Washington River Protection Solutions, LLC
Tank Farm Operations Contract

Report from the Department of Energy
Voluntary Protection Program
Onsite Review
February 7-16, 2017

U.S. Department of Energy
Office of Environment, Health, Safety and Security
Office of Health and Safety
Office of Worker Safety and Health Assistance
Washington, DC 20585

Foreword

The Department of Energy (DOE) recognizes that excellence can be encouraged and guided, but not standardized. On January 26, 1994, the Department initiated the DOE Voluntary Protection Program (VPP) to encourage and recognize excellence in occupational safety and health protection. This program closely parallels the Occupational Safety and Health Administration's (OSHA) VPP. Since its creation by OSHA in 1982 and implementation by DOE in 1994, VPP has demonstrated that cooperative action among Government, industry, and labor can achieve excellence in worker safety and health.

DOE-VPP outlines areas where DOE contractors and subcontractors can surpass compliance with DOE Orders and OSHA standards. The program encourages a *stretch for excellence* through systematic approaches, which emphasize creative solutions through cooperative efforts by managers and employees. Requirements for the DOE-VPP participation are based on comprehensive management systems with employees actively involved in assessing, preventing, and controlling potential health and safety hazards at their sites. All contractors in the DOE complex, including production facilities, laboratories, and various subcontractors and support organizations may participate in DOE-VPP.

However, in keeping with OSHA and DOE-VPP philosophy, *participation is strictly voluntary.* Additionally, any participant may withdraw from the program at any time. DOE-VPP consists of three programs with names and functions similar to those in OSHA's VPP: Star, Merit, and Demonstration. The Star program is the core of DOE-VPP. This program is aimed at outstanding protectors of employee safety and health. The Merit program is a steppingstone for participants that have good safety and health programs, but need time and DOE guidance to achieve true Star status. The Demonstration program, expected to be used rarely, allows DOE to recognize achievements in unusual situations about which DOE needs to learn more before determining approval requirements for the Merit or Star program.

By approving an applicant for participation in DOE-VPP, DOE recognizes that the applicant exceeds the basic elements of ongoing, systematic protection of employees at the site. The symbols of this recognition are certificates of approval and the right to use flags showing the program in which the site is participating. The participant may also choose to use the DOE-VPP logo on letterhead or on award items for employee incentive programs.

This report summarizes the results of the evaluation of Washington River Protection Solutions, LLC (WRPS), the Hanford Tank Farm Operations contractor, conducted February 7-16, 2017, and provides the Associate Under Secretary for Environment, Health, Safety and Security (AU) with the necessary information to make the final decision regarding WRPS' continued participation as a DOE-VPP Star site.

TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS iii

EXECUTIVE SUMMARY v

OPPORTUNITIES FOR IMPROVEMENT vii

I. INTRODUCTION 1

II. INJURY INCIDENCE/LOST WORKDAYS CASE RATE 3

III. MANAGEMENT LEADERSHIP 4

IV. EMPLOYEE INVOLVEMENT 9

V. WORKSITE ANALYSIS 14

VI. HAZARD PREVENTION AND CONTROL 19

VII. SAFETY AND HEALTH TRAINING 24

VIII. CONCLUSIONS 27

Appendix A A-1

ABBREVIATIONS AND ACRONYMS

ALARA	As Low As Reasonably Achievable
AMW	ALARA Management Worksheet
APR	Air-Purifying Respirator
AU	Office of Environment, Health, Safety and Security
AU-12	Office of Worker Safety and Health Assistance
BLS	Bureau of Labor Statistics
CEHA	Chemical Exposure Hazard Analysis
CFR	Code of Federal Regulations
CVST	Chemical Vapor Solutions Team
DART	Days Away, Restricted or Transferred
DOE	Department of Energy
DST	Double-Shell Tank
EA	Office of Enterprise Assessments
EAPC	Employee Accident Prevention Council
EJTA	Employee Job Task Analysis
ELM	Enterprise Learning Management
ESH&Q	Environment, Safety, Health and Quality
ETF	Effluent Treatment Facility
FLM	First Line Managers
FLS	First Line Supervisors
GHA	General Hazards Analysis
HAMMER	Volpentest Hazardous Material Management and Emergency Response Training Center
HAMTC	Hanford Atomic Metal Trades Council
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HPMC	HPM Corporation
HSWET	Hanford Site Worker Eligibility Tool
IH	Industrial Hygiene
IHT	Industrial Hygiene Technician
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
JRG	Joint Review Group
MSA	Mission Support Alliance, LLC
MSF	My Safety Focus
NAICS	North American Industry Classification System
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
PAPC	President's Accident Prevention Council
PER	Problem Evaluation Report
PPE	Personal Protective Equipment
RL	Richland Operations Office
SCBA	Self-Contained Breathing Apparatus
SCIT	Safety Culture Improvement Team
SEG	Similar Exposure Group
SME	Subject Matter Expert

SOC	Skill-of-the-Craft
SST	Single-Shell Tank
Team	DOE-VPP Assessment Team
TRC	Total Recordable Case
TVAT	Tank Vapor Assessment Team
TVIS	Tank Vapor Information Sheet
VMDS	Vapor Monitoring and Detection System
VPP	Voluntary Protection Program
WRPS	Washington River Protection Solutions, LLC

EXECUTIVE SUMMARY

The Department of Energy's (DOE) Voluntary Protection Program (VPP) Assessment Team (Team) from the Office of Environment, Health, Safety and Security (AU) recommends that Washington River Protection Solutions, LLC (WRPS), continue participating in DOE-VPP as a Star site. This report documents the Team's observations, conclusions, and identifies several opportunities for improvement that WRPS may consider in its pursuit of excellence in worker safety and health.

The Hanford Site Tank Farms contain approximately 57 million gallons of radioactive and mixed waste stored in 177 large, aging, underground tanks. This nuclear waste is the result of more than four decades of reactor operations and plutonium production for national defense. The systems and infrastructure that support storage of the waste are aging and pose a threat to the environment. WRPS has held the tank operations contract since 2008, earned the DOE-VPP Star in 2014, and currently employs approximately 2,100 personnel. In 2015, the operation and maintenance of the Effluent Treatment Facility (ETF) transferred from CH2M Hill Plateau Remediation Company to WRPS.

WRPS injury rates continued to decrease during this 3-year reporting period, and remain well below its Bureau of Labor Statistics (BLS) comparison industry average. The Team did not find any incentives to discourage the reporting of injuries, illnesses, or safety concerns by workers.

WRPS managers demonstrated a deep commitment to safety and a dedication to balancing the competing priorities, perceptions, and opinions about concerns presented by the waste in the tanks. They are supporting workers' ideas and innovations, seeking long-term solutions to difficult problems, and trying to be responsive to workers' concerns. WRPS has improved its relationship with bargaining unit leaders, but it still faces long-term trust issues with portions of the workforce. Managers are trying to maintain open and honest dialog with workers and are working to improve their visibility to workers.

WRPS continues its efforts to improve employee involvement and ownership of the safety and health program. WRPS has a well-established structure of safety committees and councils and maintains a wide array of employee recognition programs that promote recognition and reinforce safe behaviors demonstrated by individuals or teams. WRPS should continue its focus on improving the Employee Accident Prevention Council (EAPC) participation rate by workers. It should also consider identifying a "VPP Champion" who will lead its VPP initiatives and help EAPCs and other committees integrate continuous improvement activities.

WRPS is analyzing many challenging hazards to develop control strategies and protect workers, the public, and the environment. The work control process integrates the radiological, industrial hygiene (IH), and industrial safety analysis results into work instructions, procedures, and training. WRPS uses recommendations from multiple sources and researching cutting edge monitoring and detection technologies to further characterize, control, and prevent tank vapor exposures. The improved use of scientific methods and field equipment are raising confidence among the safety and health community and workers that solutions are credible.

WRPS implements the hierarchy of controls to control worker exposures, with the first choice being engineered controls to reduce or control worker hazards. Despite this preference, DOE investment in engineered controls has been limited, necessitating extensive reliance on personal

protective equipment (PPE) and administrative controls. Collaboration among workers and managers has resulted in innovative hazard prevention and control approaches. Certified safety and health professionals are also available to identify hazards and recommend controls.

WRPS continues to maintain a training program that ensures trained and qualified workers can perform their job functions safely. WRPS requires managers, technicians, operators, instructional staff, maintenance and craft, and scientific staff to meet qualifications established by the company. The training organization ensures that employees' training fulfills the training needed to meet and maintain those qualifications.

Since 2014, WRPS has continued to deal with challenges to worker, public, and environmental safety presented by the waste it manages. Ongoing worker concerns about vapor exposures, differing public perceptions, and the threat posed by degrading tank conditions were the priority when WRPS identified a leak into the annulus of a double-shell tank (DST). WRPS used its expertise and worker input to solve the problem in a timely manner.

