing a stack radiation detector at WRAP by multiple craft on an elevated platform. A worker raised this concern to the WRAP EZAC chairperson, work was paused, an investigation was performed, and a decision was made to prepare an AJHA prior to resuming work.

However, some examples were noted in which feedback and improvement activities were either ineffective or not appropriately implemented (see Finding #D-6):

- During crane placement of low-level mixed waste drums in a Low-Level Burial Grounds trench, a suspended drum bumped into another drum that was being labeled by workers. The workers were focused on labeling the drum and not the immediate danger posed by the suspended drum. The person-in-charge called for a work pause to discuss this incident and options to reduce the risk from having to use a spotter to direct drum placement (a structure blocked the view of the crane operator). However, the person-in-charge and the involved craft personnel did not perform a formal post-job analysis/lessons learned.

- Although procedurally required, documented post-job reviews are infrequently specified or performed. As-low-as-reasonably-achievable and post-job feedback databases on the FH intranet for several facilities reflect numerous cases over the past two years where post-job reviews were initiated but never completed or documented. This deficiency was identified by RL surveillance findings on work control program weaknesses and confirmed during subsequent FH self-assessments; corrective action plans have been developed and include ongoing actions, such as modification of training; monthly and quarterly monitoring of feedback databases; and reviewing progress with work control managers.

Overall, although additional rigor is warranted, activity-level feedback programs have many positive attributes and contribute to improvements in safety management and performance in most cases.

D.3 Conclusions

EM. EM senior managers demonstrated that they clearly understand their safety management roles and responsibilities, and are engaged in safety decisions and setting priorities. Communication mechanisms between EM and RL are effective. Delegation of safety management roles and responsibilities are formal and appropriate.

RL. RL roles and responsibilities for ES&H are generally well described, and many ES&H responsibilities are adequately implemented. The RL FR program is a mature, well-managed, and generally well-documented program. RL evaluations of contractor performance appropriately reflect ES&H performance in award fee determinations. RL has an assessment program in place and conducts surveillances, operational awareness activities, self-assessments, and formal assessments of its contractors. However, there are a number of deficiencies in RL self-assessments, planning and scheduling assessments, and several RL procedures. RL has self-identified that the TQP does not meet applicable requirements and needs to be significantly enhanced. The RL issues management/corrective action tracking process has a number of deficiencies and requires senior RL management attention to revise and implement an effective program. Some aspects of the ECP are adequately implemented; however, disposition criteria for the transfer of employee concerns is not adequately defined, and RL transfers most concerns to other organizations.

FH. FH has established and implemented effective processes for the various elements of a contractor assurance system as delineated in DOE Order 226.1. Generally robust assessment, safety inspection, and issues management programs have been established. Lessons learned are identified and applied. Safety concerns are addressed, and several new processes are being piloted to identify and prevent safety problems. With some exceptions, implementation of the activity-level feedback and improvement processes is effective, with many examples of improvements in processes and safety attributed to staff feedback as reported by WSD management. However, process and procedure weaknesses and implementation deficiencies in several areas hinder fully effective safety oversight. Some program procedures lack sufficient detail, clear responsibilities, and sufficient process controls. More rigor is needed in the implementation of employee concerns and lessons-learned programs to demonstrate and provide assurance of the effectiveness of these programs. The implementation of assessment and issues management processes also needs improvement in some areas. Although FH has compiled excellent injury and illness statistics, and few significant operational safety events and incidents have occurred, injury investigation and corrective/preventive action processes and documentation need considerable strengthening to ensure effective prevention of occupational injuries and exposures.

Overall, aspects of EM, RL, and FH feedback and improvement programs are effective. However, many of the deficiencies in implementation of work control described in Appendix C are longstanding and have not yet been adequately addressed. The work control deficiencies, in combination with the weaknesses discussed in Appendix E and this appendix, indicate that RL and FH need to improve the effectiveness of implementation of the feedback and improvement processes.

D.4 Ratings

The ratings below for the feedback and improvement program at the Hanford Site WSD as managed by EM, RL, and FH also reflect the feedback and improvement processes for essential safety systems at CWC and T-Plant, such as the safety system oversight program and system engineer program, as discussed in Appendix E.

RL Feedback and Continuous Improvement Processes..NEEDS IMPROVEMENT
FH Feedback and Continuous Improvement Processes..NEEDS IMPROVEMENT

D.5 Opportunities for Improvement

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

Office of Health, Safety, and Security

1. **Work with the DOE Headquarters Office of Management and Office of Economic Impact and Diversity and all line management employee concern offices to enhance DOE Order 442.1A and ensure that it provides clear and consistent direction to DOE offices and contractors, including criteria for disposition of employee concerns**. The new criteria should assure an appropriate level of DOE involvement and control of investigations and corrective actions in areas where DOE has responsibility and potential liability for actions taken.

RL

1. **Enhance RL assessment, self-assessment, and issues management/corrective action processes and performance.** Specific actions to consider include:

   - Develop and implement a multi-year (e.g., three-year) rolling master assessment schedule (surveillances, audits, independent internal or external assessments, and self-assessments) that captures all assessments planned over that period to aid in developing the annual integrated evaluation plan and reconciliation of assessments completed.

- Review and revise the RIMS oversight plan to include all directive-required assessments if its use is continued.

- Develop and implement a workable self-assessment process that allows: 1) capture of formal monthly performance review meetings and associated actions as a self-assessment; and 2) a more formal self-assessment process when it is appropriate (e.g., compliance or RL management assessments).

- Review and revise RITS in a fashion that ensures that: 1) issues are identified; 2) effective corrective actions are developed; 3) corrective actions are tracked to closure; 4) validation, verification, and effectiveness reviews are supported and documented; and 5) data is available to RL technical personnel and supports identification of trends and/or shaping of the oversight program.

- Review and revise processes/procedures for determining the follow-up actions needed for RL issues (e.g., a corrective action plan, RL lead assessor closure, or less formal mechanisms) to ensure that expectations are clear and that causal analysis and extent of condition reviews are performed in accordance with directive requirements.

- Enhance stronger corporate ownership (i.e., federal project director/integrated project teams, Organizational Effectiveness and Communications Division, and Safety and Engineering Division) of the operational awareness process and products.

2. **Enhance the effectiveness of the RL TQP.** Specific actions to consider include:

    - Designate a dedicated and qualified RL training coordinator who, among other duties, maintains TQP records and prepares/routes TQP periodic status reports to senior RL management.

    - Ensure that the new draft procedure addresses directive requirements before issuance and implementation.

    - Review the duties and responsibilities (e.g., position descriptions) of all RL technical personnel against directive requirements for inclusion in the TQP.

    - Ensure that position descriptions and individual development plans are kept current and that position descriptions for personnel who are required to participate in the TQP state this requirement.

3. **Enhance the FR program quarterly performance indicator process and the operational awareness database.** Specific actions to consider include:

    - Provide a simple tool to FRs for recording total time, field time, and oversight time at a reasonable interval (e.g., at least weekly) to ensure data integrity.

    - Develop and implement a RIMS procedure for the operational awareness database and associated operational oversight reporting.

    - Foster corporate supervisor ownership (outside of the Operations Oversight Division) for the technical content of the operational awareness database to enhance consistency in the identification of issues and reduce variance in the technical rigor of inputs.

4. **Enhance performance measurement and lessons-learned processes.** Specific actions to consider include:

    - Ensure that the recent Headquarters requirement for monthly and quarterly performance reporting is reflected in the appropriate RIMS procedures.

    - Develop and implement a lessons-learned/operating experience process in accordance with new DOE Order 210.2.

5. **Enhance the RL ECP.** Specific actions to consider include:

   - Reassess the disposition guidance in the RL ECP procedure. Revise the criteria to assure appropriate Special Concerns Office involvement for concerns in areas where DOE is responsible and potentially liable. Consider increased use of RL technical support resources to enable more independent DOE investigation and more DOE involvement in cases referred and transferred to other organizations.

   - Review the RL criteria and lines of inquiry for contractor ECP assessments, and ensure that comprehensive reviews are conducted.

   - Establish a process for formally documenting the notification and agreement of concerned individuals when their identity is to be released based upon a need to know.

   - Consider sending survey forms to concerned individuals as part of closure notifications to seek customer feedback on program effectiveness.

   - Establish controls to assure that the Special Concerns Office is manned and that telephones are answered during posted business hours.

   - Revise the recorded message on the ECP hotline to eliminate the obsolete pager number, and provide instructions for reporting conditions of imminent danger.

   - Provide training for individuals temporarily assigned to provide administrative support.

   - Develop and implement a simple reminder system to track actions on referrals.

FH

1. **Strengthen the self-assessment program to ensure that safety programs, processes, and performance are appropriately and rigorously evaluated.** Specific actions to consider include:

   - Review current management assessment report grading criteria and tighten the focus on performance and the evaluation of ISM implementation and work observation.

   - Adjust the scoring system for elements that do not apply to individual assessments to establish a normalized scoring to achieve a more meaningful trending/comparison tool.

   - Ensure that persons who conduct management assessments as well as project managers receive the narrative discussion of the assessment quality review.

   - Conduct workshops with “hands-on” training on the conduct of assessments and analysis of results for personnel performing management and independent assessment activities.

2. **Strengthen the occupational injury and exposure investigation and reporting processes to ensure that potential precursor events are thoroughly documented and analyzed, with causes determined and appropriate preventive actions identified and implemented.** Specific actions to consider include:

   - Consider revisions or supplements to the event report form and the procedure to better support documentation of the incident, investigation details (including causal analysis), and corrective/preventive actions. Ensure that the elements of ISM are addressed in the investigation report.

   - Establish/strengthen safety and health and institutional internal oversight processes and controls to ensure that the incident descriptions, investigation details, and corrective/preventive actions are rigorously completed and documented by line supervisors and ES&H representatives.

   - Establish a more formal method of tracking the completion of corrective/preventive actions (e.g., use of CAMS).

- Conduct periodic functional area and project-level management self-assessments to ensure that the investigation and preventive action elements are effectively implemented.

3. **Increase the rigor and formality of ECP management.** Specific actions to consider include:

    - Provide more details and institutionalize in the FH formal ECP procedure the responsibilities, interfaces, and specific processes for managing employee concerns. Include such elements as the protocols and processes for concerns referred and transferred from RL; requirements for assigning responsibility for conducting investigations; documentation of investigation details and oversight by the ECP staff; and interfaces with the concerned individuals, including confidentiality and formal feedback on dispositions. Provide guidance and expectations that investigators sufficiently interact with the concerned individual to elicit the full extent and essence of their concerns, document any refinement of concern statements, and focus resolutions on any refinements.

    - Strengthen the documentation in ECP case files. Include a chronological log of all activity in each case, from citing the date and method of communicating the concern, to the date and method of communicating the resolution to the concerned individual and closure. Ensure that all actions are complete and evidence provided and/or verified or appropriately entered into CAMS before formally closing employee concerns. Summarize notes from meetings, interviews, and document reviews in the chronological log. Document the research of and requirements from FH, DOE, and other regulatory body policies and standards and the level of compliance as applicable.

    - Ensure that investigation results and resolutions are communicated and discussed with concerned individuals, and solicit feedback.

    - Ensure that all elements and the specific concerns, as well as any resulting corrective actions, are addressed by the investigation. Establish processes for appropriate ECP staff to monitor and ensure the adequacy of the investigation's scope, depth, and conclusions if the investigation is conducted by organizations or personnel other than the ECP staff.

    - Eliminate the ambiguous disposition category of "information supplied." All concerns should be classified as either not substantiated, substantiated, or partially substantiated.

4. **Increase the rigor and formality of management of the lessons-learned program.** Specific actions to consider include:

    - Strengthen the Level 1 procedure to address the documentation of institutional and functional area SME reviews and results, and establish a means to document any actions to be taken and feedback on completion of those actions.

    - Issue implementing procedures or instructions on processes for identifying, screening, documenting, and applying lessons learned.

APPENDIX E
ESSENTIAL SYSTEM FUNCTIONALITY

E.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight evaluated essential system functionality for selected safety systems at two T-Plant facilities: 221-T and 2706-T. The systems selected were the safety-significant ventilation exhaust systems in both facilities and the safety-significant fire suppression system in 2706-T (221-T has no fire suppression system).

Independent Oversight also evaluated the effectiveness of Fluor Hanford, Incorporated (FH) programs and its Waste Stabilization and Disposal Project (WSD) processes for engineering and configuration management to determine whether safety systems are capable of performing their safety functions with a high level of confidence, commensurate with their importance to safety. The programs and processes evaluated included configuration management, the unreviewed safety question (USQ) program, maintenance, testing, and operations. Two of the Independent Oversight 2006 focus areas (quality assurance in engineering and configuration management programs and processes, and safety system component procurement) are closely related to essential system functionality and are discussed in this appendix. Richland Operations Office (RL) and FH feedback and improvement systems as applied to the evaluated safety systems were also reviewed, and the results are considered in the overall evaluation of feedback and improvement systems as discussed in Appendix D.

The exhaust ventilation systems review focused primarily on the safety-significant structures, systems, and components (SSCs) that provide confinement for the 221-T and 2706-T facilities, including the systems' fans, filters, ducting, dampers, stacks, and instrumentation. These systems maintain the facilities at a negative pressure relative to the outside environment and provide filtration of all building exhaust through high-efficiency particulate air (HEPA) filters. They perform these functions during normal operation and during accidents, when they are the primary contributors to reducing releases of radioactive materials.

The fire suppression system review focused on the safety-significant SSCs that provide fire suppression in the 2706-T building complex. The adequacy of the water supply to the T-Plant site was also reviewed.

The purpose of an essential system functionality assessment is to evaluate the functionality and operability of selected SSCs that are essential to safe operation of the facility. The review criteria are similar to the criteria for the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 2000-2 implementation plan reviews; however, the Independent Oversight reviews also include technical evaluations of the selected SSCs' design, engineering, configuration management, operation, maintenance, surveillance, and testing. Additionally, these reviews address a facility's safety bases and related programs, such as the USQ program. Essential system functionality assessments are performed at a very detailed technical level that includes system calculations that are the bases for the systems' designs and safety analyses; the documented safety analyses (DSAs) and other related safety basis documents, such as technical safety requirements (TSRs) and the fire hazards analysis (FHA); drawings; specifications; vendor documents; facility-specific technical procedures; facility walkdowns; and interviews with system engineers, design engineers, maintenance and testing engineers, operators, technical managers, and other technical support personnel. The primary focus of these reviews is verification that the systems' designs and safety bases are technically correct, consistent, and in accordance with applicable codes, standards, regulations, and DOE orders, and that the systems are fully capable of performing their design safety functions.

E.2 Results

E.2.1 Configuration Management Programs and Supporting Processes (including the Quality Assurance in Engineering and Configuration Management Programs Focus Area)

Independent Oversight reviewed the FH and WSD procedures for engineering design and configuration management, including such key areas as component classification and identification; design drawings, calculations, and/or analyses; design modifications; engineering specifications; and document control.

At the corporate level, FH has a configuration management policy, HNF-POL-CONFIG, that establishes formal processes for documenting the functional and physical characteristics for items during their life cycle, controlling changes to those characteristics, and providing information on the status of change actions. The configuration management principles at FH are appropriately based on American National Standards Institute/Electronic Industries Alliance 649, *National Consensus Standard for Configuration Management*, and DOE-STD-1073-2003, *Configuration Management Program*. The policy also requires establishment of technical and programmatic configuration baselines. The implementation of configuration management requirements at the WSD level was reviewed.

Engineering design and configuration management. At the highest procedure level, HNF-RD-1819, *Project Hanford Management Contract Engineering Requirements,* establishes rigorous requirements for the design process, engineering personnel responsibilities and qualification/training, and engineering configuration management. The procedure addresses the required phases of engineering design, from identification of design inputs to acceptance and update of the technical baseline. The procedure clearly defines expected roles and responsibilities of system engineers and design authorities in relation to vital safety systems (VSSs) and other active systems that perform important defense-in-depth functions. The procedure also establishes appropriate requirements for configuration management processes in accordance with DOE Order 420.1B, *Facility Safety,* and DOE-STD-1073-2003, including development and continuous maintenance of a configuration management baseline that realistically reflects the physical configuration of the VSSs.

A number of lower level procedures provide implementation details in such key areas as component classification and identification, design drawings, calculations and/or analyses, design modifications, engineering specifications, and document control. In general, the associated processes are adequately defined and clearly documented, as shown by the following examples.

- HNF-PRO-20050, *Procedure for Engineering Configuration Management*, provides adequate implementation-level details in such areas as identification of safety class and safety-significant SSCs, development of a configuration management baseline, and a work package configuration management process that ensures safety in modifications to SSCs.

- HNF-PRO-8259, *Procedure for Calculation Preparation and Issue*, establishes adequate requirements and processes for preparation, documentation, review, approval, and retention of design and safety-related calculations.

- HNF-PRO-2001, *Facility Modification Package Process,* provides implementation details necessary to capture design process information in a readily retrievable package for present and future use and reference.

- HNF-PRO-8017, *As-Built Verification Process*, establishes the requirements for field verification of drawings. The procedure also prescribes how to document as-built verification on engineering data to ensure that new drawings entering the Hanford Document Control System meet as-built standards contained in this and other engineering documents.

The overall engineering processes and underlying procedures are appropriately rigorous, as discussed above. The Independent Oversight team also reviewed a representative sample of configuration documents to determine the adequacy of implementation of these procedures, as discussed in the following paragraphs.

System walkdowns and examination of a sample of drawings for the 221-T and 2706-T exhaust ventilation systems and the fire suppression system in 2706-TA, TB, and the fire water supply riser room were performed. These activities revealed consistency between drawings and actual installations. Many other configuration management system documents were reviewed, including drawings, modification packages, calculations, vendor documents, and testing, operations, and other technical procedures. These reviews indicated that, in general, the configuration management procedures are followed.