WRPS is also dealing with long-term trust and communication issues with some workers. Many of these issues stem from differing perceptions of the hazards among workers. While some workers are extremely concerned about the hazards posed by tank vapors, many others are not, and believe the use of self-contained breathing apparatus (SCBA) for respiratory protection presents more hazards to the workers than the tank vapors. WRPS is trying to resolve this issue, using state-of-the-art vapor detection technology, real-time meteorological data, and plume modeling, to better understand the locations and mechanisms for vapor exposures. It is also working with the unions to obtain valid test data for other protection methods, primarily air purifying respirators (APR), to determine if those methods will protect workers from vapor exposures. Overall, WRPS has a culture that values worker safety and health, encourages workers to raise issues and contribute to issue resolution, and performs its mission successfully.

TABLE 1
OPPORTUNITIES FOR IMPROVEMENT

Opportunity for Improvement	Page
WRPS should define the roles, responsibilities, authorities, accountability, functions, and assignments for the VPP coordinator in its system of policies and procedures and ensure the position is appropriately located within the organization to carry out that mission.	**6**
WRPS should continue its efforts to increase all managers' presence and visibility at work locations and ensure that their presence enhances communication and trust among the workforce.	**7**
WRPS should consider developing annual training modules for FLS and FLMs that identify topics of concern from the preceding year, including recent employee concerns and labor issues, and ensure supervisors and managers become more proficient in addressing employee concerns.	**7**
WRPS should consider identifying a "VPP Champion" whose primary duty is leading its VPP initiatives and helping EAPCs and other committees integrate continuous improvement activities.	**10**
WRPS should continue to focus on removing barriers to meeting attendance and improving the EAPC participation rate.	**10**
WRPS should consider better promotion and advertising for available health and wellness programs through its communications to employees.	**12**
WRPS should identify methods to modify or supplement MSF to include peer observations and stimulate discussions among individuals about safe and at-risk behaviors.	**13**
WRPS should consider asking the CVST to consider workers' concern about the radial filters on tank breathers and using a teaming approach, including SMEs, engineers, and craft workers involved in the maintenance and installation of the radial filters, to achieve a better understanding by all personnel of the competing considerations.	**17**
WRPS should work with American Electric to determine a means of documenting weekly inspections of construction areas that balances the purpose of the inspections with the ALARA concerns related to working in contaminated areas with full respiratory protection.	**18**
WRPS should continue its efforts to find engineered solutions to control tank vapor to eliminate or reduce the need for SCBAs.	**20**

WRPS should increase its efforts to provide feedback on the status of workers' concerns, especially when the work to resolve the concern or unsatisfactory condition is a low priority.	**21**
WRPS should consider teaming with the other site contractors, the Hanford occupational medicine providers (HPMC and Kadlec), and DOE-RL to ensure all the Hanford Site contractors have access to the information they need to make timely and accurate injury and illness recordkeeping decisions in accordance with 29 CFR 1904.	**23**
WRPS industrial hygienists should inspect maintenance crafts shops for good hygiene practices to reduce the risk of cross contamination that could result from consuming food in maintenance workspaces.	**23**
WRPS should consider developing a guidance document that describes the IHT mentor/mentee roles and responsibilities for the successful achievement of the program goals.	**25**

I. INTRODUCTION

The Hanford Site Tank Farms contain approximately 57 million gallons of radioactive and mixed waste stored in 177 large, aging, underground tanks. This nuclear waste is the result of more than four decades of reactor operations and plutonium production for National defense. The systems and infrastructure that support storage of the waste are aging and pose a threat to the environment. The solution to this problem is to safely and cost-effectively retrieve, process, and immobilize this waste and to close the Tank Farm system so that it no longer poses a threat to the environment.

DOE's Office of River Protection (ORP) manages the cleanup of the Hanford Site tank waste. In July 2008, ORP awarded the tank operation contract to Washington River Protection Solutions, LLC (WRPS). AECOM (formerly URS Corporation) and Energy Solutions jointly own WRPS. After WRPS took over tank farm operations, it more than doubled its workforce, increasing from 700 to approximately 1,700 employees in 2012. WRPS currently employs approximately 2,100 personnel.

WRPS entered DOE-VPP in November 2010 as a Merit participant. In February 2014, the DOE's former Office of Health, Safety and Security's VPP Team evaluated WRPS and determined that WRPS had significantly improved its safety and health program, fostered additional employee involvement, and improved the relationship between managers and workers. The Team noted that segments of the workforce remained distrustful of managers' motives and that leadership training could help improve the communication between workers, middle managers, and senior managers. Based on these improvements, WRPS met the expectations for participation at the Star level.

WRPS is responsible for safe and environmentally compliant operation, maintenance, radiological control, project management, construction, work management, and IH for 149 single-shell tanks (SST), 28 DSTs, and the 242-A Evaporator at the Hanford Site's 200 Area and associated facilities. Tank operations include monitoring existing tanks for leaks and transferring waste from leaking or suspected leaking tanks. In 2015, the operation and maintenance of ETF transferred from CH2M Hill Plateau Remediation Company to WRPS. The ETF mostly supports tank farm operations, and personnel experienced with ETF operations supported the transition. WRPS also provides maintenance and operational support to the 222-S Analytical Laboratory, and a separate contractor performs the analysis within the laboratory.

Three organizations within WRPS perform the bulk of the hazardous work on the tank farms. Production Operations is responsible for the operation and maintenance of most of the tanks, including the evaporator facilities used to reduce the volume of tank waste and the 222-S Analytical Laboratory. The SST Retrieval Project performs retrieval operations from the SSTs, including waste transfers between tanks. The Tank Farm Projects organization performs construction-related work necessary to install equipment or facilities used by the other organizations. An Environment, Safety, Health and Quality (ESH&Q) department provides the necessary expertise in safety, IH, and radiological controls to ensure WRPS performs work safely and compliantly. Other organizations provide the necessary support functions, such as project integration, engineering, human resources, and financial management.

WRPS workers contend with numerous environmental, industrial safety, construction hazards, radiological hazards, and chemical hazards (including exposure to potentially hazardous chemical vapors emanating from the tank waste and beryllium exposure). Industrial hazards include electrical, mechanical, scaffold work, and working with overhead loads. WRPS also has to consider potential nuclear safety hazards during tank-to-tank waste transfer activities.

In April 2015, DOE's Office of Enterprise Assessments (EA) conducted an independent review of work planning and control at the Hanford tank farms. During this review, EA found that WRPS established the appropriate processes to define the scope, analyzed the hazards, and established controls in the conduct of operational, maintenance and construction work. EA recommended several opportunities for improvement that encompassed training, work planning, hazard identification and analysis, and worker involvement in work planning and prejob briefings.

Continued participation in DOE-VPP requires a triennial assessment by the Office of Worker Safety and Health Assistance (AU-12). The Team performed the onsite assessment from February 7-16, 2017. The review included fieldwork observations and walkdowns in all project areas; interviews with workers, supervisors, and managers; and reviews of procedures, work packages, and other records. This report contains the results of the assessment and provides the Team's recommendation to the Associate Under Secretary for Environment, Health, Safety and Security.

II. INJURY INCIDENCE/LOST WORKDAYS CASE RATE

Injury Incidence/Lost Workdays Case Rate (WRPS and staff augments)					
Calendar Year	Hours Worked	Total Recordable Cases (TRC)	TRC Incidence Rate	DART* Cases	DART* Case Rate
2014	4,115,416	12	0.58	4	0.19
2015	4,976,766	7	0.28	3	0.12
2016	4,861,097	5	0.21	2	0.08
3-Year Total	13,953,279	24	0.34	9	0.13
Bureau of Labor Statistics (BLS-2015) composite for NAICS** Code 562, waste management and remediation services			4.5		3.0
Injury Incidence/Lost Workdays Case Rate (WRPS Subcontractors)					
Calendar Year	Hours Worked	TRC	TRC Incidence Rate	DART* Cases	DART* Case Rate
2014	97,376	0	0	0	0
2015	294,811	0	0	0	0
2016	358,379	0	0	0	0
3-Year Total	750,566	0	0	0	0
Bureau of Labor Statistics (BLS-2015) composite for NAICS** Code 562, waste management and remediation services			4.5		3.0

* Days Away, Restricted or Transferred
** North American Industry Classification System

3-year TRC Incidence Rate, including subcontractors: 0.33
3-year DART Case Rate, including subcontractors: 0.12

Conclusion

WRPS injury rates decreased during this 3-year reporting period, and remain well below its BLS comparison industry average. The Team selected eight first-aid cases to review from the past 15 months and did not identify any errors in categorization of the injuries. The Team did not find any incentives to discourage the reporting of injuries, illnesses, or safety concerns by workers. The WRPS injury/illness and DART rates meet the expectations for continued participation in DOE-VPP.

III. MANAGEMENT LEADERSHIP

Management leadership is a key element of obtaining and sustaining an effective safety culture. The contractor must demonstrate senior level management commitment to exceeding occupational safety and health requirements and meeting the expectations of DOE-VPP. Management systems for comprehensive planning must address health and safety requirements and initiatives. Elements of the management system include: (1) clearly communicated policies and goals; (2) clear definition and appropriate assignment of responsibility and authority; (3) adequate resources; (4) accountability for both managers and workers; and (5) managers must be visible, accessible, and credible to employees. Authority and responsibility for employee health and safety must be integrated with the management system of the organization and must involve employees at all levels of the organization.

In 2014, the Team determined that WRPS' improvements in Management Leadership had produced significant improvements in its safety programs. Changes in leadership, training managers and supervisors in leadership skills, and proactively managing issues were building trust and improving communication with workers. Segments of the workforce remained that did not yet share that trust, and WRPS needed to continue its efforts to reach out to those workers.

WRPS maintains an extensive set of policies, plans, and procedures that implement a comprehensive approach to excellence in safety and health. TFC-POL-14, *WRPS Safety and Occupational Health,* establishes WRPS' commitment "to the highest standards of safety and health performance and to be a model of excellence in the performance of safe, quality work." The policy established that safety and health have precedence over all other considerations, and identifies integrated safety management systems (ISMS) and VPP as the means of accomplishing the goals of zero injuries. The policy establishes a list of 12 "Master Safety and Occupational Health Rules" and reiterates the workers' Bill of Rights, consistent with title 10, Code of Federal Relations, part 851 (10 CFR 851), and the collective bargaining agreement.

WRPS has an active communications team that focuses on both internal and external communications. These communications include newsletters, e-mails, Web pages, and video and written releases to the public. In one example, WRPS highlighted project successes in a full-page advertisement (dated September 2016) in the Tri-City Herald, titled "Employee Driven Solutions." The advertisement described the successes of the WRPS initiative to meet required milestones and provided that information directly to the public. WRPS has also produced several short videos featuring employees describing situations they may find themselves in and identifying strategies workers can use to respond. These are excellent approaches to communicating company messages to workers and the public to help them understand the challenges and approaches to mission success.

WRPS managed the transfer of ETF to WRPS very well. Prior to the transfer, DOE had not committed the necessary resources and attention to maintaining ETF, leading to significant equipment and facility degradation. WRPS worked with ORP to identify the necessary resources, personnel, and equipment required to restore the facility to safe, efficient operations that support the tank farm mission. WRPS supported workers' ideas and approaches to repair, and in some cases, replace failed equipment and established an expectation for operational excellence at ETF. Although the facility still has some conditions that cause workers concern,

WRPS has identified those conditions, and in most cases, WRPS is working to correct those conditions (see Hazard Prevention and Control).

In September 2015, worker exposure to waste tank vapors again rose to the foreground when one of the Hanford Atomic Metal Trades Council (HAMTC) affiliated unions and an outside stakeholder organization filed suit against DOE and WRPS over work practices on the tank farms. In July 2016, the HAMTC president issued a stop work for all work in the tank farms because he was dissatisfied with the WRPS response to an earlier demand letter related to vapor exposures. Since then, with agreement from HAMTC, workers have been wearing SCBAs when entering the tank farms, and managers have been trying to continue the mission while adequately addressing worker concerns about vapor exposures. With DOE support, WRPS has invested significant time, talent, and funds to characterize vapors, identify emission sources, correlate odors with release points, model vapor dispersion, develop real-time monitoring capabilities, and ensure workers are protected while performing work. WRPS has established a vapor Website with extensive information about potential and actual vapor exposures. WRPS is developing, testing, and deploying innovative detectors that will allow workers to definitively correlate odors with release points and ensure WRPS captures accurate real-time exposure data (see Hazard Prevention and Control). WRPS has also revitalized the Chemical Vapor Solutions Team (CVST) as a means of stimulating greater employee involvement in reducing or preventing worker exposure to tank vapors. Due to these efforts, all interested parties are involved in mediation that should lead to practical, realistic exposure control strategies that workers trust. In the meantime, WRPS managers are trying to maintain an open dialog with workers, involve workers in planning strategies for urgent work, and respond when issues arise.

In 2014, WRPS identified a DST that was leaking into the annulus. Such leaks have been anticipated as the tanks continue to age. WRPS responded to the identification of the leak in AY-102, ensuring DOE, the State of Washington, and the Environmental Protection Agency were all informed. WRPS identified potential response strategies, formulated plans, and quickly implemented projects to transfer the waste out of the tank into other tanks. All the parties agreed to a March 2017 completion date for the transfer. This was an aggressive schedule, especially because of the lawsuit and the HAMTC demand letter. Many activities had to be conducted on nights and weekends to minimize potential exposures to other workers. During the transfer, the leak into the annulus increased as workers cleared waste away from the leak. WRPS' plans and procedures accurately anticipated these potential liabilities and included planned responses those issues. Despite these challenges, the combination of management commitment, and worker involvement in the design and conduct of the transfer activities resulted in WRPS completing the necessary transfer in February 2017.

The success of the waste transfer from the leaking DST is largely attributable to WRPS' (and the preceding contractors') investment in innovative technologies to efficiently remove waste from SSTs and transfer the waste into more reliable DSTs. Over the years, WRPS has developed robotic arms, cameras, pumps, and other devices to mobilize tank waste and reduce direct worker exposure. These technologies permit workers to visualize tank contents and move waste out of tanks more efficiently. Many of these innovations came directly from worker ideas.

WRPS is taking a deliberate approach to safety culture improvement and operational performance improvement. One group, the Organizational Performance Improvement group

within the Project Operations organization, identifies potential performance enhancing strategies and techniques; and it interfaces extensively with both the Energy Facilities Contractors Operating Group and DOE. Many of these efforts focus on integrated safety management implementation, Human Performance Improvement, and safety culture. The ISMS, VPP, and safety culture improvements are integrated and complementary. The manager of this group was historically involved in VPP efforts under the previous contractor and during the early years of transition to WRPS. Since then, he has only been peripherally involved in WRPS' VPP efforts.

In recent years, WRPS has relied on a VPP coordinator within the ESH&Q organization. The VPP coordinator is a business systems analyst under the industrial safety manager. WRPS assigned him that role in October 2016. The previous VPP coordinator had been in the position for 3 years before resigning from WRPS in February 2017. As a result, the WRPS VPP efforts have not been sufficiently coordinated across the company. The current VPP coordinator does not have any company policies, directives, or procedures that identify roles and responsibilities, expectations, functions, and assignments for the position. The maturity of the program at WRPS and many years of participation by workers throughout the company have compensated for this weakness, but many experienced personnel may soon retire. Without clearly defined functions, assignments, roles, and responsibilities, the WRPS VPP efforts may lose momentum as the company approaches the end of its contract in 2018. WRPS should define the roles, responsibilities, authorities, accountability, functions, and assignments for the VPP coordinator in its system of policies and procedures and ensure the position is appropriately located within the organization to carry out that mission.

Opportunity for Improvement: WRPS should define the roles, responsibilities, authorities, accountability, functions, and assignments for the VPP coordinator in its system of policies and procedures and ensure the position is appropriately located within the organization to carry out that mission.

WRPS is working to improve its relationship with HAMTC. In May 2016, AECOM performed a corporate review of labor relations at WRPS. That review identified that the labor relations function resided at too low a level within WRPS, and the labor relations manager did not have sufficient authority to resolve labor issues. Resolutions had to work their way up through the company, often requiring action by the WRPS president/project manager. The delays in resolving labor issues were adding to trust issues. To improve labor relations, WRPS hired the leader for the corporate review as a Senior Labor Relations Advisor reporting directly to the WRPS president/project manager. WRPS consolidated the labor relations function under the senior advisor, who now has sole authority within WRPS to interpret the collective bargaining agreement.

WRPS continues to struggle with trust issues from a few union leaders. Those union leaders do not believe that WRPS and DOE have been honest regarding worker exposures to tank vapors. This is in contrast to many union workers who believe they are using overly protective measures that introduce additional hazards, discomfort, and inconvenience. The trust issue remains as a result of historic action (or inaction) on employee perceptions and, in some cases, a failure to adequately follow up on issues raised by employees. For example, the previous contractor initiated a change to replace breather filters on passively ventilated SSTs to reduce vapor releases and maintenance requirements. WRPS continued the project when it took over and installed the

radial filters between 2009 and 2011. Engineers responsible for the project expected the radial filters would reduce condensation buildup on the tank breather filters. Engineers also collected data demonstrating that the filters would not need quarterly testing and got agreement with the State of Washington to replace the filters annually rather than perform quarterly testing. WRPS expected this change would reduce the number of times workers needed to be in the vapor zones for filter testing and reduce radiation exposure as well. Unfortunately, some employees continue to identify conditions that they believe indicate the radial filters are exacerbating the vapor issues rather than resolving them. Employees have raised the issue through the problem evaluation report (PER) system, most recently in 2015. WRPS responded to the PERs with the same answers and data each time, but has never adequately addressed the problem to the employees' satisfaction (see Worksite Analysis).