According to the engineering configuration management procedure, all essential and support drawings must be in the configuration management baseline and identified as such in the Hanford Document Control System. The procedure also states that general drawings should not be used as the basis for design, maintenance, or operational decisions. A corporate-level management assessment performed in August 2005 had found widespread non-compliances in the adequacy of implemented facility VSS configuration baselines. Actions to resolve these issues were completed by December 2005. To verify the effectiveness of the implementation activities, the configuration management baseline in the Hanford Document Control System was reviewed to determine whether up-to-date T-Plant drawings and other information consistent with physical configuration of the system existed and were used in the change control processes. Drawings, including those routinely used by T-Plant ventilation and fire protection system engineers (e.g., HVAC/Instrument Flow Diagram for ACT-2, Heating and Ventilation Air Flow and Control Diagram for Canyon), were kept up to date and had been placed in the configuration management baseline as required.

Overall, the configuration management baseline has been rigorously maintained and/or reestablished. Considering the age and extent of modifications at T-Plant throughout its operations, establishing and maintaining a current baseline is a significant accomplishment.

The Independent Oversight team reviewed FH efforts to address a general FH self-identified weakness involving inadequate identification of VSS boundaries by the system engineers. It was concluded that limited progress has been completed at T-Plant in this area to support configuration management requirements, but significant effort is planned in the near term. In response to this weakness, an FH corrective action was formally defined and included in the most recent version of the system engineering program procedure (June 6, 2006). It requires the responsible system engineers to develop a list of the credited components and systems based on information in the DSAs, clearly delineate the VSS system boundaries in their system engineer notebook, and have the information reviewed/approved by a subject matter expert (SME). At T-Plant for the ventilation and fire protection systems, the validation of VSS boundaries has not been completed. The fire suppression support system (sanitary water supply system) is not specifically classified as a VSS; however, Independent Oversight team walkdowns indicated that it is adequate to supply the T-Plant fire suppression system when needed. In the case of T-Plant ventilation, RL is implementing a review to address concerns from DNFSB Recommendation 2004-2, *Active Confinement Systems*. Recent correspondence between RL and FH indicated that the process for evaluation and designation of T-Plant ventilation VSSs based on their active safety function is well underway and is expected to be completed within the next few months.

Configuration management of the safety basis. Maintenance of the safety basis at FH is a separate process from the engineering configuration management. The safety basis activity is performed according to procedure HNF-PRO-8317, *Safety Basis Implementation and Maintenance,* under the auspices of the Central Safety Basis Group. This procedure is clearly written and comprehensive. Appendix A of this procedure describes the structure of implementation plans and compliance matrices for proper implementation and maintenance of new, revised, and updated safety basis documents to accurately reflect new TSRs and other safety basis commitments.

The safety basis compliance matrix for T-Plant is an extensive electronic spreadsheet that tracks commitments from the facility DSA/TSRs to their implementing procedures. The compliance matrix developed for each facility, including T-Plant, is printed annually, and a hard copy is kept as a controlled document. Information in this matrix is kept current as requirements and/or procedures change. According to a WSD procedure (WMP-200, Section 4.17), all changes to the implementing documents on the compliance matrix shall undergo the USQ process. Approval and validation of changes in the compliance matrix is performed by the Compliance Matrix Review Board.

The quality of information in the compliance matrix for T-Plant was reviewed and in general was good. However, as would be expected, the deficiencies in engineering design and authorization bases (identified in Section E.2.2) often also occur in the compliance matrix (see Finding #E-4). For example, one engineering deficiency relates to plugging of HEPA filters during some postulated fire events where exhaust fans are left to run until filter failure or a decision is made to secure the fans (see DSA, Table 4.4.6.4-1). The compensatory measure for this case, as described in the DSA states "Actions under the emergency management will seek to identify radioactive releases potentially indicative of HEPA filter failure. In the event that radioactive release is detected, then actions will be specified to mitigate the consequences of the release or prevent further release. Such actions could include securing exhaust fans if possible." No specific procedure providing appropriate detail to implement this compensatory measure is listed in the compliance matrix (for further discussion, see Appendix G). Notwithstanding, overall the safety basis compliance matrix is an effective approach for tracking requirements in the safety basis.

Unreviewed safety question program. The Independent Oversight team reviewed the facilities' USQ program. The two applicable procedures (HNF-PRO-062, *USQ Process*, the site-level procedure, and WMP-200-4-3, *Unreviewed Safety Questions*, the facility-level procedure) and several completed program output documents, such as USQ screenings, evaluations, and potentially inadequate safety analysis (PISA) documents, were reviewed.

With a few exceptions, the procedures and their implementation were good, with clear directions and useful guidelines in areas of frequently misunderstood requirements. Qualification requirements for screeners, evaluators, and PISA evaluators were appropriate and clear, and up-to-date lists of individuals qualified for the positions were maintained. However, the following procedural discrepancies or inconsistencies were identified:

- Section 4.10, Item 3, and other sections of the site-level procedure discuss the seven basic USQ evaluation questions. Each question begins with the phrase, "Does the proposed activity or PISA…" increase, create, or reduce some quality previously evaluated in the existing safety basis. However, the discussions of these points in 10 CFR 830 and the DOE USQ Guide 424.1-1A use the word "Could" rather than "Does" for these questions, which requires less certainty that the condition questioned actually exists to arrive at a yes answer. Therefore, the procedure's questions are non-conservative relative to the requirements. Although the procedure's USQ evaluation forms allowed answers of yes, maybe, or no, with yes or maybe answers considered to constitute a USQ, which should produce the same result, the procedure is not fully consistent with the requirements and introduces the potential for error.

- Appendix D, Categorical Exclusion 2, under the heading of Scope, the seventh bullet, allows changing clarifying notes or cautions that do not direct "operator" actions. Read literally, this allowance would only be applicable to "operator" actions, and not to the actions of other technical personnel. Consistent with FH's intent, the word "operator" is too restrictive, and a broader term, such as "personnel," is needed.

- Appendix H, Evaluation Instruction, in the discussion "discernible increase," in the first bullet on page 57, states that if a change causes a slightly higher probability of the accident occurring, but it still remains in the *Unlikely* probability range, such an increase should not be considered "discernible." This direction allows using numerical margins within which an increase can exist and still not be considered a USQ. This is contrary to the directions of the USQ Guide, which states that, "It is inappropriate…to set a numerical margin for increases in the probability or consequences within which a positive USQ would not be triggered."

The review of USQ program output documents indicated that, with the following exceptions, the procedures were followed with appropriate rigor and attention to detail:

- USQ Screening USQ-T-03-047 for a modification to cap facility 221-T storm sewer openings that connected to the ventilation exhaust system answered "no" to the first screening question about whether it was a change to the facility as described in the DSA, and, as a result, no USQ evaluation was performed. Although the storm system was not explicitly described in the DSA, the ventilation exhaust system was described, and the connection of this system with the ventilation exhaust system made it, in effect, an extension of the exhaust system, in that it affected exhaust flow, and it was a potential ground-level unfiltered leak path if the exhaust system would be secured. Therefore, the question should have been answered yes, with a USQ evaluation performed.

- Section 4.4 of the site USQ procedure, Item 1.0, requires that "…when a concern is raised about the adequacy of the safety analyses to the facility manager or identified representatives, the facility management shall confirm or refute the reasonableness of the potential for having an inadequate safety analysis as soon as possible… and shall take no longer than five working days without reporting a PISA." Appendix C describes three conditions that require entering the process: discrepant as-found condition, operational event or condition, or new information. According to this section, the "discrepant as-found condition" includes conditions where the DSA descriptions, assumptions, or controls do not match or the analysis is inappropriate, and "new information" includes errors in the DSA. During this inspection, numerous concerns were identified by the Independent Oversight team that fall within the definitions of discrepant as-found conditions or new information; however, in only one case, PISA Determination T-06-56 concerning 221-T HEPA filters testing with diffusion air pressure below manufacturer's requirement, was the formal, documented process entered in a timely manner. Responses to most of these concerns from the system engineers and safety basis engineers throughout the assessment centered around mitigating factors or potential resolutions that they felt obviated the need to enter the formal process rather than the concerns themselves and the requirements of the process. At the end of the onsite data gathering phase of the inspection, the Independent Oversight team presented its overall concern that, for 221-T and 2706-T, the threshold for entering the formal PISA evaluation process had not been adequately defined, conveyed, and/or enforced by site and facility management to ensure that the process was consistently executed as described in 10 CFR 830 and DOE Guide 424.1-1A and as required by procedure HNF-PRO-062. Although FH did ultimately address all of the open potential PISA concerns identified by the Independent Oversight team, with seven PISA evaluations or USQ evaluations after the completion of the field visit phase of the inspection, many of these concerns were not formally addressed until well after the procedure's five-day limit from the time they were initially identified to FH.

FINDING #E-1: FH, in several cases, did not enter the formal PISA evaluation process in a timely manner for valid safety basis concerns identified during this inspection. (10 CFR 830 and procedures *USQ Process* [HNF-PRO-062] and *Unreviewed Safety Questions* [WMP-200-4-3])

Summary. The FH engineering and configuration management programs were, in general, comprehensive and well defined, and adherence to these programs appeared to be generally effective, with the significant exception of the USQ PISA program. Overall, the configuration management baseline has been rigorously maintained. Considering the age and extent of modifications at T-Plant throughout its operations, maintaining a baseline is a notable accomplishment. The USQ program was also generally well defined and implemented, with one significant exception (i.e., in some cases, the formal PISA process was not entered into in a timely manner for issues identified during the inspection).

E.2.2 Engineering Design and Authorization Basis

Engineering and safety basis personnel are generally very knowledgeable about the facility, its systems, and the supporting design and safety bases. They were all observed to be well experienced and qualified, highly motivated, and possessing of a strong nuclear safety culture and sense of ownership.

The systems reviewed, with a few exceptions, were generally well designed and robust with respect to their normal operating functions. RL and FH have been conservative in application of safety-significant classification. However, several weaknesses and discrepancies were identified with respect to their accident mitigation functions as described in the safety bases, and in the translation of the design and safety bases into technical procedures and practices. As discussed below, these safety basis weaknesses call into question the capabilities of the affected SSCs to fully perform their safety functions as they are described in the safety basis.

Fire Suppression System

The review of the fire suppression system at T-Plant identified a significant deficiency with the TSR bases for the fire suppressions systems as well as a few other deficiencies of less significance.

Performance requirements in the TSR bases for fire suppression systems are inconsistent. The T-Plant TSR bases A3/4.2.1-3 in Table 3/4.2-1 require a minimum static pressure at pressure gauge F-PI-2706-601 of 88 pounds per square inch gauge (psig). The bases further state "All postulated fires in the MDSA [master documented safety analysis] and in the FHAs were determined to last less than one hour; as such, the Fire Suppression System supply and distribution system must be able to provide sufficient water supply for at least one hour for dual Fire Suppression System and manual fire fighting." The required static pressure and bases statement are not consistent, because contrary to these requirements, data found in the design basis hydraulic calculation HNF-16788 indicates that a static pressure in excess of 88 psig is required to support both automatic suppression supply and manual hose stream flow. The manual hose connection may be used at the same time the safety-significant sprinkler system is required, thereby impairing water flow to the sprinkler system. DOE Order 420.1B and DOE Order 5480.7A, *Fire Protection*, consider the fire protection criteria from the National Fire Protection Association (NFPA) 13 standard as mandatory. NFPA 13 requires that the suppression system be capable of simultaneous dual fire suppression and manual fire fighting hose flows. The TSR fire suppression system limit of 88 psig allows full T-Plant operation and does not address the above design requirement. The current acceptance criterion of 88 psig for the T-Plant fire suppression system surveillance SR-4.2.1.1 is based on the source static pressure required to deliver flow to the suppression system alone and does not consider the hose flow allowance from the system hose connection that the TSR bases specify.

FINDING #E-2: The T-Plant safety-related fire suppression system TSR static pressure value and supporting surveillance test do not ensure that the system will perform its intended safety function (sprinkler flow) as defined and required in the TSR bases, as well as support concurrent manual hose stream flow as required by NFPA 13. (10 CFR 830 and T-Plant technical safety requirements)

The greenhouse structures in the 2706-TA facility create an obstruction to the overhead suppression system. To support past operations in Building 2706-TA, which included waste sampling and management of "problem" waste containers, a greenhouse was installed in the building. The greenhouse is currently non-operational, and combustibles are low and within acceptable limits; however, the allowable combustible loading is significantly higher, and the greenhouse structure creates an obstruction to the overhead sprinklers. This obstruction has not been removed because of the uncertainty of Building 2706-T's projected mission. This situation was also previously identified as a finding and documented in the master FHA.

The T-Plant fire protection water distribution system does not meet all the requirements related to redundant water supply. The water supply system to the T-Plant does not fully meet the requirements of DOE Order 5480.7A, *Fire Protection,* in that it does not feature a looped network of piping so that any point in the network is provided with two points of supply. A looped system is required by DOE Order 420.1B, where the maximum possible fire loss exceeds $1 million. The existing configuration was analyzed in Section 3.3.18.2 of the master FHA and found to be acceptable; however, an exemption from the DOE requirement is needed. In April 2002, an equivalency exemption request was submitted to DOE, and DOE responded in April of 2002 that the request did not actually provide an alternative means of satisfying this deficiency that could be considered an equivalency. In addition, the request did not address additional deficiencies of the water supply as identified in the master FHA. To date, this item remains open.

Ventilation Exhaust Systems

The review of the safety-significant 221-T and 2706-T ventilation exhaust systems identified the following safety basis and design deficiencies.

Inadequate TSR building differential pressure (dp) limit. The current 221-T and 2706-T TSR building dp limit, ≤ minus 0.03 inches (") water column (w.c.) (measured between the building static pressure and the outside static pressure), is inadequate to accomplish its intended confinement function in the following respects:

- **Ambiguous requirement.** The TSR surveillance requirement requires the buildings' dps be ≤ minus 0.03" w.c., whereas the TSR limiting condition for operation (LCO) requires only that the building pressure be maintained negative, with no numerical value specified. These requirements are ambiguous and subject to misinterpretation. RL's stated intent was that the buildings always be maintained ≤ - 0.03" w.c. when in operation, except when specifically not required by the LCO, such as when the outside doors are opened.

- **Wind effects.** The TSR surveillance requirement dp limit is inadequate to prevent localized pressure reversals and resultant potential outward leakage due to wind effects on the building for velocities greater than approximately 8 miles per hour (mph). FH instituted a new administrative control of ≤ -0.06" w.c. as a compensatory measure until this concern was finally resolved. However, this value was inadequate in that it only provided compensation for wind velocities up to 9 mph.

- **Fire pressurization effects.** The heat and gas generation pressurization effects of fires inside the buildings are not accounted for.

- **HEPA filter loading.** Rapid HEPA filter soot loading in a fire event, which will reduce exhaust flow and thereby reduce building dp, is not accounted for.

- **Instrument uncertainty.** Building dp is currently read from an instrument with an accuracy of only ± 0.03" w.c. to verify the limit of ≤ - 0.03" w.c. dp. This uncertainty is too large and is not accounted for in the TSR surveillance requirement limit. This issue was identified during a recent RL surveillance and is being evaluated by the contractor.

Non-conservative HEPA filter plugging analyses. The MDSA, in Table 3.4.2.6-2, credits the ventilation systems in buildings 221-T and 2706-T with reduction of the consequences of medium fires inside those facilities by 99 percent. Such credit requires that the systems' HEPA filters remain intact throughout the event. However, combustion products from the fires would rapidly load the filters, increasing the dp across them. HEPA filter failure criterion (i.e., loading limit) is defined at 10" w.c. dp. The MDSA credits combustible loading controls with limits based on combustible loading analyses documented in the FHA to assure that the filter loadings would not exceed their failure criterion. These analyses were found to be significantly non-conservative, as follows:

- **Non-conservative HEPA filter loading model.** In the 221-T facility, the building exhaust HEPA filters are contained in four parallel banks, with two HEPA filter stages in each bank, for a total of eight filter stages, and common inlet and outlet headers. The HEPA soot loading analyses model for the design basis fire non-conservatively assumed that the loading would be uniform to all eight stages. However, in actuality, although the first stages would uniformly load up to their failure criterion (for the first half of the fire), the second stages would receive essentially zero event loading, since they would be protected by the first stages. At the point where one of the first stage filters would fail, the flows and pressures across the remaining filters would change dramatically. In the bank with the failed filter the resistance would drop to that produced by the remaining relatively clean filter, causing a resultant large flow increase in that bank. At the same time the total dp across the remaining banks would also be reduced, causing corresponding flow decreases. The filter system would come to a new equilibrium with a uniform, initially lower dp across all of the banks. However, since each of the three intact banks would share this dp across two series filters, the dp across the first stages would drop from their previous level. However, the bank with just the second stage remaining would carry this entire new dp across just this one filter. Because for the remainder of the event this one filter would continue to be at a higher dp than any of the other first stages, it would reach its rated value and potentially its failure point before any of the other first stages, thereby ending the filtration effectiveness of the system. This second filter failure could occur at any time after the initial first stage failure, depending on the failure mode of the first stage; a blowout first stage failure could produce an almost simultaneous second stage failure due to the rapid velocity change (dp is a function of velocity squared), the potentially large release of soot from the first stage, and the relatively rapid additional collection rate due to the preferential flow through this bank, and a gradual first stage failure would allow more gradual changes in the system dynamics and hence more subsequent loading of that second stage before its failure. Therefore, in the best case, the gradual loading case, only five of eight filter stages credited in the analyses could be loaded before a total system failure occurred; in the worst case, the blowout case, only four of eight could be loaded. Therefore, on this factor alone, the maximum allowable combustible loading currently allowed would have to be reduced by 50 percent.

(This factor does not apply to the 2706-T facility ventilation systems, because they have only one HEPA filter stage.)

- **Maximum normal filter loading in normal operations.** The MDSA and plant procedures allowed up to 5" w.c. dp normal filter loading; however, the analyses accounted for only 4" w.c. dp. FH indicated their intent to revise the MDSA and procedures to conform with the analyses.

- **Non-conservative limit for flammable liquid fires.** The 5 kilogram (kg) FHA limit for combustible liquids (from calculation WHC-SD-CP-ANAL-008, Rev 0) was derived based on an average of widely scattered test data. This data indicated that when starting from an initially clean filter, 5 to 7 kg of liquid was required per filter to produce plugging. However, when starting from an initially dirty filter at the 4" w.c. filter dp changeout limits, the mass required to plug was only 3 to 4 kg. FH indicated it would revisit its analysis.

Invalid diagnostic systems and strategy for fire event. The accident analyses exposure values for the 221-T and the 2706-T medium fire event take credit for both the exhaust ventilation HEPA filters and maintaining the building at negative pressure. However, the MDSA, in Table 4.4.6.4-1, outlines vulnerabilities in the ventilation system and the accident response strategy that would prevent this system from fully performing the functions credited, as follows:

- **DSA allows running HEPA filters to failure.** The DSA states that the system will be run until the HEPA filters fail, and then the exhaust fan will be secured. However, for this event, the accident analyses values for mitigated exposures are based on the filters not failing and the building dp being maintained at or below the TSR limit, which could not be accomplished with the fans secured. Additionally, even for those events where the filters would be expected to fail and hence they are not credited in the MDSA, such as the large fire, the correct strategy would be to secure the fans *before* the filters failed, not after, to minimize the actual releases.

- **Inadequate HEPA filter failure detection capability.** The MDSA states that the emergency management will detect the filter failure by identifying the associated radioactive release. Currently, the installed radiation detection equipment is not specifically designed for this function, and HEPA dp instrumentation would likely provide a misleading indication regarding actual or pending filter failure, because the readings could be contraindicating, depending on the failure mode (instantaneous versus gradual). (The emergency management concerns with the use of these instruments is discussed further in Appendix G.)

- **Inadequate bases for passive building mitigation.** The MDSA credits 90 percent confinement effectiveness with the ventilation systems secured, based on engineering judgment. However, it did not appear that the following conditions had been adequately accounted for: (a) the building's very large unfiltered openings in the unloading tunnel and at the abandoned former air supply system inlet, (b) the driving force generated by the fire's heat and gases, and (c) the previously discussed wind effects.

FHA, DSA, and TSR discontinuities for 2706-T. Per the FHA, for the medium fire in 2706-T, which includes a 26-gallon diesel fuel spill, 12 drums engulfed in the flames, and the fixed combustibles, the fuel loading would exceed the FHA calculated allowable with respect to HEPA filter soot loading (5 kg/filter x 12 filters = 60 kg). The FHA concluded that "...it is possible that a lift truck related fire could lead to the failure of the HEPA filters." Contrary to this, the MDSA credited the HEPA filters for two orders of magnitude reduction in radiation exposures for this event. The MDSA also credited TSR administrative controls of combustible materials for this event. However, the MDSA combustible materials limits and the TSR combustible loading procedure allow loadings greater than the FHA analyzed limits to assure HEPA filter integrity.

In considering the effects of all of the above-described discrepancies, it should be recognized that, although the 2706-T exhaust fans had the static pressure capability to cause failure of fully loaded HEPA filters, only one of the two 221-T exhaust fans had the capability of producing greater than the 10" dp across the HEPA filters that would be required to cause their failure. However, the controls for this fan had been modified to limit its maximum static pressure to 10" w.c. to address an unrelated structural harmonics issue, thereby also removing its ability to cause filter failure, regardless of the loading. While this change would eliminate the above-described filter loading issues for that fan, the inability of the 221-T fans to cause HEPA filter failure had not been captured and credited in the MDSA. Consequently, any future system modifications, such as replacement, might raise these fans' static pressure capabilities and could reintroduce the filter failure scenarios described above.

FINDING #E-3: The T-Plant safety-related ventilation exhaust systems' safety bases' limits for building negative pressures and HEPA filter loading during fires, the safety bases' descriptions of equipment and strategies for dealing with fire-induced filter failures, and the supporting analyses for these limits and descriptions are not adequate to ensure that the systems will perform their intended safety functions, as credited in the safety bases. (10 CFR 830 and T-Plant safety bases)

Weaknesses in Safety and/or Design Bases Translation to Procedures and Practices

The following are weaknesses that were identified in the translation of the safety basis and/or design basis requirements/commitments for the T-Plant fire suppression and exhaust ventilation safety systems into implementing procedures and practices.

Inadequate specificity in combustible materials control procedure. The procedure contains inadequate specificity to enact the combustible material controls described in the MDSA. Additionally, where specific values are provided, they allow material quantities and types outside the limits established in the FHA and reflected in the MDSA. For example, the procedure allows up 4,000 kg per fire area of unspecified materials in the T-canyon and tunnel. However, this value represents the limit for wood only; if these materials were plastics, which have soot generation rates per kg typically about five to nine times that of wood, the limits would have been much less, and this potential is not reflected in the procedure. The procedure also allows storage in the 221-T canyon head area of up to three 5-foot cube pallets of unspecified flammable materials in addition to fixed flammables. However, a fire-induced breach of the sheet metal separation wall that separates this area from the canyon could connect this area to the canyon ventilation envelope. Such a volume of plastics would exceed the allowable limits by a large margin. The procedure also does not require documenting the masses observed during inspections versus the allowables.

Non-conservative 2706-T, ACT 1 HEPA filter testing. The TSRs require efficiency testing of the 2706-T ACT 1 exhaust system HEPA filters to verify ≥ 99 percent efficiency. However, the procedure for performing this testing does not account for the locations for the dioctyl phthalate (DOP) injection nozzles and the sampling points relative to the HEPA filters and the prefilters (not credited in the accident analyses), and as a result, the procedure actually determines the combined efficiencies of the pre-filters and the HEPA filters. Because the procedure indicates that the penetration results are for the HEPA filters alone, the calculated results are non-conservative. In spite of this procedural error, considering the latest test results of ~ 0.002 percent penetration (99.998 percent efficiency), even with the likely error induced by this issue, it is very unlikely that the actual HEPA filter efficiency would be less than the 99 percent TSR limit.

In reviewing this issue, the Independent Oversight team also observed that the TSR requirements for the 2706-T, ACT 1 ventilation HEPA filter efficiency testing for the Solid Waste Operations Complex (SWOC) are non-conservative with respect to the accident analyses. Whereas the accident analyses credits 99 percent HEPA filter efficiency, and because no credit is taken for the non-safety prefilters, the TSR acceptance criteria are "…at least 99 percent for HEPA filter exhaust *banks* [emphasis added]…," which *would* include the prefilters.

221-T HEPA filter test procedure not per vendor requirement. The filter housing vendor manual requires that, for testing the HEPA filters, DOP diffusion air must be supplied at 100 psig, whereas the procedure allows lower pressure, 60 to 100 psig, which has the potential to not provide adequate diffusion. In response to this observation, the system engineer initiated PISA Determination T-06-56. Subsequent tests performed by the system engineer showed the same filter efficiency results at 60 psig and 90 psig supply pressures, indicating insensitivity to this parameter. Additionally, independent informal calculations by the system engineer and the Independent Oversight team indicated that there was choked flow in the diffusion air supply at pressures well below 60 psig, which would explain this apparent insensitivity. Also, the procedure does not account for the induced error in the calculated efficiency due to the additional air supplied for diffusion. However, informal analyses indicated that because of the wide margin of previous test results over the acceptance criteria, the magnitude of this error would not have caused results below the TSR acceptance criteria. None of these concerns were evaluated to be actual PISAs, although the procedure should be revised to account for the diffusion air induced error.

FINDING #E-4: FH has not ensured that the safety bases for the T-Plant facilities, including the MDSA, the TSRs, and the FHA, and the supporting analyses are valid, consistent, and adequate, and that the translation of the safety bases into facility procedures/practices is adequate to demonstrate that the safety-significant ventilation and fire suppression systems will perform their intended safety functions. (10 CFR 830 and T-Plant safety bases)

FINDING #E-5: RL's reviews were not performed with sufficient rigor, depth, and detail, in some cases, to ensure that the safety bases for the T-Plant facilities, including the MDSA, the TSRs, and the FHA, and the supporting analyses are valid, consistent, and adequate, and that the translation of the safety bases into facility procedures/practices is adequate to demonstrate that the safety-significant ventilation and fire suppression systems will perform their intended safety functions. (10 CFR 830 and DOE Standard 1104)

The Independent Oversight team's walkdown inspections of the systems indicated that they are as depicted on the associated design documents, that they are being properly maintained, and that their material conditions are very good, with one exception. At the 221-T exhaust system HEPA filters, the bottoms of the supporting legs for the filter housings are rusty and losing their protective finish, apparently as a result of de-icing materials used during freezing weather. The system engineer promptly initiated a corrective maintenance work request upon identification of this condition.

Summary. The systems reviewed are generally well designed and robust for normal operations and accident conditions. However, the engineering design and safety bases for T-Plant are not sufficient to ensure that their safety functions will be performed in all accident conditions. Two of the safety systems' TSR operating limits, the minimum allowable building negative differential pressures for 221-T and 2706-T, and the minimum allowable fire sprinkler header water pressure for 2706-T were not adequate to ensure that their safety functions, as described in the safety bases, would be reliably accomplished. Engineering and safety bases personnel associated with these systems are well qualified, highly motivated, and exhibited strong ownership of their respective areas of responsibility. The safety basis documents and supporting analyses for these systems, however, contain numerous discrepancies or inconsistencies that could keep users from fully and confidently understanding commitments, performance requirements, and capabilities for these systems and the facilities in general, and formal evaluation of these in the PISA process had not been performed in a timely manner.

E.2.3 Surveillance and Testing

10 CFR 830 requires that surveillances and tests be defined in the TSRs. The TSRs must ensure that safety SSCs and their support systems required for safe operation are maintained, that the facility is operated within safety limits, and that limiting control settings and LCOs are met.

The Independent Oversight team observed the performance of a number of TSR required surveillances at T-Plant and reviewed a sample of completed surveillances and tests. The surveillance and testing procedures reviewed were generally well written, clear, and contained appropriate direction, including associated data sheets and forms. Additionally, a review of the last two years of surveillance results for the safety-related ventilation and fire protection devices indicated that the surveillances were performed on time, and the data sheets were appropriately filled out.

The surveillances and tests were performed by two separate groups: the T-Plant nuclear and chemical operators/maintenance workers and the stationary operating engineers who are not part of the T-Plant staff. In general, the nuclear and chemical operators properly executed the surveillance and test tasks, including correct logbook entries and responses to expected alarms, and they demonstrated proper conduct of operations rigor. The stationary operating engineers, in most cases, performed adequately, but there were a few performance lapses. For example, two different stationary operating engineers, neither of which had been to T-Plant for weeks, did not review the previous day's surveillance results as required. As the stationary operating engineers assume more responsibility for surveillance and testing, the T-Plant manager plans to ensure that the transition does not reduce the expected high level of performance for the completion of surveillances and tests.

T-Plant pre-job briefings for surveillance and testing were adequate. Overall, T-Plant operators, supervisors, first line managers, and others were knowledgeable of the selected safety systems and surveillance procedures. Technicians who were interviewed demonstrated familiarity with the details of the functional tests that they perform.

Summary. The surveillance procedures are well written and controlled. The surveillances are being performed when appropriate and are generally completed in a rigorous manner. The staff members performing the surveillances were knowledgeable of the associated safety systems and the test procedures.

E.2.4 Maintenance and Safety System Component Procurement Focus Area

Independent Oversight's review of maintenance focused on several aspects of T-Plant's programs for maintaining safety systems, including preventive, corrective, predictive, and life-cycle maintenance, as well as the material condition of the systems. The review included interviews with personnel responsible for maintenance activities, a review of the adequacy of maintenance procedures, documentation of performed maintenance activities, a review of deferred maintenance, and a review of the procurement processes.

FH has a well-defined and appropriate program for implementing DOE requirements for maintaining safety equipment. An FH company-level procedure describes the maintenance program objectives and requirements and provides appropriate instructions for establishing a combination of preventive and predictive maintenance activities to support equipment reliability. The system engineer (who also serves as the design authority) is appropriately responsible for establishing the maintenance requirements and developing maintenance procedures for his/her assigned systems. The maintenance procedures reviewed for the fire protection and ventilation systems are generally well written, provide clear and appropriate instructions and data forms, and incorporate vendor recommendations.

The maintenance tasks are well performed. Work is performed in accordance with a formal work control process, and procedure data sheets are appropriately filled out. Personnel performing the maintenance are very knowledgeable of the systems, and demonstrated the ability to appropriately perform the maintenance. The fire protection and ventilation systems are in good working condition, with no signs of leakage or damaged components, and very few outstanding corrective or troubleshooting work orders. Completed maintenance work packages are well documented, and contain the appropriate information, including post-maintenance testing requirements and records.

FH has effective processes for tracking and trending equipment maintenance history and performance. FH appropriately uses computerized systems (JCS and Maximo) for tracking maintenance history, which facilitates quick retrieval of maintenance history. The T-Plant system engineers are adequately performing system performance trending to support predictive maintenance. In particular, extensive tracking is performed on the ventilation fans (i.e., bearing temperature and vibration and building delta pressure and ventilation flows).

T-Plant management took appropriate actions in the 2000 time frame to replace both of the 221-T ventilation fans to correct reliability concerns. In addition, the system engineer performed appropriate troubleshooting (including utilizing SMEs) to identify and resolve additional failures that occurred on one of the replaced fans (design flaws were found and addressed). Over the last few years, the ventilation system reliability has been excellent. FH has also developed a detailed procedure for monitoring and evaluating HEPA filter degradation, which is used as a tool for forecasting and establishing priorities of HEPA filter replacement needs.

Some isolated concerns were identified with the maintenance program. The most significant is that the master equipment list for the T-Plant has not been well defined and is not a fully effective tool to support maintenance and procurement operations, in large part because the boundaries of the safety systems have not been rigorously defined (the boundaries have been identified by hand marking uncontrolled documents in the system engineer notebooks). As discussed in the configuration management section, FH self-identified this concern, and although limited progress has been made to correct it, significant effort is planned in the near term. Furthermore, the T-Plant has two processes that can serve as the master equipment list (the safety equipment list and the computerized work control system), but it is not clearly defined which of these is to be utilized as the master equipment list. Independent Oversight identified several components that were identified in the notebooks as safety-related but that were not identified as such in either the computer-based system or the safety equipment list.

Further, weaknesses were identified in a few work packages:

- While most fire suppression procedures have very good restoration steps specified, one did not. Specifically, the restoration steps in FS0020 (maintenance on wet riser alarm check valves) do not include performing a system test or notifying the building manager of the completion of the test. Restoration steps are, however, included in the work order generated for performing the procedure. These steps are automatically added via the Maximo system. However, the Maximo system is not controlled, and therefore a USQ is needed (and is performed) for each work order it generates that could impact the T-plant safety basis.

- Some recently performed fire department work packages did not include instructions from the latest approved versions of the standard fire department procedures and included a data sheet that did not include criteria consistent with the TSR criteria. Two 4-month wet riser inspection procedures referred to and used instructions from revision B of procedure FS0017 instead of the current revision C. Furthermore, the data sheet included in one of the packages indicates that riser pressure as low as 67 psig is acceptable (70 psig for the other package), which is lower than the TSR value of 88 psig. Although these procedures are not utilized for performing the TSR required monthly check of the riser pressure, they should be consistent with the TSR criteria to support identification of any out-of-specification conditions.

- One NFPA 25-required fire protection system inspection (quarterly test of riser main drain flow with backflow preventer) is not performed at the NFPA-required frequency. Although FH appropriately developed a table that linked the NFPA requirements to FH's implementation that indicated where deviations existed and referenced DOE approvals to the deviation, this one deviation had not been identified and formally submitted to DOE for approval.

Safety System Component Procurement

FH has a well-defined program for the procurement of safety system components. Procedures define roles and responsibilities for establishing quality requirements in procurement requests, and provide appropriate requirements for utilizing qualified vendors, documenting quality assurance inspection criteria for receipt inspection, and performing receipt inspections. Engineering has the lead for preparing the scope of work/material requisitions for procurement, developing criteria for inspection and testing, and assuring that appropriate testing methods are defined. A sample of procurement specifications reviewed clearly identified appropriate codes and standards and other user needs (such as dimensional tolerances).

FH has a well-defined vendor evaluation program and has a dedicated and experienced staff to perform supplier evaluations. FH performs an initial onsite evaluation to determine whether the vendor meets the quality requirements. Furthermore, an onsite audit is performed every three years, and desktop evaluations will be performed for the next two years. A list of approved vendors is maintained on the FH intranet.

The procurement process includes provisions for maintaining accurate stock records, tracking of purchase orders, and maintaining traceability of safety-related parts and material. Supplies of safety-significant spares in two warehouses inspected by Independent Oversight were appropriately stored and were marked with quality assurance tags and expiration dates.

FH warehouse receipt inspectors are well trained and qualified and demonstrated competence in their duties. The receipt inspection of safety-significant 55-gallon drums was well performed. The inspector appropriately had certificates of compliance and inspection plans and demonstrated good diligence in following the plan. Furthermore, the inspector checked closure bolts for suspect/counterfeit items. However, two concerns were identified:

- One of the requirements is for the drum to be less than 24 inches in diameter, with the lid torqued to a minimum of 60 foot-pounds. Independent Oversight observed a case where lids of several drums were torqued to 60 foot-pounds. After this initial torquing, most of the drums inspected were larger than the maximum size allowed. The inspector then directed that the torque be increased to see whether the drum would then meet the criterion. For the first drum retorqued, the craftperson increased the torque to the point where the ring was deformed (and likely the drum also), but the drum still did not pass the size criteria. This indicated a weakness in the procedure, that is, that no maximum torque criterion was specified in the inspection package (or the supplier catalog) to prevent the operators from over-torquing the ring/drum.