Several months ago, the president/project manager began conducting roundtable meetings with selected groups of employees. These groups of about 25 people represent a particular work group to identify workers' concerns related to any topic, including safety and health. The president's goal was to increase his visibility to workers and build worker trust. In cases where the president/project manager meets with the same group, he selects individuals to attend to reach the maximum number of employees. Initially, WRPS scheduled the roundtable meetings monthly, but recently increased the frequency to every 2 weeks. These meetings provide feedback to the president/project manager, but the Team consistently heard from workers that managers' presence at the worksites is not meeting employees' expectations for greater manager awareness of worksite issues and conditions. WRPS should continue its efforts to increase all managers' presence and visibility at work locations and ensure that their presence enhances communication and trust among the workforce.

Opportunity for Improvement: WRPS should continue its efforts to increase all managers' presence and visibility at work locations and ensure that their presence enhances communication and trust among the workforce.

Both the Senior Labor Relations Advisor and the Employee Concerns Program Manager are developing training modules for first line supervisors (FLS) and first line managers (FLM) to help them understand their roles. Neither of these managers were aware of any recurring training for FLSs or FLMs related to labor relations or employee concerns. WRPS should consider developing annual training modules for FLSs and FLMs that identify topics of concern from the preceding year, including recent employee concerns and labor issues, and ensure supervisors and managers become more proficient in addressing employee concerns.

Opportunity for Improvement: WRPS should consider developing annual training modules for FLS and FLMs that identify topics of concern from the preceding year, including recent employee concerns and labor issues, and ensure supervisors and managers become more proficient in addressing employee concerns.

Conclusion

WRPS managers demonstrated a deep commitment to safety and a dedication to balancing the competing priorities resulting from differing perceptions and opinions about waste in the tanks.

They are supporting workers' ideas and innovations, seeking long-term solutions to difficult problems, and trying to be responsive to workers' concerns. WRPS has improved its relationship with bargaining unit leaders, but it still faces long-term trust issues with portions of the workforce. Managers are trying to maintain open and honest dialog with workers and working to improve their visibility to workers. WRPS demonstrates the expected Management Leadership for continued participation in DOE-VPP.

IV. EMPLOYEE INVOLVEMENT

Employees at all levels must continue to be involved in structuring and operating the safety and health program and in decision-making that affects employee health and safety. Employee involvement is a major pillar of a strong safety culture. Employee participation is in addition to the right to notify managers of hazardous conditions and practices. Managers and employees must work together to establish an environment of trust where employees understand that their participation adds value, is crucial, and welcome. Managers must be proactive in recognizing and rewarding workers for their participation and contributions. Employees and managers must communicate and collaborate in open forums to discuss continuing improvements, to recognize and resolve issues, and to learn from their experiences.

In 2014, the Team concluded that the WRPS employees were involved in their own safety and that of their coworkers. Employees recognized their right to notify their managers of any issues or concerns and often exercised their right to stop work. WRPS employees and managers participated in open forums, such as EAPCs, the President's Accident Prevention Council (PAPC), and other committees. However, WRPS could increase its efforts to ensure work schedules and meeting schedules permitted regular attendance. Managers could continue to formally recognize, encourage, and reward employees for their participation and contributions, but could also remember the value of informal recognition, such as face-to-face dialogue, a handshake, or a pat on the back for a job well done.

WRPS has continued its efforts to improve employee involvement and ownership of the safety and health program. Interviews with employees, observations of President's Safety Breakfast, prejob briefs, EAPC meetings, Safety Startup meetings, and document reviews demonstrated that the workforce continues to have multiple opportunities to be involved in the WRPS safety program. Based upon Team interviews during the current assessment, WRPS employees clearly own safety and embrace the methods to accomplish work safely and maintain safety success while meeting VPP expectations. Employees demonstrated a questioning attitude and, in most cases, indicated they would report any safety issues or concerns to their immediate supervisor for resolution.

WRPS has a well-established structure of safety committees and councils. The PAPC is WRPS' safety leadership council with the WRPS president/project manager and the lead HAMTC safety representative for WRPS serving as cochair persons. EAPCs, the As Low As Reasonably Achievable (ALARA) Committee, and other safety committees report to the PAPC on a monthly basis. These safety committees and councils provide a partnership among bargaining units, exempt, nonexempt employees and managers to improve safety performance and reduce injury and illness rates through the application of VPP principles and ISMS structure within WRPS.

The PAPC cochairs and members may establish standing committees to meet a specific goal or objective as circumstances warrant. These standing committees report progress to the PAPC members and establish a chairperson or co-chairs per the rules established in the PAPC charter. WRPS does not currently have any standing committees under the PAPC, but several other committees do involve employees. These committees include a CVST, Thermal Stress, and SCBA Equipment Evaluation Team in response to recognized/recommended needs.

Currently there are five EAPCs throughout WRPS. Each EAPC meets monthly. The EAPC chairs and cochairs also meet monthly at the PAPC meeting and discuss each other's successes, best practices, and issues. EAPCs conduct safety initiatives to reduce and prevent injuries and accidents within their organizations. WRPS encourages the councils to be creative and innovative in their efforts to improve safety performance. At the monthly PAPC meeting, each EAPC chair presents a Strengths, Weaknesses, Opportunities, and Threats overview of its business unit. These various monthly meetings provide many opportunities to share timely information between the business units. The PAPC and EAPCs tend to focus on issue and problem resolution rather than long-term improvement initiatives, such as VPP. Some workers stated, "We don't hear about VPP until an assessment or evaluation," indicating that WRPS is not linking long-term improvement initiatives to VPP. As discussed below, the PAPC and EAPCs have not fully adopted the responsibility to promote and champion long-term improvement efforts like VPP. Overall, the PAPC and EAPCs are effective means for workers to identify issues, learn about or recommend corrective actions, and foster employee involvement in the safety program.

WRPS does have a VPP management sponsor, a VPP executive sponsor, and a VPP coordinator, but those positions are all collateral duties (see Management Leadership). Since the 2014 review, WRPS disbanded the VPP task team and moved the VPP task team's responsibilities to the EAPCs. WRPS expected this decision to improve communications by providing information directly to employees via the EAPC rather than managing an additional committee and passing that same information through multiple committees. Based on Team interviews and attendance at EAPC meetings, the EAPCs have not fully adopted the responsibility of governing and leading the VPP. The VPP coordinator had been serving in this capacity, but with the resignation of the previous VPP coordinator, the current VPP coordinator has not had sufficient training and experience to fulfill that role. WRPS should consider identifying a "VPP Champion" whose primary duty is leading its VPP initiatives and helping EAPCs and other committees integrate continuous improvement activities.

Opportunity for Improvement: WRPS should consider identifying a "VPP Champion" whose primary duty is leading its VPP initiatives and helping EAPCs and other committees integrate continuous improvement activities.

As discussed in the 2014 assessment, WRPS considers voluntary membership in safety committees/councils a normal component of the member's duties. WRPS expects managers to support members by giving them adequate time to attend meetings. WRPS tracks percentage of safety council members' attendance each month. The 2014 report recommended WRPS work to increase employee participation and pursue a 90 percent goal for attendance. Team interviews indicate that WRPS has increased employee participation (internal WRPS goal of 80 percent), but has not yet achieved the goal of 90 percent or more. Some workers interviewed indicated that work schedule and meeting location still affected regular attendance at the committee meetings. WRPS should continue to focus on removing barriers to meeting attendance and improving the EAPC participation rate.

Opportunity for Improvement: WRPS should continue to focus on removing barriers to meeting attendance and improving the EAPC participation rate.

The CVST is a joint management/employee initiative to review processes and solutions to improve hazard identification, controls, training, and communication for tank farm chemical odors and vapors. The CVST reports to the Executive Safety Review Board. The CVST is empowered to form subteams as necessary to meet specific objectives. The cochairs of the CVST appoint the members and leaders of the subteams from CVST members. Recently, WRPS tasked the CVST to evaluate and provide feedback on the actions from the Implementation Plan for the Hanford Tank Vapor Assessment Report Recommendations. Team interviews identified that many workers support the CVST and believe it is helping identify solutions to ongoing tank farm vapor concerns.

The Team attended a Safety Culture Improvement Team (SCIT) meeting and observed an engaged and energetic group of employees representing a large spectrum of the workforce. WRPS created SCIT to invigorate the safety culture of the WRPS workforce through several methods. One of those methods focuses on developing a series of video messages titled, "The Tank Farm Teamwork Series Peer to Peer Review Video Safety Clips." These videos demonstrate the importance of performing work activities correctly and not allowing outside pressure to circumvent safety. Recent videos focus on vehicle walkarounds and proper frisking techniques, using members of the workforce to provide important messages in a lighthearted fun way. One strength of the videos is the demonstration of the correct method of performing the task with equal and accurate simulation of how the task is typically "circumvented." Employee interviews identified that the situations in the videos reflected similar situations workers have experienced at the Hanford Site. The SCIT has developed three videos to date, with several additional videos in development.