- The inspection plan included a provision that the measuring gauge (for the drum lid diameter) was to be "identified by catalog identification number." It was not clear what the "catalog identification number" was supposed to be, and the inspector inappropriately utilized a gauge that did not have any identification on it.

FH has a well-defined and effective suspect/counterfeit item program that is consistent with guidance provided in DOE Guide 414.1-3. An FH procedure defines requirements (with cross links to specific contract requirements document DOE Order 440.1A source requirements). FH has established a centralized suspect/counterfeit item interpretive authority to help guide implementation of the program sitewide and to be the point of contact for DOE. Procurement packages include clauses requiring vendors to not supply suspect/counterfeit items, and quality assurance inspection plans specifically require receipt inspectors to look for suspect/counterfeit items. Although expectations are provided that suppliers will not provide suspect/counterfeit items, the effectiveness of supplier suspect/counterfeit item programs are not assessed.

Specialty training on suspect/counterfeit item has been provided to appropriate personnel (e.g., receipt inspectors and quality assurance). In addition, familiarity training is provided annually to every employee as part of the general employee refresher training. Annual surveillances are performed at each facility and are guided by a surveillance checklist, which was recently revised to provide greater detail. Over the last several months, suspect/counterfeit items were identified during three different receipt inspections, indicating that the receipt inspectors are appropriately performing suspect/counterfeit item inspections.

Summary. The safety systems are effectively maintained and reliable, and preventive maintenance and condition assessments are effectively performed. Equipment history is well documented and easily retrievable, and equipment performance is tracked and trended. The procurement process is well defined and appropriate to ensure that quality components are used for safety-related applications.

E.2.5 Operations

The Independent Oversight team reviewed operational procedures, training, and system controls to assess the tools and knowledge for proper operation of the safety systems and to verify adequate performance of TSR-related duties; evaluated operating procedures and operator training for the T-Plant safety-related ventilation and fire protection components; and reviewed the knowledge and capability of the operators and facility supervisors to operate T-Plant under normal conditions and to take appropriate actions in abnormal and accident conditions.

FH has established an appropriate set of operation procedures (e.g., normal operations, alarm response, follow-up procedures, and round sheets) to support required safety functions. Normal operations and alarm response and follow-up procedures are clear and concise and contain appropriate actions and supporting information. The alarm response procedures are well organized, and operator actions are clear and concise.

The operations training program is detailed, thorough, and appropriate, and administered by professional trainers as well as SMEs. T-Plant has adequately defined qualification requirements for its operators, and qualified operators have completed and documented the necessary qualifications in most cases. A professional trainer who resides at T-Plant has established effective and innovative processes to ensure that personnel qualifications are maintained current so that they do not perform tasks for which they are not currently qualified.

A representative group of T-Plant operators were interviewed and were able to accurately describe process and support systems on which they are qualified. All operators and supervisors demonstrated good knowledge of the operation of the respective process or support systems. Interviewees indicated that there is a good relationship between workers, staff, and management that significantly enhances safety and operational excellence. For example, they indicated that no job is started until all questions and comments are addressed. Operators appropriately indicated that when an operating abnormality occurs, they refer to the appropriate alarm response procedure(s), and the duty operations supervisor or other management representative also appropriately indicated that they would refer to the TSRs.

They indicated that the respective SMEs, supervisors, and management at T-Plant took the time to respond to their questions and concerns as well as make sure they understood the training materials for the respective implementing documents. Interviews and observations further demonstrated that these personnel understand system functions, operating procedures, abnormal conditions, response procedures, and system interfaces.

Criticality control. T-Plant presents a relatively low public nuclear safety risk because of a number of specific and relatively strict, yet quite conservative administrative controls. Because of the nature of the waste material processed as well as a strict set of administrative controls, accidental nuclear criticality has been appropriately deemed incredible at T-Plant. Among other things, this DOE-approved conclusion means that no criticality accident alarm system is required. Interviews and document reviews confirmed that this is a sound decision at T-Plant for its current mission. One support system that helps maintain criticality incredibility at T-Plant and elsewhere is the Solid Waste Inventory Tracking System, which was judged to be of high quality and well functioning while fully supporting production demands at T-Plant.

Summary. FH has established effective procedures, electronic tools, and training for the safety systems reviewed. Technicians, operators, and supervisors are well prepared to monitor and operate the systems and associated support systems and take appropriate action in cases of emergencies. Operating procedures, electronic aids and support systems, and operator knowledge are acceptable. Additionally, operator performance regarding adherence to TSRs and administrative controls that enhance nuclear safety are adequate at T-Plant.

E.2.6 Essential System Functionality Feedback and Improvement

The Independent Oversight team reviewed the FH and RL processes to ensure that deficiencies in engineering procedures and/or products, including the key areas of engineering design and configuration control, surveillance testing, maintenance, and operations, are identified, tracked, analyzed, and corrected. The key processes reviewed included the FH system engineer program, the FH corrective action management program, and the RL safety system oversight (SSO) program. The results of the review of feedback and improvement are considered in the evaluation of the overall feedback and improvement program in Appendix D.

FH system engineer program. FH has adequately defined a comprehensive system engineering program in HNF-PRO-16331 that addresses the fundamental requirements of a system engineering program as depicted in DOE Order 420.1B. The program document clearly defines system engineer and appropriate staff roles and responsibilities, required system engineer assessments, tracking and trending requirements, and the expected content and use of the system engineer notebooks. The system engineer program and personnel are the overall responsibility of the system engineer program manager. In addition, FH has defined a rigorous qualification process for system engineers.

FH has established a mature system engineer program. FH has an acceptable number of system engineers and has formally assigned responsibility for the various FH VSSs to the appropriate system engineer. The system engineers at T-Plant have completed formal qualifications and have adequately implemented the requirements of the FH system engineer program. The T-Plant system engineers are well qualified for the position and have the appropriate education and broad technical experience, both inside and outside Hanford and the nuclear industry and in various roles, including design engineering. Additionally, they displayed detailed knowledge of most aspects of their systems, strong ownership, and aggressive and appropriate responses to characterize, quantify, understand, and initiate resolutions to concerns identified by Independent Oversight (except for the PISA issues discussed elsewhere). The VSS status and system engineer program is routinely and thoroughly reviewed by the FH Independent Assessment Organization. The reviews at T-Plant were adequate and have identified deficiencies that are being appropriately addressed by FH. On an annual basis, the system engineer program manager reviews the results of the last year of independent assessments of the VSSs and generates an annual report. There is clear evidence that the program management ensures that identified system engineer program deficiencies are analyzed and that corrective actions are defined and implemented.

A small number of isolated deficiencies were noted as exceptions to an overall satisfactory FH system engineer program:

- The system engineer qualification card does not include a specific item(s) to identify what codes and standards are applicable to the assigned system and to ensure that appropriate training is completed on the identified codes and standards. DOE Order 420.1B specifically requires that the system engineers have qualification and training on applicable codes and standards pertaining to their assigned system. The FH course *Qualification Card for System Engineer* (Course # 022422) does not directly address this requirement. There are indirect qualification requirements that potentially review a candidate's knowledge of codes and standards. These include the candidate's manager and project chief engineer interviews and a qualification task that has the candidate "state important industry standards."

- The VSS assessment for the C-HV-221-T canyon confinement ventilation and 2706-T fire suppression system lacked appropriate rigor in a couple of sections. The VSS assessment is performed every two years to verify that the system engineer requirements are satisfied. Guidance provided with the form provides details on the expectations of each section and was not closely followed in two instances:

  - For the C-HV-221-T canyon confinement ventilation VSS assessment, in the safety function definition section, only a partial list of the implementing documentation for the configuration management baseline was found. Also, in the system maintenance section, the assessment did not document that a review was performed on the maintenance component history files as requested.

  - For the 2706-T fire suppression system, the system engineer is only responsible for the system between the T-Plant post indication valve and the components in Building 2706-T. The VSS assessment requests the identification of support systems (in this case, the fire/sanitary water system) and the associated configuration management documents. Although some information was documented, it was incomplete. The system engineer, the T-Plant manager, and project chief engineer did not ensure that assistance was provided by the system owners, the utility service group, and the fire department to satisfactorily complete the VSS assessment. As above, the review of the maintenance files was not documented.

  - The system engineer program manager has not instituted routine meetings with the systems engineers to foster the sharing of lessons learned and other information.

FH Corrective Action Management System (CAMS) process related to T-Plant safety systems. WSD, including T-Plant, has fully implemented the CAMS process in HNF-PRO-052. The CAMS procedure defines a rigorous process on how deficiencies are identified, reviewed, and prioritized, and how corrective actions are defined, assigned, tracked, completed, and closed. The Independent Oversight team review of several T-Plant CAMS documents revealed that, in general, WSD has effectively implemented the FH corrective action management process. Although not currently required for less significant issues in HNF-PRO-052, Deficiency Evaluation Groups are still used by WSD to evaluate individual deficiencies. These groups are convened at the facility level and at the project level. The WSD Deficiency Evaluation Group considers cross-cutting issues, and allows for the WSD management team to become familiar with the issues and make informed decisions as a group to resolve issues.

The Central CAMS Organization provides the necessary support to T-Plant and other FH projects to enable the CAMS process to effectively work. The CAMS organization provides adequate database support, ensures compliance with CAMS procedures, and determines the significance categorization of issues. Because of the importance of evaluating newly identified deficiencies, Independent Oversight reviewed the process for determining the threshold of issues in more detail. Each identified issue from a variety of sources (for example, both internal and external surveillances, management assessments, and also FH independent assessments) is thoroughly reviewed by the authoritative source, and an authoritative source screening form is completed that documents the classification of the issue (Significant Issue, Low Threshold Deficiency, Opportunity for Improvement, Trend Only). The Independent Oversight team's review of a sample of completed screening forms for T-Plant indicates that this process is effective. The use of an authoritative source has provided the advantage of an independent evaluation of the WSD deficiencies and has shown that deficiencies are being properly categorized. In addition, for the deficiencies identified as Significant Issues, the corrective actions are also reviewed for adequacy by the Authoritative Source. With the exception of one closure package, the identified corrective actions were adequate to correct the identified deficiency. The exception is with an FH independent assessment that identified incomplete guidance was provided to the system engineers on the determination of VSS boundaries. A corrective action was identified to provide guidance to the system engineers, and this task has been closed. The guidance consisted of having the system engineers submit to an SME for approval their proposed VSS boundaries by June 2007. The task to have the SMEs complete their reviews of the VSSs was not included as part of the required actions.

RL safety system oversight program. RL has defined the necessary elements of an SSO program, including a separate procedure for the SSO qualification process. The SSO qualification requirements are identified in the RL SSO qualification standard. In addition, RL has formally assigned qualified SSO staff to the Hanford facility VSSs.

RL has adequately implemented the SSO program for the safety systems at T-Plant. RL has assigned a SSO engineer to the HVAC system at T-Plant Buildings 221 and 2706 (T-T-HV) and the fire suppression system at Building 2706. The RL HVAC SSO engineer for these systems is well qualified, very knowledgeable, heavily involved, and aggressive in addressing concerns identified by the team. The RL SSO engineer's individual performance plan requires a quarterly walkdown of the SSO engineer's assigned systems. The RL HVAC SSO engineer is currently responsible for the safety systems in Buildings 324, 327, CVDF, PFP, WESF and T-Plant. The HVAC SSO engineer closely tracks and ensures that these walkdowns are performed and documented in the operational awareness database. The review of the database showed that the HVAC SSO engineer has conducted adequate walkthroughs and surveillances at T-Plant.

RL establishes a high priority for RL SSO engineers to observe the FH independent assessments of the VSSs, and the engineers effectively oversee the assessments. The RL SSO engineers are expected to become engaged in the various stages of the assessments, including attending planning meetings, and observing/participating in interviews. At the completion of each assessment, the assigned SSO engineer provides an evaluation of the effectiveness of the review to FH. For example, the FH independent assessment of the T-Plant fire protection and ventilation VSSs were observed and reviewed by the appropriate RL SSO engineers. In the case of the ventilation FH independent assessment, the SSO engineer completed a formal surveillance that included several valid issues that were formally transmitted to FH to correct. FH is in the process of evaluating and correcting the identified RL issues.

RL also recently conducted a self-assessment of its SSO program. The SSO program assessment has identified several areas for improvement, and a corrective action plan has been finalized to address the numerous opportunities for improvement. Some of the significant opportunities for improvement that were identified included improving the working relationship with the RL FRs, conducting programmatic assessments of the FH system engineer program, improving the SSO qualification card, and reviewing/improving how the RL SSO engineers assess FH engineering products. Work is progressing toward completing the identified corrective actions.

E.3 Conclusions

The FH and WSD configuration management policies, processes, and supporting procedures adequately establish a rigorous framework for such areas as identification of safety-significant SSCs; development of a configuration baseline; control of design calculations, drawings, and modifications; and document control. Configuration management requirements have been translated and implemented at T-Plant, except for the USQ PISA determinations, which were not pursued in a timely manner for deficiencies identified during the review. The facility has established an effective configuration baseline for the safety systems reviewed, including the fire suppression and exhaust ventilation systems. However, while many aspects of the FH engineering and configuration management programs are comprehensive and well defined, the number and nature of the discrepancies identified in the safety bases for the safety systems that were reviewed indicate that the safety basis generation and review processes and their translation into support documents have not always been executed with the rigor necessary to assure reliable performance of accident prevention and mitigation functions, and therefore warrant increased management attention and action. An extent-of-condition evaluation is needed to determine the full extent of deficiencies in all WSD nuclear facilities.

The surveillance procedures are well written and controlled, and are performed and completed in a rigorous manner. Similarly, the operating procedures and operator training for the safety systems that were reviewed have prepared technicians, operators, and supervisors to monitor and operate the systems and associated support systems at T-Plant and take appropriate actions during emergencies. Safety system components are in good physical condition, with appropriate corrective and preventive maintenance scheduled and performed to assure their continued integrity, operability, and reliability. In addition, safety system procurement processes are well defined and are effectively implemented for procured items to ensure that they meet quality criteria and are appropriate to the intended application for safety-related SSCs.

WSD has a mature corrective action management process in place that in most cases addresses T-Plant deficiencies effectively by identifying, prioritizing, and defining corrective actions for essential safety system issues. The CAMS process also adequately tracks the status and closure of corrective actions. FH has established an effective system engineer program to ensure that the configuration management and operating status is maintained for the safety systems at T-Plant. Similarly, RL has established an adequate SSO program that reviews the effectiveness of the FH system engineer program, the configuration and material condition of safety systems, and the appropriateness of safety system maintenance and surveillance to determine the reliability of the safety system. However, the roles and responsibilities specified in DOE Order 420.1B for the FH system engineers and indirectly to the RL SSO engineers do not include the responsibility to validate that the safety basis design assumption, calculations, and results are correct for their assigned systems, but rather that the requirements defined in the safety basis are fully implemented. The safety basis review and approval process is used to provide this assurance, and in the case of the MDSA approval process, it was not entirely effective.

E.4 Ratings

Configuration Management Programs and Supporting Processes .... EFFECTIVE PERFORMANCE
Engineering Design and Authorization Basis .... SIGNIFICANT WEAKNESS
Surveillance and Testing .... EFFECTIVE PERFORMANCE
Maintenance and Procurement.. EFFECTIVE PERFORMANCE
Operations .... EFFECTIVE PERFORMANCE

E.5 Opportunities for Improvement

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

RL

1. **Improve the RL process for approving safety basis documents.** Consider the following tasks:
   - Review the process that was undertaken to approve the MDSA to determine why the deficiencies noted during this inspection with the MDSA, TSRs, and FHA were not identified.
   - Based on the above review, identify and implement improvements to the RL DSA review process.
2. **Enhance RL's oversight of the MDSA by adding surveillances to the integrated evaluation plan that specifically target a review of the supporting analysis and design assumptions on a priority basis**.

3. **In coordination with FH, perform extent-of-condition safety basis reviews of all SWOC facilities addressed by the common T-Plant MDSA.**

- Determine which SWOC facilities have similar ventilation and fire suppression requirements.

- Review on a priority basis the engineering design of the other SWOC facilities that are similar to T-Plant.

- Revise as necessary the supporting design calculations, safety basis accident assumptions, and TSR setpoints and bases for SWOC facilities that are similar to T-Plant.

FH

1. **Reassess the entire confinement conceptual approach currently underlying the safety bases for 221-T and 2706-T to reliably ensure confinement for all normal operations and accident conditions, addressing the following issues and revising affected safety basis documents and implementation procedures:**

   - **Minimum building negative dp.** Identify new minimum allowable building negative dps, taking into consideration the following elements: wind effects on external building skin pressures; fire pressurization effects; HEPA filter loading exhaust flow reduction effects; instrument uncertainty (in addition to including the uncertainty in the dp calculation, consider modifications to replace the existing instrument with a more accurate instrument, and with it, a building outside static pressure leg damping chamber to minimize wind-induced instrument oscillations); and TSR consistency (ensure that LCOs and surveillance requirements use the same limiting dp).

   - **221-T's passive confinement barriers.** Consider modifications to 221-T to make its actual configuration consistent with its safety basis credited function and effectiveness and with normal, accepted design practice for passive confinements. Such modifications should include but not be limited to: identify and close off or reduce the size of passive boundary openings, such as the building offloading tunnel rollup door gap at the top and the building's old supply air openings; and provide filtration at all significant openings not practicable to close off.

2. **Revisit the HEPA filter plugging analyses, making the necessary revisions to properly account for the following:**

   - Only credit first stage filters.

   - Use conservative filter loading values for all fuels addressed.

   - Revise filter changeout procedure requirements to 4" w.c. dp, to be consistent with analyses.