WRPS demonstrated excellent employee involvement in 2015 when it relocated the WRPS sign shop from the 200W area to the production operations site in the 200E area. The sign shop workers gave significant input into the layout, design, and procurement of new equipment for the new sign shop. Workers identified ergonomically improved desk layouts and designs for improved productivity, newly designed worktables for mass production of signs, and greater storage capability that resulted in a safer workspace. The workers were enthusiastic about the opportunity to develop and design the new location and were satisfied with the experience. This is an excellent example of promoting employee involvement to improve worker safety and continuous improvement.

WRPS continues to maintain a wide array of employee recognition programs to encourage employees to identify hazards and find controls. These programs recognize and reinforce safe behaviors demonstrated by individuals or teams. Employees sometimes receive cash or can choose from a variety of safety items. The EAPCs play a substantial role in these programs. For example, one of the five EAPCs rolled out a wellness campaign called "One Million Steps." The program awarded water bottles and lanyard pins to participants for completing the goal. While participation among employees in this particular EAPC was reasonable, a company-wide initiative might bring even greater benefits. The WRPS VPP Web page identifies various safety resources and information for employees, including a wellness program that offers information on dieting, pain management, recommended exercise goals, and interactive stretching sponsored by the HPM Corporation (HPMC). Team interviews identified several workers who were unaware of these programs. WRPS should consider better promotion and advertising for available health and wellness programs through its communications to employees.

Opportunity for Improvement: WRPS should consider better promotion and advertising for available health and wellness programs through its communications to employees.

WRPS has other company awards to recognize and reward employees for acts that go beyond the daily expectations. The President's Life Saving Award recognizes WRPS employees for acts of heroism that saved a life. The President's Safety Award program allows WRPS employees to recognize other WRPS employees for exhibiting an outstanding, long-term commitment to safety. The President's Safety Team Award recognizes a team that has made a significant contribution to safety. The team can be a work team, department or organizational team, or an ad hoc team. One recent submittal to the Presidents Safety Award was for an employee who helped an injured coworker who slipped on an icy parking lot.

Based on an EAPC recommendation that WRPS needed an improved recognition award program, WRPS developed the Workforce Incentive Program as its latest performance award. The WRPS managers stipulated that any significant incentive award program had to include performance against the contract milestones. In order to demonstrate its commitment to the Workforce Incentive Program, WRPS committed $8 million of its own money (non-DOE reimbursable funds) to support this program. The resulting incentive award provides a significant bonus to all employees (up to $1,500 per year per employee) if WRPS accomplishes approximately 75 contract milestones on schedule in fiscal year 2017. The goals of the incentive program are to improve the employees' understanding of the company's contractual milestones, to reinforce that the workers and managers have to work as a team to achieve these goals, and to emphasize the importance of achieving those goals safely and on schedule. Two of the performance objectives, measures, and commitments goals listed included the expectation that WRPS' annual TRC and DART rates must be below DOE's Office of Environmental Management's established goals. Setting goals based on injury/illness data may result in the unintended consequence of discouraging workers to disclose injuries to avoid affecting their cash award, although no workers currently felt reluctant to report injuries. Another unintended consequence could be additional schedule pressure on workers as milestone dates approach. WRPS managers should remain vigilant and look for any indications that workers are reluctant to report injuries or taking shortcuts to reach contract milestones in order to receive the bonus.

In 2010, WRPS created the Big League Safety process to encourage peer-to-peer safety observations. WRPS designed the Big League Safety program to recognize and reward those employees that performed and documented safety observations. The program only recorded observations of safe behaviors. By focusing on safe behaviors, WRPS hoped to encourage employees to observe and eliminate at-risk or unsafe behaviors. The Big League Safety did not achieve the intended results, so WRPS replaced it with the "My Safety Focus" (MSF) program.

The MSF program (described as a behavior-based safety program) uses a simple 3 by 5 card completed by workers prior to performing work. The MSF card asks the worker to consider and describe in writing the hazards presented by slips, trips, and falls; vehicle safety; PPE; SCBA; and winter walking safety. However, the MSF program relies solely on personnel identifying and focusing on their own safety behaviors and attitudes. The program eliminates the behavior-based safety element of peer-to-peer safety observations that provide a third person view of the potential safety issues and supports the "I Am My Brother's Keeper" concept. WRPS should

identify methods to modify or supplement MSF to include peer observations and stimulate discussions among individuals about safe and at-risk behaviors.

Opportunity for Improvement: WRPS should identify methods to modify or supplement MSF to include peer observations and stimulate discussions among individuals about safe and at-risk behaviors.

Team observations identified multiple mechanisms that WRPS uses to communicate consistent site-wide safety messages to the workforce. These mechanisms include "The Solutions" publication, "Tank Talk" newsletters, the Safety Flash awareness publication, and the "EV Everyday" publication. WRPS delivers these publications via e-mail distribution and makes hardcopy formats available to employees at multiple locations across the company's facilities.

Conclusion

WRPS continues its efforts to improve employee involvement and ownership of the safety and health program. WRPS has a well-established structure of safety committees and councils. WRPS continues to maintain a wide array of employee recognition programs that promote recognition and reinforce safe behaviors demonstrated by individuals or teams. WRPS should continue its focus on improving the EAPC participation rate by workers. It should also consider identifying a "VPP Champion" who will lead its VPP initiatives and help EAPCs and other committees integrate continuous improvement activities. WRPS continues to meet the expectations in Employee Involvement for continued participation in DOE-VPP.

V. WORKSITE ANALYSIS

Management of health and safety programs must begin with a thorough understanding of all hazards that might be encountered during the course of work and the ability to recognize and correct new hazards. Implementation of the first two core functions of ISMS, defining the scope of work and identifying and analyzing hazards, form the basis for a systematic approach to identifying and analyzing all hazards encountered during the course of work. The results of the analysis must be used in subsequent work planning efforts. Effective safety programs also integrate feedback from workers regarding additional hazards that are encountered and include a system to ensure that new or newly recognized hazards are properly addressed. Successful worksite analysis also involves implementing preventive and/or mitigating measures during work planning to anticipate and minimize the impact of such hazards.

The 2014 assessment concluded that WRPS improved its work control process by refining the intent and application of the hazard analysis processes. This refinement eliminated many of the subjective elements of the work control process identified in prior assessments. WRPS committed resources to the identification and understanding of the vapor hazards in the tank farms and ensured controls were effective to protect the workers from the identified hazards.

WRPS uses four levels of work packages to manage hazards, analysis, and controls as described in TFC-OPS-MAINT-C-01, *Tank Operations Contractor Work Control.* Beginning with the simplest of work, Level 4 work is low hazard, frequently performed, and verbally directed. WRPS maintains a list of authorized Level 4 work activities, along with the hazard analysis, on the WRPS Work Planning and Control Website. This allows work planners, located in multiple areas, to stay consistent and avoid the potential for adding tasks to the work beyond the initial definition without an associated hazard analysis.

The general hazards analysis (GHA) is a list of common hazards that WRPS personnel may encounter. All employees receive training on GHA, which provides workers with the knowledge of controls to work safely under Level 4 work. The next complexity of work is Level 3, or skill-of-the-craft (SOC) activities. Similar to Level 4 work, WRPS subject matter experts (SME) developed lists of approved activities that each craft may perform based on education or training specific to the craft. The work management website maintains a list of SOC activities. Level 3 work activities may have hazards that need additional analysis. A job hazard analysis (JHA) checklist assists the planning team with the analysis unless a standing JHA is available. TFC-OPS-MAINT-C-01 contains criteria for Level 3 and 4 work to ensure work packages are within their respective scope. TFC-OPS-MAINT-STD-03, *Tank Operations Contractor Skill of the Craft*, describes the process to change the activities listed on the SOC or the Level 4 activities table. These processes provide an efficient method to ensure WRPS identifies and analyzes all hazards for routine work prior to the start of work.

Level 1 or 2 are complex work packages. The activities within these work packages may be highly complex, have high hazard or consequences and likely involve using complex hazard controls. For Level 1 work packages, planning teams walk down the work to define the scope, develop the JHA, develop the work instructions, and verify workability. Level 2 work packages are approved procedures or previously approved work instructions and may only require field walkdowns of the work. If changes to work packages are required, the Level 2 will revert to a

Level 1 planning process. TFC-OPS-MAINT-C-01 contains criteria for Level 1 and 2 work to ensure work packages are within their respective scope and the required SMEs provide reviews. To assist in the development of work instructions or procedures for work packages, the planning team uses the JHA checklist per TFC-ESHQ-S_SAF-C-02, *Job Hazard Analysis*. The checklist has 30 required activities to review that are indigenous to WRPS, and there is room to add more activities. After the analysis of each activity, the planning team selects the control or adds additional comments in the control section. The JHA is comprehensive and covers the hazards unique to WRPS.

Permits listed on the JHA typically address particular types of hazards that must be controlled per specific standards. For example, radiological work requires a radiological work permit. Before the completion of a permit, health physicists and technicians use the ALARA Management Worksheet (AMW) to capture the radiological hazard analysis. The evaluation questions listed in Chapter 3 of HNF-5183, *Tank Farm Radiological Control Manual*, guide the AMW development.