3. **Revise the strategy for addressing internal fire events to minimize releases and to reflect the limitations of HEPA filter failure diagnostic capabilities, and make corresponding changes to safety basis documents, facility procedures, and emergency operations training, to include:**

   - Eliminate all plans, references, and descriptions regarding operation of ventilation systems to failure of the HEPA filters, in order to assure the maximum benefit of the filters, without their compromise.

   - Remove all descriptions, plans, and references regarding use of the currently installed plant instrument to diagnose HEPA filter failures, including those utilizing the currently installed exhaust radiation monitoring instruments and the HEPA dp instruments, since they are incapable of providing unambiguous indications.

   - Install descriptions in the MDSA of the limitations on the 221-T exhaust fans' static pressure capabilities to $\leq$ 10" w.c. as a design feature to assure that the HEPA filters cannot be failed by soot loading from a fire.

   - Consider making design revisions to the 2706-T exhaust fans to also limit their static pressure capabilities to $\leq$ 10" w.c.

4. **Revise safety basis accident analyses and the FHA to describe only two classes of internal fires, as follows:**

    - One class is those whose combustion products can be contained by the existing HEPA filters' capacities without failure, or up to the point where the system loses the ability to maintain the flow required to provide adequate building negative pressure, whichever comes first.

    - A second class is those whose combustible loading will cause exceeding the HEPA filters' capacities.

    - Revise accident exposure analyses to address the exposures associated with each class, and only credit the HEPA filters for those fires or portions of fires up to the smaller limit for combustible loading.

    - Where feasible, revise the combustible loading administrative controls to preclude exceeding the smaller fire class.

5. **Revise the combustible loading administrative control procedure to contain the specifics of the allowable combustible loading for each plant area**.

    - Consider mass and type of materials allowed and the bases for the limitations, whether it be for minimizing HEPA filter loading or for other fire risk considerations, whichever is smaller.

    - Add requirements and data sheets for recording actual estimated masses and types of materials observed versus allowables, in order to have auditable, documented evidence of facility conditions.

6. **Revise the TSR acceptance pressure for the fire suppression systems in 2706-T so that they are consistent with the TSR bases.** Flow requirements as defined in NFPA 13, pressure margins from DOE Standard 1066, and instrument uncertainties must be considered in the derivation of the new acceptance criteria.

7. **Revise the efficiency testing setup or procedure for the 2706-T, ACT 1 HEPA filters to properly account for the system's prefilters**. Revise the associated TSRs to correctly reflect that the tests are for the HEPA filters only, not the filter units.

8. **Revise USQ procedures to provide a clear, definitive, unambiguous, conservative threshold for entering the PISA evaluation process, and provide updated training to all safety basis personnel and others associated with the USQ program on these revisions.**

9. **Revise the contractor's USQ procedures so that they are consistent with 10 CFR 830 and DOE Guide 424.1-1A as follows:**

    - Change the leadoff word of all USQ evaluation questions from "Does" to "Could."

    - In Appendix H, in the discussion of "discernible increase," the first bullet on page 57, replace the wording that indicates that a bin increase change is required for increases in probability or consequences in order for such increases to be considered USQs with wording from DOE Guide 424.1-1A to the effect that it is not the magnitude of the change in probability or consequences, but the direction that determines the answer to these questions.

    - In Appendix D, Categorical Exclusion 2, under the heading of Scope, the seventh bullet, change the word "operator" to a more generally applicable term, such as "personnel."

10. **Improve fire department procedures and work packages utilized for performing preventive maintenance and surveillance at T-Plant.** Specific actions to consider include:

    - Ensure that the latest revision of the fire protection procedure is used in the development of the work packages.

    - Revise the value for supply pressure to be consistent with the TSR value.

    - Modify the test frequency for the backflow preventer valve to meet NFPA requirements, or obtain DOE approval for the deviation.

- Determine whether facility-specific procedures should be utilized for the fire protection maintenance rather than incorporating steps from a generic procedure into work packages.

11. **Formally and rigorously define system boundaries.** Specific actions to consider include:

    - Establish a formal process and specific criteria for establishing system boundaries.
    - Document system boundaries in system design descriptions or similar documents consistent with guidance in DOE-STD-3024.
    - Update the master equipment list to include the appropriate safety classification of components.
    - Specify in a company-level or T-Plant-specific document what system or document is to be utilized as the master equipment list.

12. **Improve the system engineer VSS assessments.** Specific actions to consider include:

    - Systematically review the completed set of FH VSS assessments to assure that the inspections adequately cover the guidance provided for the assessment.
    - Revise or redo the current C-HV-221 canyon confinement ventilation VSS assessment to ensure that the configuration management baseline is adequately listed and that a review is performed and documented on the maintenance component history files.
    - Revise or redo the current 2706-T fire suppression system VSS assessment to ensure that the support systems and associated configuration management questions are adequately documented, and that a review is performed and documented on the maintenance component history files.

APPENDIX F
MANAGEMENT OF SELECTED FOCUS AREAS

F.1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight inspection of environment, safety, and health (ES&H) and emergency management programs at the Hanford Site Waste Stabilization and Disposition Project (WSD) included an evaluation of the effectiveness of the Office of Environmental Management (EM), Richland Operations Office (RL), and Fluor Hanford, Incorporated (FH) in managing selected focus areas.

Based on previous DOE-wide assessment results, Independent Oversight identified a number of focus areas that warrant increased management attention because of performance problems at several sites. During the planning phase of each inspection, Independent Oversight selects applicable focus areas for review based on the site mission, activities, and past ES&H performance. In addition to providing feedback to EM, RL, and FH, Independent Oversight uses the results of the review of the focus areas to gain DOE-wide perspectives on the effectiveness of DOE policy and programs. Such information is periodically analyzed and disseminated to appropriate DOE program offices, sites, and policy organizations.

The focus areas selected for review at the environmental management program activities at the Hanford Site WSD and discussed in this appendix are:

- Environmental management system (EMS) and pollution prevention programs (see Section F.2.1)

- Workplace monitoring of non-radiological hazards (see Section F.2.2).

Two other focus areas (quality assurance in engineering and configuration management programs and processes, and safety system component procurement) are closely related to essential system functionality and are discussed in Appendix E. The focus areas are not rated separately, but results of the review of the focus areas are considered in the evaluation of integrated safety management (ISM) elements in Appendices C, D, and/or E, where applicable.

F.2 Results

F.2.1 Environmental Management System and Pollution Prevention Program

An executive order and DOE Order 450.1, *Environmental Protection Program,* required DOE sites to implement an EMS by December 31, 2005. Independent Oversight selected the EMS as a focus area for 2006 to provide feedback to DOE management on the effectiveness of implementation of the new EMS program by line organizations at DOE sites across the complex. For the Hanford Site WSD environmental management program activities, Independent Oversight evaluated RL program management and oversight for EMS activities, and the FH environmental compliance program and the implementation of EMS at selected operations at the Low-Level Burial Grounds (LLBG) and at the Waste Receiving and Processing Facility (WRAP).

RL. The RL EMS program adequately defines Federal activities and oversight of contractor activities involving environmental management. The Federal EMS has been integrated into the RL Integrated Management System (RIMS) to ensure that DOE Order 450.1 requirements are implemented in site management contracts and that the technical aspects of environmental compliance and environmental programs are achieved in all RL activities. RL's approach to environmental management provides an effective administrative framework for such Federal activities as dealing with external regulators and overseeing contractor activities.

As part of its compliance oversight program, RL recently established an environmental compliance assessment program (E-CAP), which was directed and supported by EM. The initial efforts at Hanford included a combined training session and an assessment of selected facilities using the EM support contractor and electronic database/assessment process for E-CAP. The results of the initial assessment indicate that E-CAP will be an effective tool for identifying and defining compliance concerns. However, although this initial effort was conducted in May 2006, RL has not entered the findings from this initial assessment into the Richland Issues Tracking System (RITS). In addition, RL intends to perform additional E-CAP assessments using Federal environmental subject matter experts and enter the results in the operational awareness database; these assessments have not yet been scheduled. RL personnel indicated that staffing limitations have impacted their ability to enter the findings and schedule assessments.

FH. The FH EMS has been certified by RL and is an integral part of the contractor's ISM system. To ensure that environmental aspects are incorporated into work activities, FH has developed adequate documentation to implement the EMS within the overall work planning and control program and updated the ISM documents accordingly.

At the facility level, FH has assigned environmental compliance officers to such field organizations as LLBG, T-Plant, and WRAP to support development of work packages and such skill-of-the-craft work documents as minor work tickets. The environmental compliance officers are also tasked to review operating procedures to ensure that environmental requirements are included as specific tasks. For example, FH's procedure, *Management of LLMW at LLBG*, includes specific steps necessary to meet waste tracking and reporting requirements. Environmental compliance officers review these procedures, work packages, and minor work tickets to identify environmental and waste management hazards using two tools: an environmental-activity screening form and a waste planning checklist. The screening form provides an overall analysis that identifies requirements that need to be reviewed against the planned activity and then refers to the section in the *Environmental Protection Process* that defines those requirements. The checklist is directed at the work activity and results in an analysis of the waste that could be generated so that specific controls can be defined. These tools have been used effectively to identify the environmental aspects so that controls can be implemented to ensure compliance and proper waste management.

Environmental compliance officers are located at the facilities and thus are able to provide day-to-day support to managers and support internal oversight activities to ensure that environmental requirements are met. The environmental compliance officer deployment provides for an overall effective compliance program. However, a few minor concerns were identified. Although hazardous waste was being accumulated in a work area, the area was being operated as a storage area and will be included as a treatment, storage, and disposal permitted storage area in the State of Washington dangerous waste permit application. Because the work area is being used to store hazardous waste beyond the regulatory one-year limit, a rationale acceptable to the State is required that justifies why hazardous waste is being stored beyond the one-year limit. This justification has not been developed. This justification and additional requirements for a treatment, storage, and disposal permitted storage area would not be necessary if the work area was operated as a satellite accumulation area, which has less stringent regulatory requirements. However, the FH subject matter expert for State of Washington dangerous waste permits has not been requested to conduct an analysis specific to this work area at WRAP. Also, lead-contaminated gloves (Resource Conservation and Recovery Act hazardous waste) in this area had been incorrectly placed in a drum labeled for "State [i.e., Washington State regulated] Waste Only." Finally, in another storage area, recyclable lamps were not stored in a manner to protect them from breakage. These concerns indicate a need for involvement by subject matter experts, additional hazardous waste generator training, and attention to detail.

FH has established a pollution prevention/waste minimization program and assigned a pollution prevention sitewide coordinator. As part of the program, FH operates a noteworthy Centralized Consolidation/Recycling Center, which provides an efficient and effective recycling program for FH and other Hanford contractors and operations. The coordinator oversees a pollution prevention hazard minimization program that includes recycling of lead batteries, universal waste lamps/batteries, aerosol products, and shop towels, and the requirements for performing these functions are clearly defined in HNF-PRO-15333, Rev 7.

Although the coordinator operates an overall effective program, performance weaknesses were noted. In the past, the FH program to find and analyze opportunities to reduce waste using formal pollution prevention opportunity assessments (PPOAs) and a dedicated pollution prevention staff had been very effective. However, this staff and the number of PPOAs conducted have been severely reduced. Therefore, hazardous waste reduction efforts are now a secondary action rather than a focused effort. For example, the FH decision to use a non-hazardous material in place of a hazardous compound at WRAP for a gasket installation process was in response to worker concerns about hazardous vapors; this decision was not based on a PPOA to identify where non-hazardous chemicals could be substituted. In addition, FH has reduced the recycling programs for cardboard.

Summary. RL has instituted an adequate EMS for Federal activities and for ensuring that contractors meet DOE Order 450.1 requirements. The EM-directed E-CAP assessment program has been established. However, concerns identified by the initial assessment have not been entered into the RITS, and resources for conducting additional E-CAP assessments have not been defined. FH has an approved EMS that integrates environmental requirements into the ISM system. The EMS adequately sets general expectations for line organizations to integrate environmental requirements into work activities, including requirements for pollution prevention/waste minimization. A key control for ensuring that environmental requirements are achieved is deployment of environmental experts to field organizations, and use of two effective tools (environmental-activity screening form and a waste planning checklist) to ensure that environmental aspects are effectively integrated into facility operations and work activities. Although the FH environmental program generally achieves expectations, a few areas for improvement were identified in technical review of field operations by subject matter experts, assurance that pollution prevention activities are conducted, and training for hazardous waste generators.

F.2.2 Workplace Monitoring of Non-Radiological Hazards

DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*, establishes requirements for line management to ensure that workplace monitoring has been effectively implemented for Federal and contractor workers, including subcontractors. Worker exposures to chemical, physical, biological, or ergonomic hazards are to be assessed through appropriate workplace monitoring (including personal, area, wipe, and bulk sampling), biological monitoring, and observations. Monitoring of results must be formally recorded, and documentation should include the tasks and locations where monitoring occurred, identification of workers monitored or represented by the monitoring, and identification of the sampling methods and durations, control measures in place during monitoring (including the use of personal protective equipment), and any other factors that may have affected sampling results.

During this inspection, the Independent Oversight team reviewed a number of work activities at WSD sites in which workers could be exposed to chemical, physical, biological, and ergonomic hazards. In addition, the Independent Oversight team reviewed the current state of FH non-radiological worker exposure assessments as defined in procedures, instructions, and various presentations.

The work activities at the WSD sites are generally non-complex and repetitive, and are currently focused on the retrieval of buried transuranic and low-level radioactive mixed-waste drums and the subsequent, transport, inspection, sampling, repackaging, and certification of these mixed-waste drums for shipment off site to a permanent repository. Non-radiological exposures include chemical vapors from drum emissions; heat and cold stress from outdoor working conditions, particularly at the LLBGs; ergonomic hazards from drum movement; hazard exposures to pests and rodents; and noise hazards from hand tools and stationary or portable equipment noise sources (e.g., electrical generators).

FH exposure assessment program. DOE Order 440.1A has been incorporated into the DOE-FH contract, and FH has developed a guidance document – HNF-GD-17916, *Industrial Hygiene Baseline Hazard Assessments* – for implementation of the requirements of DOE Order 440.1A. This guidance document, although not a procedure, establishes recommended processes for conducting baseline hazard characterization, qualitative exposure assessments, prioritization of additional exposure assessment activities, and communication of results. FH has also required the implementation of Occupational Safety and Health Administration (OSHA)-mandated standards for quantitative and qualitative exposure assessments and/or hazards analysis. Examples include 29 CFR 1926.62, *Lead*; 29 CFR 1926.1101, *Asbestos*; 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*; 29 CFR 1910.146, *Permit-Required Confined Spaces*; and 29 CFR 1910, Subpart I, *Personal Protective Equipment.*

Industrial hygiene and analytical resources are adequate to support the workplace monitoring and exposure assessment requirements at the WSD. Resources have been allocated to the WSD to enable sufficient monitoring and analysis of WSD exposure hazards. Industrial hygiene equipment is typically state of the art. The onsite Waste Sampling and Characterization Facility (WSCF) analytical laboratory has sufficient experienced staff and laboratory instrumentation to analyze workplace monitoring samples in accordance with prescribed OSHA and National Institute of Occupational Safety and Health protocols for the analysis of chemical samples. WSCF also holds a number of American Industrial Hygiene Association laboratory credentials, which provides assurance that the analysis is conducted in accordance with industry standards.

While there is guidance for implementing the exposure assessment requirements of DOE Order 440.1A, there are no FH institutional procedures that establish and document clear policies. Implementation of the requirements of DOE Order 440.1A is generally left to the industrial hygienists deployed at various WSD projects, with guidance provided in HNF-GD-17916; through a series of frequently asked questions accessible via FH's new Industrial Hygiene Integrated Document Management System; and via regular Industrial Hygiene forum meetings. In some cases, because of the demand for resources to conduct workplace monitoring, some administrative processes, such as developing and/or maintaining sampling plans, strategies, and baseline hazards assessments, have not been completed or updated on a routine frequency as required by DOE Order 440.1A.

Implementation of FH exposure assessment programs at WSD. Most workplace exposures have been assessed and documented for work activities conducted at the T-Plant, Central Waste Complex (CWC), LLBG, and WRAP, commensurate with the risk. At T-Plant, significant exposure monitoring of workers involved in the sorting of waste drums has been conducted, analyzed, and documented. Data includes personal breathing zone monitoring data, direct reading instrument data, and noise survey and exposure data. At LLBG, a similar volume of exposure data has been collected for workers removing drums from the trenches. Data includes direct reading instrument data, heat stress data, sound level data, personal breathing zone data, and, more recently, summa canister data. (A summa canister is a small evacuated spherical chamber used to collect grab samples of gaseous media that are subsequently analyzed in the WSCF laboratory for a variety of chemicals). At WRAP and CWC, although less exposure assessment data has been documented, the potential for exposure to non-radiological hazards is not as significant, and the exposure data appears to be commensurate with the risk.

Workplace monitoring is performed in accordance with the requirements of DOE Order 440.1A. Appropriate monitoring methods and equipment are used in the conduct of workplace monitoring (e.g., direct reading instruments and personal breathing zone samplers). Monitoring results are formally recorded in the FH Industrial Hygiene database, and records are maintained locally with the industrial hygienists. Records include monitoring location, identification of workers and activity monitored, sampling methods, and other information. American Industrial Hygiene Association-accredited laboratories (i.e., WSCF labs) are used to perform the analysis of samples, and workers are notified of the monitoring results, with summaries of the collective sampling results being posted on a monthly basis.

A few concerns were identified with recording and reporting of industrial hygiene data. For example, for breathing zone sampling during the WRAP darting process, an employee was sampled on October 27, 2004, the report was issued on December 20, 2004, and the worker acknowledged reviewing the report on March 31, 2005, a time lapse of five months.

Several concerns were also identified with the FH Industrial Hygiene database. First, there is sometimes a delay of several months prior to entering some exposure data into the FH Industrial Hygiene database. Second, the format for the FH Industrial Hygiene database is different from the exposure data forms, and some pertinent data cannot be entered. Third, it is often difficult to readily obtain historical data from the FH Industrial Hygiene database. FH is aware of these longstanding concerns, and the expected near-term issuance of a new Integrated Document Management System could resolve these concerns. For example, it allows direct entry of exposure data by the industrial hygienist and thereby minimizes the delay in the entry of sample data into the database. The same information that is collected on the exposure data is entered into the Integrated Document Management System, thereby eliminating errors in data translation. Furthermore, it is accessible to industrial hygienists and FH Occupational Safety and Health management.

FH has made progress with respect to implementation of DOE Order 440.1A requirements for baseline hazards assessments. FH has issued a guidance document for implementing the requirements of DOE Order 440.1A. However, the FH guidance document provides Industrial Hygiene personnel with flexibility in implementing the provisions, so there is considerable variability in the progress that has been made across the various WSD projects. For example, T-Plant and WRAP have elected to develop Excel spreadsheets that follow the guidelines of the FH Baseline Hazard Assessment Guidance Document and provide such data as an exposure rating of the task and a qualitative health effect rating for each work task. At LLBG and CWC, the industrial hygienists are developing an exposure assessment program that meets the intent of the American Industrial Hygiene Association's *Strategy for Assessing and Managing Occupational Exposures,* as referenced in the DOE Order 440.1A Guide on Exposure Assessments. At the present time, all WSD projects have a path forward to defining and meeting the DOE Order 440.1A requirements, but none of the WSD projects have completed their programs for implementing the exposure assessment requirements of DOE Order 440.1A.

In a few cases, workplace exposures have not been adequately assessed. The WSD workplace hazards that are most likely to not have an exposure assessment are typically those work activities that reflect skill-of-the craft, general industrial hazards. For example, noise exposures for fork truck operators at CWC, radiation control technicians and instrumentation and control technicians performing functional testing of continuous air monitor alarms at WRAP, and workers in the vicinity of electrical generators at the LLBG had not been sufficiently assessed to determine requirements for hearing protection. (See Appendix C.)

The FH hazards analysis process, particularly for work performed as skill-based, does not have sufficient "triggers" to ensure that industrial hygienists are sufficiently involved in the analysis of hazards. As discussed in Appendix C, hazards associated with skill-based activities are required to be assessed and mitigated through worker knowledge gained from the employee job task analysis (EJTA) process. The EJTA process attempts to globally address all the potential hazards to which a worker may be exposed based on their work task assignment. While most exposure hazards are identified though the EJTA process, the magnitude or nature of a hazard for a particular work activity may not be assessed, resulting in the improper hazard control being assigned. An example is the noise exposure for workers assigned to test continuous air monitor alarms. Although noise is identified as a potential hazard on the worker's EJTA, and most workers were aware of the need for hearing protection, the type of hearing protection was not specified, and the effectiveness of the foam plugs being used may not have been adequate. Through the EJTA process alone, there is no "trigger" to ensure that Industrial Hygiene is notified to evaluate the noise exposure and assign the appropriate ear protection.

In some cases, the results from workplace exposure assessments have not been adequately integrated into work control documents (i.e., procedures, AJHAs, and work orders). For example, worker exposures when performing drum filter installation (i.e., darting) at WRAP have been monitored and documented for a variety of work scenarios. However, the results from this monitoring do not appear to have been factored into the automated jobs hazards analysis (AJHA) and controls associated with this activity, and the hazard controls are unclear. Similarly, for lead soldering work that is performed at T-Plant as a skill-based activity, there is no mechanism for integrating the results of Industrial Hygiene exposure monitoring from lead soldering into the work activity (because there is no AJHA, nor is the worker's EJTA sufficiently specific so that the exposure monitoring data can be entered). For skill-based activities, which do not require AJHAs, there is no clear mechanism for incorporating the results of workplace exposure assessments into work documents or work activities.

In a similar concern, the results from conducting an exposure assessment are seldom summarized, documented, and correlated with the work control package. Although the results from direct monitoring and Industrial Hygiene sampling are recorded and provided to the workers, the analysis of the monitoring and sampling on existing hazard controls (administrative engineering, personal protective equipment) is seldom summarized in an exposure assessment report, memorandum, or work control document (e.g., AJHA). For example, for the drum darting activity in WRAP, breathing zone sampling was performed on two of the workers. As a result, there was some guidance from Industrial Hygiene on the purpose and necessity of the local ventilation system. However, this analysis was not documented, and therefore there were no explanations entered into the AJHA about the expected use of the local ventilation system, or evidence that exposures had been monitored.

FINDING #F-1: FH has not fully met the requirements of DOE Order 440.1A with respect to maintaining baseline hazards assessments, recording personnel exposure records, and ensuring that industrial hygienists are appropriately involved in assessing changes in workplace exposures. (DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees)*

Summary. Overall workplace monitoring of non-radiological hazards is robust and in accordance with the intent of DOE Order 440.1A. Most exposure hazards have been identified, analyzed, and quantified at each of the WSD projects assessed. For those work tasks that involve the highest potential for worker exposures to drum vapors (e.g., chemicals and metals), significant attention is focused on characterizing the vapor source and minimizing worker exposures through engineering, administrative, and personal protection controls. Exposure monitoring and sampling programs have been implemented, including both direct monitoring instruments and personal breathing zone monitoring to assess the vapor hazard. Adequate resources have been allocated to implement the exposure assessment and workplace monitoring requirements of DOE Order 440.1A.

However, there are several areas in which improvements are warranted. Some workplace exposure assessment program documentation, particularly sampling strategy documents and baseline hazards assessments, are being drafted but have yet to be finalized. Some exposures, particularly those with general industry or skill-of-the-craft work (e.g., machine shops, lead soldering) have not been adequately analyzed. In addition, for skill-of-the-craft work activities that are performed without an AJHA, there are no “triggers” to ensure that Industrial Hygiene is involved in the analysis of the exposure potential. In some cases, the results of workplace monitoring and exposure assessments have not been adequately integrated into work documents, such as AJHAs and procedures.

F.3 Conclusions

EM, RL, and FH have devoted attention and resources to implementing the EMS and non-radiological workplace exposure monitoring programs. Most aspects of these programs are effective. The EMS adequately sets general expectations for line organizations to integrate environmental requirements into work activities, including requirements for pollution prevention/waste minimization. However, a few areas for improvement were identified in the areas of technical review of field operations by subject matter experts, assurance that pollution prevention activities are conducted, and training for hazardous waste generators. Overall, workplace monitoring of non-radiological hazards is robust and in accordance with the intent of DOE Order 440.1A. However, there are several areas in which improvements are warranted, such as workplace exposure assessment program documentation, exposure records and retrieval of records, provisions to ensure sufficient Industrial Hygiene involvement in the analysis of the exposure potential (particularly for skill-based work and for changes in workplace hazards), and integration of workplace monitoring and exposure assessments into work documents.

F.4 Opportunities for Improvement

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

RL

1. **Ensure that the E-CAP is fully implemented.** Specific actions to consider include:

    - Enter findings from the initial E-CAP into the operational awareness database so that the findings can be communicated to RL managers and Facility Representatives, and the corrective actions can be tracked to closure. Ensure that future E-CAP findings are entered in a timely manner.

    - Perform E-CAP assessments on a schedule that ensures regular oversight of environmental compliance at all FH facilities.

FH

1. **Review the level of environmental compliance support to field organizations.** Specific actions to consider include:

    - Ensure that centrally managed subject matter experts are available to deployed environmental compliance officers, not only through field-requested assistance visits but also by participation on oversight and support activities in their subject area that are performed by the environmental compliance officers.

- Ensure that these centrally managed subject matter experts are involved in analyzing decisions to obtain and use permitted storage areas versus satellite accumulation areas for hazardous waste accumulation.

- Evaluate hazardous waste generator training to determine whether additional coverage is required in specific areas based on recurring concerns identified during inspections and assessments.

2. **Evaluate the effectiveness of the pollution prevention program in identifying reduction and recycling opportunities.** Specific actions to consider include:

   - Determine whether the reduction in the number of planned pollution prevention assessments is resulting in missed opportunities to reduce waste through substations, process changes, and recycling.

   - Re-evaluate the decision to reduce cardboard recycling to determine whether this program should be a higher priority based on DOE's pollution prevention goals.

3. **For each of the WSD projects, develop and implement an exposure assessment and baseline hazards assessment that are consistent with the requirements of DOE Order 440.1A and related guidance documents and consistent among WSD projects.**

4. **Develop guidance for line managers and work planners for when industrial hygienists should be involved in work planning and exposure assessments for skill-of-the-craft work activities.**

APPENDIX G
EMERGENCY MANAGEMENT

G.1 Introduction

In conjunction with the Office of Independent Oversight inspection of environment, safety, and health programs at the U.S. Department of Energy (DOE) Hanford Site, Independent Oversight's Office of Emergency Management Oversight conducted a limited-scope inspection of selected aspects of the site's emergency management program, concentrating on program implementation at T-Plant. The review included assessments of the contractor – Fluor Hanford, Incorporated (FH) – and DOE feedback and improvement programs, focusing primarily on emergency management readiness assurance activities at the facility level.

The Richland Operations Office (RL) is responsible for the operation of the Hanford Site, excluding the tank farm and the Pacific Northwest National Laboratory, and is responsible for overall management, direction, and oversight of emergencies at the Hanford Site that are not related to the tank farm. FH is responsible for developing and administering such sitewide emergency management elements as incident response (fire and security), training, and emergency operations center management, and is also responsible for developing and implementing emergency management elements at the Waste Stabilization and Disposition project (WSD), which includes T-Plant.

This Independent Oversight inspection at Hanford Site WSD focused on planning, preparedness, and readiness assurance activities at the T-Plant, and on DOE readiness assurance responsibilities. In reviewing FH performance, Independent Oversight evaluated specific emergency management focus areas, including:

- Work control and configuration management processes related to maintenance of hazards surveys and emergency preparedness hazards assessments (EPHAs)
- Facility-specific emergency response plans and procedures
- Initial training and proficiency mechanisms for facility emergency responders
- Functionality of selected facility systems for identifying and communicating emergency conditions and implementing protective actions
- Emergency management and response feedback and improvement mechanisms.

In reviewing DOE performance, the inspection focused on the effectiveness of RL in managing the Hanford Site WSD contractor, including such management functions as allocating resources, monitoring and assessing contractor performance and self-assessments, and managing and resolving issues.

While the inspection is limited to a single facility, the results provide insights into the effectiveness of processes to ensure consistent implementation across the site at the facility level in such areas as hazards surveys and EPHAs; plans and procedures; and training, drills, and exercises. Any corrective actions to address identified weaknesses or improvement opportunities should therefore be developed with an approach that considers the specific nature of the weakness and the extent to which the corrective action should be applied to other projects and facilities.

G.2 Results

G.2.1 Emergency Planning

The hazards survey and EPHAs are the foundation of the emergency management program because they provide the baseline information for developing effective emergency response procedures and other elements of the program. The effectiveness of the emergency response procedures in implementing the emergency management philosophy and approach depends upon a rigorous linkage to the EPHA analytical results and the necessary detail, including decision-making thresholds, to effectively direct the response to an emergency, irrespective of its magnitude.

Hazards Survey and EPHAs

FH has implemented an appropriate set of institutional processes to govern the identification of hazardous materials that may affect emergency planning, although some minor weaknesses were noted during the inspection. Site procedures provide several methods to identify potential changes to the inventory of hazardous materials and bring them to the attention of responsible emergency management personnel, such as the facility emergency preparedness (EP) coordinator. These processes include:

- A solid waste inventory and tracking system to identify the hazardous materials being processed in the WSD waste stream
- A comprehensive chemical management process that applies to acquisition, tracking, storage, use, transport, and disposal of chemicals and that includes annual inventories of chemicals at the facilities
- A process for reviewing and approving technical documents that formalizes requirements for EP review of significant changes in facility operations, design, safety basis, or hazardous material inventory
- Facility inventory control processes for radioactive materials that generally support EPHA analysis assumptions.

During the inspection, a walkdown of T-Plant by Independent Oversight personnel verified that the facility's chemical inventory is mostly accurate and supports the identification of hazardous chemicals, although a few minor discrepancies were noted in the chemical inventory. Two weaknesses in the processes for identifying hazardous chemicals were noted. First, the screening criteria implemented in several of the procedures use regulatory-based limits to identify the chemicals that require notification of site EP personnel. These limits are not provided in the procedures, are not readily usable by individuals without specific training or knowledge, and implement thresholds that may exclude hazardous chemicals that require further screening (e.g., chemicals with National Fire Protection Association hazard ratings of 3 or 4). Second, although interviews indicate that the facility EP coordinator is involved in the review of most planned activities at the facility, there is no requirement that the EPHA analyst, who is most familiar with the hazard screening and analysis, also participate in these reviews.

FH has established an appropriate set of requirements for performing hazards surveys and EPHAs in the *Hanford Emergency Management Plan* and in the *Emergency Preparedness Program Requirements* document. The emergency plan briefly describes the expected content of the hazards survey and specifies that EPHAs are required when the hazards survey identifies hazardous materials in quantities that exceed one of the regulatory-based threshold quantities. The EP requirements document contains such additional detail as the assignment of responsibility for preparation of the hazards survey to the FH EP staff, and requirements for updating the hazards survey when warranted (but at least every three years) and reviewing the EPHA at least annually and updating it for any changes that affect the analysis. Furthermore, FH has developed an EPHA implementing procedure that specifies the overall EPHA goals (e.g., analysis, site boundaries, and classification criteria), the required documentation and approval process, and its format and content.

As required, FH completed a hazards survey for the facilities under its management, including T-Plant, in January 2004. The hazards survey is generally acceptable in identifying the facilities requiring EPHAs. However, the hazards survey did not examine the Solid Waste Operations Complex (SWOC) facilities in the detail necessary to identify all of the hazardous chemicals that require further screening and analysis. The process for preparing the hazards survey appropriately included tours of selected facilities, and reviews of such documents as the existing hazards survey, facility hazard classification, emergency and hazardous chemical inventory, and dangerous waste permit applications. The hazards survey states that the screening criteria used to identify hazardous materials requiring further analysis were the regulatory-based quantities referenced in DOE Order 151.1B, *Comprehensive Emergency Management System*. The hazards survey goes on to discuss the hazards associated with SWOC facilities within WSD, in general terms; identifies the presence of radiological hazards; and concludes that SWOC facilities require EPHAs (because of the quantities of radiological material present). Nonetheless, although the sodium hydroxide inventory at T-Plant exceeded the "reportable quantity" screening criteria, this process chemical was not identified in the hazards survey or the EPHA. Although sodium hydroxide is a relatively low-hazard material, its erroneous exclusion indicates a process weakness that warrants attention.

The SWOC EPHA appropriately implements the site's internal requirements, addresses the hazards associated with processing waste streams, and is closely tied to the master documented safety analysis (MDSA) for the facilities. Consistent with information contained in the hazards survey, the EPHA addresses the identification and screening of hazards within the SWOC facilities. Beginning with a small set of hazardous chemicals (25) expected to be in the waste stream, the screening process implemented in the EPHA eliminates most of the chemicals from further analysis, utilizing such appropriate screening mechanisms as threshold screening criteria, small quantity exemption, National Fire Protection Association hazard ratings, and the potential for dispersion (for solid metals). Using this process, all the hazardous chemicals were screened from further consideration, although sodium and mercury were further evaluated for the effect of fire on dispersion. The subsequent hazards analysis closely follows the accident analysis of the MDSA for fires, explosions, and spills during waste handling activities (with some modifications that make the EPHA results more conservative than the MDSA). The analysis appropriately addresses supporting assumptions (e.g., dose conversion factors and site/facility boundaries), identifies receptor of interest locations, and establishes the classification criteria.

Although the EPHA is generally thorough, several weaknesses were noted. The analyzed scenarios are representative of the types of accidents anticipated at T-Plant when no release filtering mechanism is available; however, no accident scenarios address fires, spills, or other upsets that could occur inside the facilities (for example, 221-T Canyon or 2706-T). The result is that analyzed accidents represent worst-case scenarios, but no analysis is available to support use of existing instrumentation (e.g., stack monitor, ventilation filter differential pressure) in the facility's response procedures or emergency action levels (EALs) for identifying and responding to scenarios, such as internal fires, that may challenge the confinement barriers (see Appendix E). Another lesser weakness is that EAL classification thresholds utilize Solid Waste Inventory Tracking System drum loading values that are based on a dose conversion factor (dose equivalent gram to dose equivalent curie) that is less conservative than that used in the EPHA. Consequently, the EAL classification thresholds are potentially non-conservative (e.g., a site area emergency should be declared for a drum loading slightly smaller than listed in the EAL). Although other EPHA conservatisms likely counter this concern, justification for using the less conservative values for classification purposes is not documented in the EPHA or elsewhere. Finally, although the EPHA analysis addresses chemicals that may be in the waste stream, it does not address other chemicals (e.g., process chemicals) that are present at T-Plant in quantities requiring further screening analysis (similar to the weakness noted in the hazards survey above).

FINDING #G-1: The SWOC EPHA does not include a spectrum of mid-range events to facilitate development of response tools that support T-Plant emergency response organization personnel in addressing a full range of potential internal building events. (DOE Order 151.1C, *Comprehensive Emergency Management System,* and RLEP 3.22, *Emergency Preparedness Hazards Assessments)*

Plans and Procedures

Collectively, the site emergency management plan, the RL emergency plan implementing procedures (RLEPs), and contractor implementing procedures represent a logical approach to the development and implementation of emergency management and emergency response procedures. As a result, response duties and interfaces among the facility-level decision-maker (i.e., the building emergency director [BED]) and site-level decision-makers (i.e., Incident Commander, Occurrence Notification Center [ONC] Duty Officer, Patrol Operations Center) are, with a few exceptions, appropriately described and controlled by facility-level and site-level emergency response procedures. The site emergency plan establishes a standard program and requirements for the multiple site contractors, and provides a solid framework for emergency response. The RLEPs establish a common set of procedures to be used by all site contractors in implementing the plan. In some cases, the RLEPs are directly implemented; in other cases, contractors are required to develop lower-tier, facility-specific procedures to support implementation of the sitewide procedure. At the facility level, emergency management and response are governed by the building emergency plan and the facility's operating procedures. T-Plant facility operating procedures that directly impact emergency response include both alarm response and emergency response procedures.