The Team reviewed an AMW (AW-2592) for removing contaminated jumpers and working in the AX-104 tank farm pits. The analysis identified the radiological hazards in the pits as moderate risk and control recommendations included heavy sleeves, glovebags, or containment tents. The analysis also identified the contamination as "flighty" and recommended controls, such as fixative application, plugs for jumper ends, and long length tools to handle the plugs, to keep the contamination under control and limit the dose to workers. The AMW incorporates lessons learned from the analysis of related work.

In another work evolution in a tank farm pit, the handling of a flexible jumper caused contamination to rise from the pit and contaminate workers' clothing and skin. WRPS' ALARA review of the contamination concluded that workers did not apply enough fixative to one end of the jumper prior to repositioning it. Since then, AMWs reflect using copious amounts of fixative on both jumper ends and if possible, plugging both ends before repositioning the jumper. Results from the ongoing radiological monitoring of the work environment for contamination and workers' dose accumulation may change the initial AMW analysis. AMW revisions trigger updates to the work package and flow into new work instructions to provide the best protection to workers.

Another significant item on the JHA checklist is the hazard analysis for tank farm vapors. Industrial hygienists use the tank farm Chemical Exposure Hazard Analysis (CEHA) template from TFC-ESHQ-S_IH-C-48, *Managing Tank Chemical Vapors*, to evaluate the potential exposures from the proposed work and from the tank vapors that may be present at that farm. Based on the work performed at a tank farm, WRPS developed similar exposure groups (SEG) to associate the exposure data. The SEG definition revolves around the support for the SSTs and DSTs. Although both tank operations use four SEG definitions, the SEGs are completely different. The CEHA also recommends completing an IH sample plan as part of the analysis. The Team reviewed the sample plan for AX pit clean out (IHSP-RETR-AX-16R7). Much like the AMW, the sample plan undergoes revision as work conditions change, and this sample plan was in its seventh revision. The sample plan uses the tank vapor information sheet (TVIS) developed for a particular farm as the basis for potential exposures. This sample plan required sampling for chemicals listed on the AX farm TVIS, monitoring for noise hazards, confined

spaces, and beryllium. Once WRPS receives sampling data, it posts the IH exposure data on the Hanford Vapors Website to increase the sharing of information to the WRPS workers and other interested people.

WRPS IH implements the Hanford Site Chronic Beryllium Disease Prevention Program. The IH supporting the AX tank farm completed the Hanford Beryllium Hazard Assessment form analyzing the potential for exposure to beryllium. The beryllium assessment cites RPP-RPT-50833, *The Technical Basis for Beryllium Chemistry in Hanford Tank Waste*, which identifies the potential for beryllium in the tank waste. The analysis concludes that insufficient fixative could risk beryllium exposure and recommends controls to limit worker exposure to beryllium, along with IH monitoring. The analysis provides the information to complete the beryllium work permit with entry requirements, such as training and medical monitoring, postings, controls, and sampling requirements. Any sampling requirements are included in the IH sample plan; and in this case, the plan (IHSP-RETR-AX-16R7) calls for individual monitoring with air samples and swipe sampling 10 percent of the equipment that entered the beryllium-controlled area. As a result, WRPS identifies and controls beryllium activities.

Work packages may contain high risk or high impact activities. When these activities meet the requirements of TFC-OPS-MAINT-C-01, the Joint Review Group (JRG) schedules the work packages for review. JRGs exist for retrieval, production operations, Laboratory, and tank farms. The JRG is composed of a level 1 manager (chairman) and representatives from safety and health, radiological control, engineering, environment, and ESH&Q. The JRG ensures the work plan identifies all hazards, assesses personnel assigned to oversee the activities, and ensures work controls are comprehensive based on sound analysis. The fieldwork supervisor presents the work package and answers questions raised by the JRG. This additional level of management review ensures the right controls are in place and that any residual risk is acceptable.

In 2014, DOE-ORP in conjunction with WRPS requested the multi-disciplinary expertise of the Savannah River National Laboratory to assemble a Tank Vapor Assessment Team (TVAT) to complete a comprehensive analysis of the issues related to tank farm vapors and to make recommendations to protect the health of workers. Based on one of the TVAT recommendations, WRPS built two $ 250,000 apparatuses to sample the headspace from tanks and expose those vapors to air-purifying cartridges to determine if the cartridges can provide adequate protection from the tank vapors.

The first test occurred in the summer of 2016 when WRPS exposed the air-purifying cartridges to vapors from a static tank to simulate worst-case vapor concentrations for workers who may enter the tank farm to do "rounds" or minor maintenance. During the assessment, WRPS exposed another air-purifying cartridge to tank vapors while transferring waste between DSTs. This exposure simulates the vapors that may be present during transfers in the tank farms. A third party is independently reviewing the results to verify the conclusions from the data analysis. This effort to develop protection factors in the field is similar to testing performed by the Department of Labor's National Institute for Occupational Safety and Health for air-purifying cartridges. This sampling supports the effort to verify cartridge protection from tank vapors, which WRPS hopes will allow it to replace SCBAs with APRs.

In another effort to analyze the vapor hazards, WRPS contracted the RJ Lee Group to perform continuous sampling in the tank farm during waste transfers. RJ Lee Group is using state-of-the-art, proton-transfer-reaction-mass-spectrometry instrumentation in a mobile van to perform real-time analysis. This instrument can detect parts per trillion concentrations of most chemicals identified in tank vapors. The van can move all around the tank farm perimeter to sample for potential vapors and can respond to and analyze odors detected by workers. Since the completion of the TVAT report, there have been multiple assessments that address the status of corrective actions and make additional recommendations. ORP and WRPS are cooperating to develop a single integrated action plan to address the actions from all the reviews. The Comprehensive Vapors Action Plan will form the basis for future actions related to protecting workers and the environment from vapor exposures.

Performing maintenance on the high efficiency particulate air (HEPA) filter for the SST's passive ventilation system has been a recurring, historical problem. One design, the G-1 filter housing, had a well next to the filter that filled with condensate and rainwater, eventually saturating the filter. Another design, the Type 2, had issues with condensation and sand or dirt, which clogged the filter. To improve the passive filtration, WRPS tested a radial HEPA filter protected by a weather cap. The radial filter system's improved design reduces the potential for filter degradation due to dirt and condensation. When testing in 2007 proved that the radial filters maintained their efficiency after being in the field for 1 year, WRPS initiated a campaign to replace the old filter types.

After replacing the filters, maintenance workers began identifying performance issues with the radial filters. During the assessment, the Team found seven PER complaints about the radial filters. Maintenance workers voiced concerns that the radial filters are not effective. The workers have replaced filters they believe were saturated or clogged that may have increased fugitive tank emissions at the tank farms. Some workers continued to believe that the former filtration system was a better system. The Team met with the project engineers who designed the radial filter system and relayed some of the workers' concerns. To foster better communication, WRPS should consider asking the CVST to consider this concern using a teaming approach, including SMEs, engineers, and craft workers involved in the maintenance and installation of the radial filters, to achieve a better understanding by all personnel of the competing considerations.

Opportunity for Improvement: WRPS should consider asking the CVST to consider workers' concern about the radial filters on tank breathers and using a teaming approach, including SMEs, engineers, and craft workers involved in the maintenance and installation of the radial filters, to achieve a better understanding by all personnel of the competing considerations.

There are many construction projects occurring at WRPS, including removal of legacy equipment or contamination, tank modification to install ventilation systems and waste pumping equipment, and electrical line installation to power that equipment. WRPS has subcontracted with American Electric to manage this work, which is performed by Building Trades workers. The American Electric safety professional conducts weekly inspections of facilities; however, American Electric is not inspecting all construction activities weekly per DOE-VPP

expectations. At the AX farm, the safety professional was using the work observation scaffold to inspect work activities, but WRPS dismantled the scaffold after finding contamination on a worker from a nearby pit. The loss of the scaffold hampers the observation of work activity since WRPS places tall barriers around work areas for radiological contamination control. WRPS should work with American Electric to determine a means of documenting weekly inspections of construction areas that balances the purpose of the inspections with the ALARA concerns related to working in contaminated areas with full respiratory protection.

Opportunity for Improvement: WRPS should work with American Electric to determine a means of documenting weekly inspections of construction areas that balances the purpose of the inspections with the ALARA concerns related to working in contaminated areas with full respiratory protection.

WRPS trends many lagging indicators, such as TRC, DART, first aids, vehicle safety, and leading indicators, such as EAPC facility inspections and stop-work reports. They also provide a monthly self-assessment to DOE-ORP of the safety and health program by using a stoplight indicator of the success of program goals.

WRPS workers actively participate in accident and incident investigations. WRPS increased the number of trained, nonexempt accident investigators to 19 in order to support the increased occurrence of reported vapor exposures. WRPS thoroughly investigates each exposure event and documents the results. Investigation reports contained many pictures to document the event and convey the conditions at the time of the event.