Sitewide procedures governing event classification, categorization, and notification are generally well organized for effective implementation. The site emergency plan, T-Plant building emergency plan, and the RLEPs are mostly consistent in the description/division of classification and notification responsibilities and duties. Consistent with the site emergency plan and implementing procedures, the T-Plant BED, with the assistance of ONC personnel, is responsible for event classification and notification. FH has developed an appropriate set of protocols that provide for back-up actions in case the BED is unavailable, and for sitewide events for which there is no BED, such as transportation accidents. One minor observed weakness in ONC processes is that the procedural steps governing ONC implementation of "site, state, and county notifications" (within the notification desk instruction) and similar steps in the *ONC Emergency Notification Directory* (i.e., the duty officer notification checklist) are not always consistent, although the desk instruction clearly requires use of the notification checklist as written.

FH has also developed generally sound site and facility plans and procedures governing event categorization, although direction in some procedures is not sufficiently specific to ensure that categorized events will always be quickly and accurately reported. The site emergency plan indicates that the BED, with the assistance of ONC personnel, is responsible for assessing event information and determining whether the event should be categorized as a "Base Program Operational Emergency" (a term unique to Hanford). The responsibilities sections of two RL implementing procedures, *Hanford Incident Command System and Event Recognition and Classification*, and *Notification, Reporting, and Processing of Operations Information*, indicate that the BED is responsible for categorization and notification of the incident to the ONC, and the BED checklist instruction requires that the BED provide the ONC with an event description and "review the appropriate contractor occurrence reporting procedure(s) or process for notifications." Although the set of procedures addresses the overall need to categorize the event, neither of the BED response procedures contains specific direction to categorize the event or a subsequent reminder to ensure that the ONC has made the appropriate notifications. In addition, use of the term "Base Program Operational Emergency" may be confusing to DOE Headquarters watch office personnel and may be misleading to Headquarters personnel with respect to the event severity. Within the DOE emergency management system, a "base program" facility is one that does not store or process significant quantities of hazardous materials. Consequently, Headquarters watch office personnel would likely assume that a "Base Program Operational Emergency" could not be further classified (because no hazardous materials are present in the facility), and might be confused if, for example, Hanford declares a "Base Program Operational Emergency" for a hazardous material facility (e.g., T-Plant) and the event subsequently escalates to a point requiring classification.

After an emergency event is properly classified, site and facility procedures clearly define and facilitate an integrated approach to formulating and implementing protective actions. Responsibilities for disseminating predetermined onsite protective actions and offsite protective action recommendations are appropriately divided among the incident commander, BED, Patrol Operations Center, and ONC, and implementing procedures sufficiently coordinate the various activities. For example, in support of the BED, the incident command post communicator completes the notification form, obtains approval from the BED, and following transmittal of the notifications, confirms that the Patrol Operations Center initiates onsite protective actions and the ONC provides offsite notification of protective action recommendations. At T-Plant, procedures (particularly the emergency response procedure for spills and releases) appropriately address protective actions for facility personnel, and procedures and processes are in place to address sheltering, evacuation, and accountability actions. During interviews, the facility BEDs demonstrated their knowledge of (and gave priority to) implementing protective actions for facility personnel. Finally, though not proceduralized, accountability processes are organized and conducted in accordance with the building emergency plan and are well understood by building personnel.

While facility procedures are generally adequate, in some cases, the processes for implementing protective actions at T-Plant do not include details that would facilitate their implementation under emergency conditions. For example, although the take cover procedure contains basic instructions for sheltering at the facility, including securing ventilation, it does not include such specific actions or checklist items as breakers to operate, ventilation dampers to close, or reports to verify implementation of take cover in the individual facilities to ensure complete implementation of the take cover direction. In addition, although the facility evacuation procedure addresses evacuation of the 221-T Canyon to the staging areas, it does not address evacuating building 2706-T and other outlying buildings, or provide guidance for evacuating a facility that is already in a take cover status to another facility.

Proper classification and subsequent initiation of protective actions depend upon development and implementation of an effective set of EALs. During this inspection, Independent Oversight personnel observed that both the site and facility have implemented procedures and processes that resulted in a set of mostly appropriate EALs. The RL implementing procedure governing the development of EPHAs includes instructions that specify the contents of the EAL section of the EPHA, and an additional, EAL-specific implementing procedure provides further guidance on their preparation. The SWOC EPHA provides a detailed discussion of the development of EALs for T-Plant (as well as other SWOC facilities); the discussion summarizes the results of the EPHA hazards analysis and provides recommendations and supporting discussions regarding EALs for facility events (e.g., fire/explosion and spills) and external events (e.g., seismic event, wind/tornado, and aircraft crash). The T-Plant EALs, which are included as an attachment to the site wide classification procedure, closely reproduce the recommendations in the EPHA.

Although the EPHA and EALs generally provide appropriate classification for anticipated events, some weaknesses or inconsistencies were noted:

- As previously discussed, the EPHA does not analyze such events as fires, explosions, or spills that originate within the 221-T canyon or Building 2706-T and that would begin as filtered releases. Consequently, there are no EALs, pre-planned actions, or procedural guidance to use existing instrumentation to monitor confinement boundaries for evidence of reduced performance or failure for these events. (The suitability of the installed instrument for accident diagnosis is also questionable, as described in Appendix E.)

- The recommended site area emergency classification for a fire or explosion with the "potential" to burn the filter media is not consistent with the cited hazards analysis, which postulates the rupture and burning of the high-efficiency particulate air filters.

- Some security contingencies in the EPHA and EALs do not follow the logic and guidance in the RL EAL procedure or the emergency management guide. For example, the EAL for explosive devices requires classification as a general emergency irrespective of the amount of hazardous material potentially at risk or actually involved.

- The site/transportation EALs provide guidance for classifying events using generic guidelines for both radiological and non-radiological hazards, but these guidelines are not included in the facility EALs.

- The EPHA and EALs provide for events involving mercury and sodium metals that address large quantities of material, but they do not address classification of a spectrum of possible events involving lesser quantities of these metals.

Responses to emergencies at hazardous facilities on the site are governed by building emergency plans, which are further implemented in alarm and emergency response procedures. At T-Plant, facility emergency response procedures and processes adequately support emergency response activities with a few exceptions. The building emergency plan describes the organization of the facility and its response to emergencies, including response to such events as fires, explosions, or spills. The primary facility emergency response procedure is the spill/release/contamination spread procedure, which includes appropriate steps to respond to most spills and releases and provides a link to the RL emergency response procedures. In addition, the alarm response procedure for response to stack monitor alarms is tied to the spill/release emergency response procedure. However, as noted previously, there are no procedures that directly address spills or fires that occur within the confinement areas of the buildings (i.e., filtered release).

To gain an understanding of the use of the facility's procedures in responding to events, Independent Oversight personnel interviewed several BEDs and discussed a number of postulated events. During the interviews, BEDs demonstrated an overall ability to execute the emergency response plans and procedures. They made appropriate use of procedures and checklists, and their response demonstrated familiarity with the governing procedures and processes. The BEDs exhibited appropriate concern and initiated early protective actions (per procedure) to ensure the health and safety of workers, and with a couple of minor exceptions, classified the emergencies quickly and accurately. Although facility procedures do not systematically address monitoring of the confinement boundary, the BEDs displayed an understanding of the 221-T canyon confinement system and evidenced concern for verifying its continuing effectiveness. Finally, although some processes (e.g., take cover and accountability) are not fully supported by procedures or checklists, the interviews revealed that facility personnel have a good understanding and generally common approach to these activities.

Summary. The Hanford emergency management plan provides an integrated approach to both the emergency management program and emergency response. Overall, the underlying RLEPs and FH implementing procedures adequately address the identification of hazardous materials and the preparation of hazards surveys and assessments, which FH has prepared in support of SWOC operations. The SWOC EPHA analyzes a number of scenarios appropriate for T-Plant, including those that are typically bounding in terms of potential impact on site workers and the public. Nevertheless, lack of analysis of internal building events at T-Plant that may impact filtration effectiveness impacts the completeness of the EALs and facility procedures in planning the response to potential facility emergencies. Although the number of scenarios in the SWOC EPHA is significant, the EPHA does not adequately address the spectrum of potential mid-range events within the T-Plant confinement areas. These analyses are necessary to fully support development of EALs and emergency response procedures that provide a consistent approach to internal events and include use of appropriate instruments and measurements to verify continued effectiveness of confinement barriers. Despite the weaknesses in some EALs and response procedures, the overall approach to emergency response at T-Plant is adequately supported by existing procedures and processes that are supplemented by an effective training and drill program (discussed later) and are well understood by facility personnel.

G.2.2 Emergency Preparedness

Training and Drills

A coordinated program of training and drills is necessary to ensure that emergency response personnel and organizations can effectively respond to emergencies impacting a specific facility or the site as a whole. This response includes the ability to make time-urgent decisions and take action to minimize the consequences of the emergency and to protect the health and safety of responders, workers, and the public. The Independent Oversight team evaluated the training and drill program used to support the emergency response organization (ERO) at the facility level, specifically at T-Plant. The Independent Oversight team also evaluated the plans and procedures that support these elements and reviewed training and proficiency records for key facility emergency responders. Drill reports were also reviewed for indications that they are being used effectively to enhance responder proficiency and evaluate the level of the facility's response preparedness.

FH's facility ERO training and drill program exhibits many strengths, both in the layout of the institutional program, as managed by the FH EP project support manager, and in its implementation at the facility level, as indicated by the training and drill program observations at T-Plant. At the institutional level, FH has developed a comprehensive hierarchy of EP requirements and guidance documents that clearly define program expectations. For example, the *EP Program Requirements* document requires the employment of a systematic approach to training development and delivery; specifies an appropriate set of facility-specific ERO training and annual proficiency activities; and requires that BEDs satisfactorily perform their key emergency responsibilities of event classification, notification, and protective-action decision-making in an evaluated drill before being considered fully qualified. Similarly, the *EP Drill Program Requirements* document defines key drill program attributes, such as drill package contents and the use of objectives and grading format drawn from a sample drill program plan. Furthermore, the EP drill program document requires that facilities develop an annual, facility-specific drill program plan that serves as a basis for the extent, type, and number of facility drills to be scheduled for the coming year.

The training materials evaluated, which included initial and refresher training courses for the BED and other important response functions/positions, reflect the applicable internal requirements and contain the elements necessary for effective training for key T-Plant ERO positions. For example, the initial BED training course is objective-based, appropriately emphasizes response checklist items and bases, contains practical exercises and a multiple-choice exam with a 70 percent minimum passing grade, and includes lessons learned. The web-based refresher course is easy to navigate, requires mastery of concepts before allowing the trainee to proceed, and includes an active link to the lessons-learned database; it also facilitates completion at the trainees' discretion. Furthermore, completion of training and proficiency activities for T-

Plant ERO personnel is well documented and, based on a sampling of such records, personnel are appropriately qualified for their designated positions.

The implementation of the FH drill program at T-Plant is also a strength, because of the combination of appropriately-detailed institutional documents and effective execution of program requirements at the facility level by the T-Plant EP coordinator. At T-Plant, drills provide numerous practice opportunities and, almost without exception, these drills are appropriately developed, evaluated, and documented in accordance with program requirements. For example, drill objectives are drawn from the drill program plan template, and the EP coordinator uses defined individual and team performance criteria to evaluate the response and identify performance positives and issues. Finally, the drills are used to address individual performance or equipment weaknesses, although issues are not consistently captured and tracked within the corrective action management process (as discussed later).

Another key strength of the drill program at T-Plant is that FH has implemented several integrating mechanisms to provide support to and consistency among the facility-level drill programs. For example, an EP coordinator is assigned to each major facility and held responsible for administering the EP training and drill program at their assigned facility in accordance with the central body of program requirements and guidance. This promotes program ownership at the facility level and facilitates the maintenance of an acceptable degree of program consistency across the Hanford Site. Additionally, the EP coordinator has access to a central EP drill support team for assistance in developing annual drill program plans and in coordinating such resources as additional evaluators or a responder simulation cell. Furthermore, the site FH Director of EP chairs frequent meetings involving facility EP coordinators, sitewide EP staff, and cognizant RL representatives to discuss common issues and lessons learned. FH has also established several drill program performance indicators to help ensure program consistency among the various facilities and to identify adverse trends in either program implementation or responder proficiency. Several integrating mechanisms in the areas of grading drills and tracking drill participation would benefit from additional definition or capability, but these items are not materially impacting the effective coordination of facility drill programs.

Notwithstanding the many positive aspects discussed above, isolated weaknesses in the requirements and guidance framework for the facility drill program diminish its overall effectiveness as a program improvement vehicle. The most important of these weaknesses is that FH requirements and guidance documents applicable to the EP drill program contain confusing and inconsistent statements regarding the treatment of drill issues within the corrective action management process. As examples:

- The *EP Program Requirements* document states that EP drills conducted for training purposes are not required to be handled within the corrective action process unless “determined by management,” although the requirements document provides no clarification as to the circumstances under which such discretion would be appropriate.

- The *EP Drill Program Requirements* document generally defines an EP drill as a “training event,” which when combined with the first item, could be interpreted as meaning that EP drill weaknesses and opportunities for improvement should be typically handled external to the defined corrective action process.

- An informal FH guidance document intended to assist EP coordinators in developing drill reports states that the “Issues” section of a drill report will ordinarily contain mostly low-threshold issues (which include low-threshold deficiencies, opportunities for improvement, and trend only items) that need to go through the corrective action management process. The list of low-threshold examples that is contained in the document is comprehensive and appears to indicate that virtually all drill-identified improvement items, including simple mistakes, should at least be trended in the deficiency tracking system, which also appears contrary to the first item.

These procedural and guidance weaknesses may have contributed to the inconsistent treatment of drill issues at facilities within WSD. For example, a few cases were identified where a T-Plant drill issue appropriately appeared in the FH deficiency tracking system. However, of the six performance, procedure, and equipment issues identified in two T-Plant EP drills conducted in August and October of 2005, none of the items was entered into the corrective action management process for trending, because all of the problems were addressed shortly after the drill was conducted. This was also the case for a March 2006

T-Plant drill, even though the identified performance issue resulted in an unsatisfactory grade. Similar reluctance to enter drill issues into the corrective action process, even for simple trending purposes, was observed for other WSD facilities.

Emergency Facilities and Equipment

Facilities and equipment that support EP response at T-Plant are adequate to support the facility's response to anticipated emergencies, and with one exception, equipment important to emergency response is appropriately inventoried, tested, and maintained. T-Plant has primary and alternate incident command posts that provide adequate space and contain procedures, communications equipment, and supporting tools necessary to respond to an emergency. Plant personnel regularly inventory and check emergency response equipment to ensure that equipment will be ready when needed. Site personnel perform routine tests on the crash telephone system, which is utilized to notify facilities across the site of emergency actions, and plant personnel perform an annual functional test of the plant's public address system. However, the public address system backup power supply does not receive routine preventive maintenance or testing to verify its continued operability.

Independent Oversight personnel also examined the ability of the stack monitoring system to support the facility's response to emergencies. The T-Plant stack provides a filtered exhaust path for the canyon ventilation system. As outlined in the MDSA, during a canyon fire, the filters may fail and "actions under the emergency management" will seek to identify radioactive releases potentially indicative of filter failure and to mitigate the effects of those releases (for further discussion, see Appendix E). The stack monitoring system is equipped with alpha and beta continuous air monitors and a fixed head sampler. The equipment is appropriately maintained to support environmental monitoring requirements; however, the system is not fully used to support emergency response. Through alarms, the continuous air monitors provide indication that a perturbation has occurred in the release path, but the alarm setpoints do not correspond to calculated release levels. Following an alarm, the stack monitor alarm response procedures alert the operators to the potential for a release, but the procedures do not provide adequate instructions to monitor the performance of the ventilation system filters or to support potential categorization and classification of the event. Overall, although the stack monitoring system is available to potentially support emergency response actions, analyses (both EPHA and engineering) have not been performed to support development of approaches and procedures to utilize the stack monitors to check confinement barrier performance during an emergency.

Summary. The FH facility ERO training and drill program is well defined at both the institutional and facility level through a comprehensive array of requirements documents, and the program is effectively implemented at T-Plant. Training materials for facility ERO personnel contain the appropriate content, and personnel must satisfactorily pass classroom and practical examinations to become qualified as T-Plant ERO members. Additionally, T-Plant drills are well constructed, frequent, and appropriately evaluated to identify issues and areas for improvement. Furthermore, FH is using several integration mechanisms to provide core support to T-Plant's drill program and to facilitate consistency with other facilities across the site. Although weaknesses exist in the documented requirements for entering issues into the corrective action process to facilitate long-term trending at the facility level, these weaknesses are currently mitigated by the actions of the responsible individuals. Finally, although analysis has not been performed to support use of the stack monitoring system in response to potential internal events, facilities and equipment at T-Plant are adequate to support the facility's response to anticipated emergencies.

G.2.3 Readiness Assurance

An effective emergency management program includes readiness assurance activities in addition to the planning, preparation, and response functions. Readiness assurance activities include implementation of a coordinated schedule of program assessments and the active involvement of DOE line organizations in monitoring program effectiveness, implementing self-assessment programs, and ensuring that timely corrective actions are taken for identified weaknesses.

As a follow-up to the May 2004 inspection conducted by Independent Oversight, this inspection examined the processes by which RL maintains operational awareness of the FH emergency management program. The inspection included a review of RL emergency management program assessment and issues management processes. Additionally, the inspection included reviews of the FH emergency management self-assessment and issues management processes and the status of actions taken to address findings identified in the previous Independent Oversight inspection.

RL Emergency Preparedness Line Management Oversight and Issues Management

Responsibility for monitoring the status of emergency management program implementation at the facility level is shared by the cognizant Facility Representative (FR) and the RL emergency management program manager. As a consequence primarily of the strong FR program, which is discussed in more detail in Appendix D of this report, RL is actively aware of the status of EP at the facility level. FRs interface with facility EP programs through a variety of frequent surveillances and drill observations; some are scheduled in advance, while others are conducted as indicated by adverse performance trends or the need to verify corrective action effectiveness. Based on a sample of FR observations of facility drills, actual events, and other EP-related activities conducted during the first four months of 2006, FR observations are well documented in operational awareness reports and are entered into the operational awareness database for trending and archival purposes. Furthermore, there is evidence that FRs actively follow up on the implementation and closeout of corrective actions resulting from EP drills.

The RL EP program manager (EPPM) is primarily focused on the sitewide EP program, but the EPPM is also expected to be aware of the status of EP implementation at the facility level. This expectation is identified in the associated division's annual work plan and in the EPPM's annual performance plan, which for fiscal year 2006 required the observation and documentation of four EP drills and ten hours per month of field activity observation. The EPPM is fulfilling these expectations, as indicated by the associated operational awareness database entries, but the database entries to date have been limited almost exclusively to logging of the activity, and have not included the types of substantive observations typically documented by the FRs. This is partly a reflection of the fact that operational awareness database usage by individuals outside the FR organization has only been recently emphasized, and partly because of the relative inexperience of the RL EPPM. Although serving as the EPPM for approximately two years, the EPPM was only recently enrolled in the technical qualification program (TQP), and despite lacking a substantive EP background, the only training involvement to date has been several basic facility-level response courses taken shortly after being assigned as EPPM. The issue of TQP implementation and enrollment is discussed more broadly in Appendix D of this report.

The final area of RL line management oversight that was evaluated as part of this inspection was the RL review of the effectiveness of the corrective actions that had been implemented in response to the 2004 Independent Oversight emergency management inspection. The 2004 inspection identified one finding for which FH developed a final corrective action plan and six supporting corrective actions; all of the corrective actions were entered in the DOE corrective action tracking system and subsequently implemented. RL's independent review, conducted by its Office of Organizational Effectiveness and Communications, was for the most part detailed and comprehensive in examining each of the corrective actions implemented by FH. Furthermore, the review identified several instances where the corrective action had not been adequately defined or appropriately completed, and the review triggered additional FH actions. However, the RL review team's conclusions are not adequately supported by the information in the body of the effectiveness review report, in part because of an apparent misunderstanding about the scope of the review. The RL review team incorrectly believed that the corrective actions that were developed by FH were intended to address the inspection report finding as well as other identified weaknesses and opportunities for improvement. Consequently, the RL review team did not consider it necessary to document completion of all of the corrective actions to conclude that the corrective actions were effective. Also diminishing the value of the report was the absence of any acknowledgement of subsequent FH corrective actions to address the items that had originally been determined as incomplete. As discussed below, the corrective actions from the 2004 Independent Oversight inspection appear to have been appropriately closed; however, increased thoroughness in the process by which such effectiveness reviews are performed would help to ensure that the reviews provide valid conclusions about corrective action effectiveness.

FH Emergency Preparedness Self-Assessments and Issues Management

FH conducts a variety of structured assessments, in accordance with program requirements, to identify EP program weaknesses and areas for improvement at facilities within WSD, including T-Plant. The EP

Program Requirements document requires an annual readiness assurance assessment of facility emergency management programs, and FH has developed an appropriate set of EP assessment objectives and criteria, contained within the *FH Safety Management Program* and *Project Hanford Management Contract Performance Objectives and Criteria* documents for use by assessment personnel. A review of the 2005 and 2006 FH independent assessments of WSD emergency management program and associated facilities (which included T-Plant) and a 2005 EP management assessment at T-Plant indicate that FH is performing self-critical assessments and is appropriately using the established EP assessment criteria to identify and document substantive items for correction or improvement.

FH also uses actual events to identify areas requiring improvement. For example, following an August 2005 emergency event at the Solid Waste Storage and Disposal facility in which a drum breach occurred during retrieval operations, FH identified a concern that applicable EALs may be overly conservative and contain insufficient guidance. As a result, FH conducted a series of EAL workshops intended to improve facility EALs across the site, and T-Plant EALs were subsequently revised to improve their applicability and utility in such relatively low-consequence events.

With very few exceptions, FH is appropriately using its corrective action management process to develop and implement effective corrective actions for identified emergency management issues. The finding from the 2004 Independent Oversight emergency management inspection has been suitably addressed and closed. At the Hanford Site level, FH evaluates weaknesses and captures and tracks the status of corrective actions developed in response to FH emergency management assessments and actual events to improve WSD and T-Plant EP programs. For example, issues from the August 2005 classified emergency discussed above; negative observations from the 2005 management assessment at T-Plant; and opportunities for improvement from the 2004 Independent Oversight inspection (discussed below) were handled within the corrective action process and tracked to closure using the FH deficiency tracking system. However, as discussed previously, a more consistent and rigorous treatment of drill items is warranted to facilitate improved issue trending.

Finally, to further enhance the site's EP program, FH performed a detailed review of all of the non-finding weaknesses and opportunities for improvement identified in the 2004 Independent Oversight emergency management inspection report. The well-organized evidence packages documented a series of generally appropriate corrective actions. For example, in response to a concern regarding weaknesses in classification thresholds for the Waste Receiving and Processing Facility security EALs applicable to a bomb threat, FH EP staff evaluated security-related EALs at a large number of site facilities to determine whether the EALs contained measurable criteria and were consistent internally and across the site. Guidance for improving the EALs was included in an update to the sitewide procedure for developing EALs, and the T-Plant EALs were improved, although as discussed in the "procedures" section of this appendix, the T-Plant EALs are overly conservative because they do not provide sufficient guidance for the BED to classify events based on the relative risk of the affected hazardous material.

Summary. RL and FH are in most cases using their respective issues management processes to institute improvements in the site's EP program at the facility level. RL is actively aware of the status of EP at the facility level, primarily through the interface between FRs and EP-related activities, such as drills and opportunities for corrective action closeout that occur at the facilities. FH conducts a variety of structured assessments and other activities, such as actual event critiques to identify EP program weaknesses and areas for improvement at facilities such as T-Plant. Additionally, FH is largely using its corrective action management process to effectively develop and implement corrective actions for self-identified emergency management issues and those identified during the 2004 Independent Oversight inspection. Several readiness assurance aspects warrant strengthening. Although the RL EPPM is also fulfilling management's expectations for awareness of EP field activities, the EPPM has only recently been directed to qualify as an emergency manager within the TQP, and documentation of line oversight activities to date has included very limited detail. Furthermore, the rigor of the RL effectiveness review was hampered by confusion among RL review team members and RL and FH EP staff regarding the scope of the review. Finally, issues identified during facility drills have not been consistently addressed through the corrective action management process. In spite of the above weaknesses, implementation of the overall readiness assurance program is effective and has resulted in continued improvement to the emergency management program.

G.3 Conclusions

Previous Independent Oversight inspections of the Hanford emergency management program found that the program was comprehensive, thoroughly documented, and well integrated. Therefore, this 2006 inspection was focused on planning, preparedness, and readiness assurance activities at a specific facility (T-Plant) and integration of these elements into the sitewide program to gain insight into mechanisms for ensuring consistency at FH facilities across the site. The results of the inspection demonstrated that, with a few exceptions, FH and RL have continued to implement an effective emergency management program that provides confidence in the ERO's ability to protect the workers and the public in the event of a hazardous material release.

FH has an appropriate set of plans, procedures, and processes in place to identify and analyze most hazards related to the operations of the facilities, has prepared a sitewide hazards survey, and has completed a generally comprehensive EPHA that addresses the activities at T-Plant. The site emergency management plan continues to provide a solid foundation for an integrated approach to emergency management at this multi-contractor site, and it is adequately supported by a system of RL emergency plan implementing procedures. Project- and facility-specific implementing procedures are generally well-integrated with the site procedures and largely provide the facility operators with the necessary tools to respond to emergency events. Furthermore, training and drills at T-Plant have been effective at preparing responders for their roles in an emergency. The drill program, based on a mostly-comprehensive set of institutionalized drill program requirements, is a notable programmatic strength, and drill results have been used to improve the facility's program. FH has also implemented critical self-assessment and appropriate corrective action processes that have been effective in identifying and addressing program weaknesses. RL continues to maintain adequate oversight of the FH programs through a combination of FR observations of facility EP activities and EPPM involvement in operational awareness activities at the site level.

Notwithstanding the above, the Independent Oversight team identified some weaknesses in the site's planning, preparedness, and readiness assurance activities. Limitations in the spectrum of potential mid-range events within the T-Plant confinement areas (necessary to fully support the facility's emergency response) and some identified weaknesses in the EAL bases in the EPHA hamper development of EALs and emergency response procedures. Further, processes to identify potentially hazardous materials, particularly chemicals, for screening and potential analysis were not always effectively implemented. The readiness assurance program does not always capture facility drill program improvement items for trending and inclusion in the lessons-learned program, and the RL effectiveness review process did not ensure that the review scope was well understood and that the report conclusions were adequately supported and documented.

Overall, the Hanford emergency management organization continues to implement a mature, effective program. Planning for identified hazards has provided site responders with a sound, integrated approach to emergency response and includes appropriate training and drills to prepare them to execute their responsibilities. Self-assessment and oversight processes have contributed to improvements in the program, and RL has maintained adequate oversight of the program. Management attention is appropriate in the T-Plant EPHA area specifically, and in the hazardous screening process in general, to ensure that EPHA analyses include an appropriate set of mid-spectrum events and that hazardous chemicals, irrespective of form, are appropriately considered.

G.4 Ratings

This inspection was narrowly focused on the implementation of key aspects of emergency management at T-Plant and integration of the overall Hanford site and facility-specific emergency management programs. No overall program rating has been assigned, and because of the inspection scope and the similarity of results for the individual program elements that were assessed within each emergency management functional area, ratings have been assigned for the three applicable functional areas. These ratings reflect the status of each FH and RL emergency management program area at the time of the inspection. The rating assigned below to the readiness assurance category is specific to those assessment, corrective action, and performance monitoring mechanisms applicable to the emergency management area.

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

Emergency Planning ....EFFECTIVE PERFORMANCE
Emergency Preparedness ....EFFECTIVE PERFORMANCE
Readiness Assurance ....EFFECTIVE PERFORMANCE

G.5 Opportunities for Improvement

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

RL

1. **Strengthen the RL process for performing and documenting effectiveness reviews.** Specific actions to consider include:

   - Establish mechanisms, such as an assignment letter, to clearly communicate the scope and reporting requirements to the review team.
   - Include steps to verify that review team personnel have the necessary training and experience in the effectiveness review process.
   - Coordinate the review process with the contractor to enable the team to include relevant contractor feedback in the final report.

FH

1. **Enhance the institutional processes that ensure that EP personnel responsible for the EPHA are notified of changes in facility processes that may trigger additional hazards surveys and/or EPHA activities due to changes in the hazardous material inventory.** Specific actions to consider include:

   - Review the screening limits in the implementing procedures and ensure that limits are consistently stated and can be applied by personnel without expert knowledge in the hazards survey and EPHA.
   - Ensure that the roles and responsibilities of facility EP personnel and EPHA analysts in conducting reviews of changes are clearly defined.
   - Verify that administrative limits on hazardous material inventories in the facilities ensure that assumptions in the EPHA are not exceeded.

2. **Improve the process for developing the site hazards survey**. Specific actions to consider include:

   - Develop a procedure that establishes more detailed expectations for preparing, reviewing, and approving the hazards survey.

- Establish a single, sitewide screening process for the hazards survey that considers the screening process in the latest revision to DOE Order 151.1.

- Include details of the facilities' hazardous material inventory in the hazards survey to clearly demonstrate the screening process.

3. **To increase the accuracy of EALs as emergency response decision-making tools, consider the following actions to improve the EPHA:**

   - Expand the range of analyzed events to include a spectrum of postulated events that occur within facility buildings, such as 221-T canyon and 2706-T, and, for example, involve the potential for progressive loss of confinement.

   - Clarify the discussion of fires or explosions involving the 291-T ventilation system to more specifically define the circumstances under which a "potential" to burn the filter media exists.

   - Review the security contingencies discussed in the EPHA (and the resulting EALs) to ensure that the EPHA follows the logic and guidance in the RL EAL procedure or the emergency management guide, particularly in the case of bomb threats or other malevolent acts that might threaten hazardous materials.

   - Consider using the guidance available in the site/transportation EALs for classifying events using generic guidelines for both radiological and non-radiological hazards in the facility EALs.

   - Address analysis and classification of a spectrum of possible events involving lesser quantities of materials (or lesser damage) when the EPHA indicates that events involving large quantities of material result in site area or general emergencies.

   - Re-evaluate the use and importance of instrument indicators in EALs to determine whether the EALs can be further enhanced by transforming them into symptom-based EALs that make use of available instrument displays and setpoints.

4. **Enhance the processes for providing emergency categorization information to DOE Headquarters, offsite authorities, and the public to ensure the accuracy and appropriateness of information released.** Specific actions to consider include:

   - Clarify the roles, responsibilities, and timelines for completing event categorization.

   - Revise the appropriate procedures to reflect the roles and responsibilities and ensure that categorization actions are implemented in a timely manner.

   - Reconcile differences between the ONC desk instruction and the ONC Duty Officer notification processes to eliminate potential conflicts between sources of information. Consider merging instructions and checklists to reduce the administrative burden associated with procedure maintenance.

   - Consider using a term other than "Base Program Operational Emergency" for reporting events at hazardous material facilities that are categorized but not classified. Alternatively, consider coordinating RL and FH efforts to obtain clarification and/or approval from the DOE Headquarters watch office and emergency management policy groups (i.e., NA-40) for using the term "Base Program Operational Emergency."

5. **Improve the procedures and checklists available to facilitate response to events at T-Plant.** Specific actions to consider include:

   - Develop a procedure (or procedure sections) to address fires and/or spills that occur within T-Plant facilities, such as 221-T canyon and 2706-T.

   - Develop pre-planned, proceduralized actions for monitoring confinement system status and anticipating potential system degradation during internal operational events.

- Develop formal checklists to assist facility personnel in performing such emergency actions as securing ventilation and monitoring and communicating the status of completed actions, such as implementation of take cover (locations and personnel status) and accountability.

6. **Strengthen the effectiveness of the drill program in identifying adverse long-term performance trends by clarifying the requirements and guidance for treatment of drill issues within the corrective action management process.** Specific actions to consider include:

   - Clarify emergency management program expectations regarding the conditions under which facility drills should be trended. Solicit facility management input to obtain buy-in for decisions to trend issues in those cases where an "immediate" corrective action is apparently available.

   - Eliminate inconsistencies among program requirements documents applicable to the emergency management program and corporate procedures applicable to the corrective action management process in the area of drill-issue identification and trending.

   - Revise, as appropriate, and formally issue the FH drill report guidance document to aid EP coordinators in understanding expectations regarding drill trending.

   - Develop a method for keeping the EP coordinators regularly informed as to which drill issues have been entered into the corrective action process to facilitate follow-up.

7. **Enhance the formality of the drill program to ensure consistency of program implementation across the site**. Specific actions to consider include:

   - Document the expectation that unusually good or poor drill element grades be justified with a written explanation.

   - Develop a common method among facilities for tracking drill participation, such as a drill proficiency database, which could be easily accessed by FH project EP personnel.

8. **Enhance the expected availability of the public address system during emergencies accompanied by a loss of power by:**

   - Evaluating potential preventive maintenance actions for the backup power supply that should be performed to enhance system reliability.

   - Evaluating the design of the present electrical power supply, including backup power, to ensure that the design meets applicable code requirements and expectations for functional reliability.

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Abbreviations Used in This Report (Continued)

EPPM	Emergency Preparedness Program Manager
EP	Emergency Preparedness
EPHA	Emergency Preparedness Hazards Assessment
ERO	Emergency Response Organization
ES&H	Environment, Safety, and Health
EZAC	Employee Zero Accident Council
FH	Fluor Hanford, Incorporated
FHA	Fire Hazards Analysis
FR	Facility Representative
FY	Fiscal Year
HEPA	High Efficiency Particulate Air
ISM	Integrated Safety Management
JHA	Job Hazards Analysis
LCO	Limiting Condition of Operation
LLBG	Low Level Burial Grounds
LLMW	Low Level Mixed Waste
MDSA	Master Documented Safety Analysis
NFPA	National Fire Protection Association
ONC	Occurrence Notification Center
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
PPOA	Pollution Prevention Opportunity Assessment
PISA	Potentially Inadequate Safety Analysis
RBA	Radiological Buffer Area
RCT	Radiological Control Technician
RIMS	Richland Integrated Management System
RITS	Richland Issues Tracking System
RL	Richland Operations Office
RLEP	Richland Emergency Plan Implementing Procedure
RWP	Radiation Work Permit
SME	Subject Matter Expert
SNM	Special Nuclear Material
SSCs	Structures, Systems, and Components
SSO	Safety System Oversight
SWOC	Solid Waste Operations Complex
SWSD	Solid Waste Storage and Disposal
TQP	Technical Qualification Program
TRC	Total Recordable Case
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
VSS	Vital Safety System
w.c.	Water Column
WRAP	Waste Receiving and Processing Facility
WSCF	Waste Sampling and Characterization Facility
WSD	Waste Stabilization and Disposition Project