Conclusion

WRPS faces many challenging hazards that it continues to analyze so it can develop control strategies and protect workers, the public, and the environment. The work control process integrates the radiological, IH, and industrial safety analyses results into work instructions, procedures, and training. WRPS is using recommendations from multiple sources and researching cutting edge monitoring and detection technologies to further characterize, control, and prevent tank vapor exposures. The improved use of scientific methods and field equipment is raising confidence among the safety and health community and workers that solutions are credible. WRPS meets the overall DOE-VPP expectations for Worksite Analysis.

VI. HAZARD PREVENTION AND CONTROL

The second and third core functions of ISMS, identify and implement controls and perform work in accordance with controls, ensure that once hazards have been identified and analyzed they are eliminated (by substitution or changing work methods) or addressed by the implementation of controls (engineered controls, administrative controls, or PPE). Equipment maintenance processes to ensure compliance with requirements and emergency preparedness must also be implemented where necessary. Safety rules and work procedures must be developed, communicated, and understood by supervisors and employees. These rules and procedures must also be followed by everyone in the workplace to prevent, control the frequency of, and reduce the severity of mishaps.

During the 2014 assessment, the Team determined that WRPS used the hierarchy of controls to reduce worker exposures. The use of engineered controls and improvements in administrative controls and the expanded use of sensors and wireless systems eliminated or reduced worker time in hazardous environments. WRPS' support of the IH department with resources had improved response time to vapor exposures and its characterization, a prevalent issue in the management of the tank farms.

These controls, along with other new controls, are still in use and continue to provide protection to workers. Tank vapors continue to be a primary concern, especially among workers. To control hazards and protect workers, it is necessary to understand the exposure potential and exposure magnitude. WRPS employs a variety of methods to measure and quantify tank vapors to determine potential exposures and to determine the best method to protect workers.

The most significant exposure concern for workers continues to be vapor emissions from waste tanks. For many years, third party assessments, workers and public stakeholders have recommended DOE identify and implement engineered controls for these vapors. DOE has invested in some engineered controls, primarily in DST farms. Engineered controls, used with varying levels of success, include vapor exhaust stack extensions with external rifling fins to increase vapor dilution and sampling ports for real-time vapor monitoring; vapor monitoring and detection systems (VMDS); carbon adsorption filtration using activated C-103 Carbtrol™; and radial HEPA and high efficiency gas adsorber filtration. WRPS is continuing its efforts to control or eliminate tank emissions through engineered controls (filtering). WRPS continues to make and use specialty long-reach tools to reduce exposure to tank vapor and radiation. Long-reach tools keep workers further from hazards when moving jumper piping or manipulating valves. Many tanks remain that have only passive ventilation systems. DOE's priority has been removing waste from these tanks rather than investing in engineered controls. Consequently, WRPS must rely heavily on the use of administrative controls and PPE, particularly respiratory protection, as a primary means of preventing worker exposures.

WRPS uses DOE-0352, *Hanford Site Respiratory Protection Program,* as its guiding procedure for respirator use. Until recently, WRPS used powered air-purifying respirators and APR as a primary means of worker protection, depending of the type of work and proximity to expected higher tank vapor concentrations. However, a recent stop work demand by HAMTC resulted in an agreement to make the use of SCBAs mandatory for all workers doing work in the tank farms. SCBAs reduce visibility, hamper communication and subject the wearer to stress from carrying an additional 25 pounds of equipment. Consequently, WRPS has recently endeavored, with

cooperation from HAMTC and independent verification, to determine if other respiratory equipment, such as PAPRs can provide an adequate level of protection to workers and eliminate the mandatory use of SCBAs. WRPS was testing chemical filter cartridges during the assessment (see Worksite Analysis). This conservative approach, intended to determine the effectiveness of APR cartridges (versus SCBA) for worker protection, used undiluted tank headspace vapors to challenge the filters. Team interviews and observations identified many workers and supervisors who are concerned about use of SCBAs for all work because it exposes workers to additional hazards, including added stress from weight and bulkiness of SCBAs. WRPS should continue its efforts to find engineered solutions to control tank vapor to eliminate or reduce the need for SCBAs.

Opportunity for Improvement: WRPS should continue its efforts to find engineered solutions to control tank vapor to eliminate or reduce the need for SCBAs.

In 2014, WRPS commissioned an independent TVAT led by the Savannah River National Laboratory to evaluate the adequacy of the protective measures used by WRPS. The TVAT published its findings and recommendations in an October 2014 report, SRNL-RP-2014-00791, *Hanford Tank Vapor Assessment Report* (see Worksite Analysis).

In response to the TVAT report, WRPS created the CVST (see Employee Involvement) and developed an implementation plan to prevent or control exposure to tank vapors. Actions from the implementation plan that address hazard prevention and control include:

- Reduce the impacts of bolus exposures, utilize real-time personal detection and protective equipment technologies designed to protect employees;
- Accelerate implementation of tailored engineering technologies to detect and control vapor emissions and exposures experienced in the Hanford tank farms ("tank farm of the future"); and
- Investigate and pursue external research opportunities and partnerships to address data and technology gaps related to vapor exposure, effects, and mitigation.

Interviews and observations found that WRPS is using a combination of personnel breathing zone monitoring and area monitoring, both passive and active, to characterize tank vapor releases. SUMMA vacuum canisters, both personal and large area size, are in use to attempt to obtain "immediate" samples when workers encounter vapors or odors. In addition, WRPS has an ongoing program to evaluate the hazards from tank vapor using data from an installed VMDS. All these data and other information gathered from personnel's lapel breathing zone and general area monitoring conducted by WRPS industrial hygienists are being used to determine the right level or type of protection for tank farm workers. Previously, industrial hygienists needed to enter the tank farm to collect data. The VMDS reduces potential exposures to industrial hygienists by allowing real-time remote data collection without additional tank farm entries.

WRPS won the Campbell Institute's 2017 Innovation Challenge for its Physiological Monitoring Program. In 2015, workers, industrial hygienists, WRPS managers, and commercial vendors teamed to employ and adapt wearable technology to monitor worker's physical conditions while exposed to heat stress. Summer work, when temperatures average above 90 degrees Fahrenheit,

combined with anticontamination clothing and SCBAs, subjected workers to a significant risk of heat stress. WRPS, working with commercial vendors, developed chest-mounted equipment with the capability to transmit workers' vital medical measurements (heart rate, skin temperature) in real time to trained technicians to detect and avoid impending heat stress.

WRPS also won the 2016 Voluntary Protection Programs Participants Association Innovation Award. WRPS electricians identified a vulnerability associated with arc-flash protection while wearing respirators. Electricians often work in contaminated areas that require the use of respiratory protection. The same electrical work performed in non-contaminated work areas requires an arc flash rated faceshield in accordance with National Fire Protection Association Standard 70E, *Standard for Electrical Safety in the Workplace*. The electricians questioned the protective properties of a fullface respirator and its ability to provide adequate arc flash protection. Research and testing found that the fullface respirators would not provide an adequate level of protection and that no commercially available arc flash rated faceshield was available that could be worn over fullface respirators. A collaborative effort among electricians, WRPS safety professionals, managers, DOE, and commercial vendors developed a faceshield that provides the needed protection and fits over a fullface respirator. The vendor now markets the faceshield commercially, providing protection to workers in similar situations outside of the Hanford Site.

WRPS uses PERs to collect information that includes employee concerns, nonconforming equipment, and workplace hazards. Several workers interviewed indicated that they had initiated a PER about a concern or workplace hazard, only to find some time later that the PER had been closed without addressing the concern or hazard. When asked, WRPS managers agreed that this occurs, but explained that many times the PER is closed when a maintenance work order is written to address the PER concern. Once the PER is in the maintenance work order system, WRPS evaluates the concern or condition and typically assigns a low priority unless cited as a "safety" concern within the work order system. Consequently, WRPS may not address the concern or condition in some cases, and does not communicate the reason for nonresolution to the worker. WRPS should increase its efforts to provide feedback on the status of workers' concerns, especially when the work to resolve the concern or unsatisfactory condition is a low priority.

Opportunity for Improvement: WRPS should increase its efforts to provide feedback on the status of workers' concerns, especially when the work to resolve the concern or unsatisfactory condition is a low priority.

Workers do not always use the PER system to raise issues or concerns, and this sometimes leads to workers' frustration that issues are not quickly or effectively addressed. For example, during walkdowns of ETF, workers were eager to point out facility conditions that were inconsistent with WRPS' stated desires regarding equipment condition and maintenance. In one case, a caustic addition system used for pH correction of water entering the system had evidence on nearly every flanged joint of slow leaks and weeping of caustic from the system. The flanges had a buildup of caustic salts that resulted from the evaporation of water. ETF personnel had marked the area around the caustic addition system with caution tape to warn workers. These caustic salts present a dermal hazard to workers if they come in direct contact with the material. Although WRPS has spent significant resources restoring ETF, it has not repaired the caustic

addition system to eliminate the caustic leaks, and workers were unaware of any work requests for repairs. In another case at ETF, there is a wire strung between two stations as part of an alignment tool for equipment. Workers have not used the tool for several years, and managers did not expect workers to use the tool again. At least one worker was concerned the wire posed a hazard if a worker fell near the wire. Managers at the facility were unaware of the worker's concern. In both cases, greater manager presence in the work area would have provided workers with an opportunity to raise their concerns to managers rather than waiting for the Team to arrive and perform a walkdown (See Management Leadership).

WRPS has well-documented emergency procedures: DOE Order 151.1C, *Comprehensive Emergency Management System*; Contractor Requirements Document; DOE-Richland Operations Office (RL) DOE/RL-94-02, *Hanford Emergency Management Plan*; and DOE-0223, *Emergency Plan Implementing Procedures* (prefixed as 'RLEP,' for RL Emergency Procedure); to establish the emergency preparedness requirements for the Hanford Site. WRPS regularly conducts coordinated drills that involve WRPS employees and other contractors at the Hanford Site. Mission Support Alliance, LLC (MSA), as the site-infrastructure support contractor, provides fire department operations and ambulance service to the entire Hanford Site. Interviews with the WRPS Emergency Preparedness Program Manager found that emergency preparedness has been operating effectively for at least the last 12 months. WRPS provided several examples of continuous program improvement. For instance, a building landlord attempted to shut down building ventilation due to an announced site chlorine leak and mistakenly cut the power to an entire building. The Emergency Preparedness Program Manager took steps to provide separate ventilation shutdown buttons and additional training for building landlords and area wardens. In addition, WRPS provided all occupied buildings with an emergency preparedness bulletin board that provides key information to building occupants. Every board includes contact information for building landlords and area wardens, emergency numbers, evacuation routes and the location of assembly areas, a list of building hazards, and the location of utility disconnects.

In accordance with 10 CFR 851, HPMC provides medical services for WRPS. HPMC conducts initial and annual workers' medical surveillance (physicals) for all site workers, including WRPS. HPMC only provides first-aid medical service and initial emergency care while Kadlec Regional Medical Center provides a higher level of medical care. Because of the organizational/company boundaries between WRPS and the occupational medicine service provider, the WRPS case manager expressed a concern to the Team that there are occasions when information necessary to determine injury and illness recordability is difficult to obtain. The Team reviewed one case involving a bee sting, and a subsequent epinephrine injection that WRPS had classified as a first-aid case because WRPS did not have the relevant medical treatment information. Further review by WRPS at the Team's request revealed the case was a recordable injury. The Team did not conduct a complete injury and illness recordkeeping review to evaluate the adequacy of medical treatment information flow across company boundaries, and the Team has seen similar problems with the other Hanford Site contractors. WRPS should consider teaming with the other site contractors, the Hanford occupational medicine providers (HPMC and Kadlec), and DOE-RL to ensure all the Hanford Site contractors have access to the information they need to make timely and accurate injury and illness recordkeeping decisions in accordance with 29 CFR 1904.

Opportunity for Improvement: WRPS should consider teaming with the other site contractors, the Hanford occupational medicine providers (HPMC and Kadlec), and DOE-RL to ensure all the Hanford Site contractors have access to the information they need to make timely and accurate injury and illness recordkeeping decisions in accordance with 29 CFR 1904.

Walkdowns of craft maintenance shops found acceptable housekeeping. The Team identified two instances, the insulator shop and the general maintenance shop in 222-S Laboratory, where workers are using maintenance shops as break rooms. Workers had left open drink cups, food, and other consumables on workbenches, worktables, and equipment creating a risk of contamination by insulation, metal filings, dust, or other workplace hazards. In the 222-S Laboratory, a break room was nearby. WRPS industrial hygienists should inspect maintenance crafts shops for good hygiene practices to reduce the risk of cross contamination that could result from consuming food in maintenance workspaces.

Opportunity for Improvement: WRPS industrial hygienists should inspect maintenance crafts shops for good hygiene practices to reduce the risk of cross contamination that could result from consuming food in maintenance workspaces.

WRPS has sufficient certified professional on staff to support operations. The friction between industrial hygienists and radiation protection personnel identified on the previous onsite assessment has been resolved. WRPS workers interviewed indicated that discipline is both fair and consistent.

Conclusion

WRPS implements the hierarchy of controls to control worker exposures with the first choice being elimination or engineered controls to reduce or control worker hazards. Despite this preference, DOE investment in engineered controls has been limited, necessitating extensive reliance on PPE and administrative controls. Collaboration among workers and managers has resulted in innovative hazard prevention and control approaches. Certified safety and health professionals are available to identify hazards and recommend controls. WRPS meets the Hazard Prevention and Control expectations for continued participation in DOE-VPP.

VII. SAFETY AND HEALTH TRAINING

Managers, supervisors, and employees must know and understand the policies, rules, and procedures that prevent or reduce exposure to hazards. Training for health and safety must ensure that responsibilities are understood, personnel recognize hazards they may encounter, and they are capable of acting in accordance with managers' expectations and approved procedures.

The 2014 assessment determined that WRPS continued to maintain a training program that ensured trained and qualified workers could perform their job functions safely. WRPS focused on the availability of trained and qualified workers at the job site. WRPS augmented the site-wide training at the Volpentest Hazardous Material Management and Emergency Response Training Center (HAMMER) facility with site-specific training to meet the unique demands of work at the tank farms. WRPS supported and encouraged employees to seek additional safety expertise through the Board of Certified Safety Professionals' Safety Trained Supervisor certification program.

WRPS and the Hanford Site continue to use the Enterprise Learning Management (ELM) system. ELM tracks employees' training, schedules training, and rolls up training metrics for the training organization to manage. MSA maintains and manages the site ELM system and HAMMER and coordinates with other site contractors to meet their training needs. A Hanford site-wide training committee monitors the ELM system and makes recommendations for updating and revising the system to meet contractor needs. The site-wide training committee consists of representatives from each of the Hanford Site contractors. The committee provides suggestions to MSA, and MSA revises the system as necessary

WRPS is able to tailor its training needs through ELM by customizing the reports requested from the system. WRPS uses customized reports from ELM to project its training requirements for the next 30, 60, and 90 days. These reports allow managers and supervisors to coordinate work assignments while maintaining worker qualifications. The system provides the reports electronically through a website that supervisors and managers can access at their convenience.

Prior to performing work, WRPS requires managers, technicians, operators, instructional staff, maintenance and craft, and scientific staff to meet qualifications established by the company. The training organization ensures that employees' training fulfills the training needed to meet and maintain those qualifications. Procedure, TFC-BSM-TQ_ADD-C-01, REV H-2, *Conduct of Training Administration*, guides the WRPS process to train the workforce to work effectively and safely. The procedure defines how the training organization determines if new training or changes to existing training are necessary. The procedure then defines how the training organization designs, develops, delivers, and evaluates the training product(s).

WRPS develops an employee job task analysis (EJTA) for each new employee or new job assignment. The EJTA defines physical and medical examination requirements, any medical baseline testing, and the employee's training requirements based on expected work tasks and hazards. After the employee satisfies the physical requirements, he or she meets with their supervisor to discuss training requirements. Every new employee receives Hanford General Employee Training, ISMS training, and depending on job classification, training on beryllium, radiological hazards, ladders, and heat stress. Individuals receive additional job-specific training based on their job tasks, such as hazardous energy control (lockout/tagout) or confined space

training. FLMs and FLS' validate qualifications and training using the Hanford Site Worker Eligibility Tool (HSWET) daily prior to assigning work to an employee. Employee training and qualifications recorded in HSWET include respirator qualifications, physical examinations, hazardous waste operations and emergency response (HAZWOPER) training, beryllium worker training, and radiological worker training.

WRPS employees receive training on site-wide programs from the HAMMER Training Center. This training includes lockout/tagout, confined space entry, beryllium awareness, lead awareness, electrical safety, radiation worker, and HAZWOPER. WRPS trainers provide facility-specific training. Examples of facility-specific training may include facility emergency response, facility-specific criticality requirements, documented safety analysis and technical safety requirements, or facility-specific equipment operation and limitations.

The WRPS training group is implementing the S.T.A.R.T. ™ training program developed by the Caterpillar Safety Center and licensed by AECOM corporate. The training focuses on providing supervisors with tools to set clear safety expectations, train and coach workers, identify and investigate near misses and positive safety behaviors, understand their role in recognizing safety as a core value, and demonstrate those values through word and deed. The training also encourages supervisors and employees to "own" safety, look out for one another, and establish a "culture of caring." WRPS has established the S.T.A.R.T. ™ training curriculum plans with classes beginning the end of February 2017.

Based on the recent history of accelerated hiring of industrial hygiene technicians (IHT) and a recommendation from the Hanford Tank Vapor Assessment Report, WRPS reintroduced a mentoring program for newly hired IHTs. While WRPS has a comprehensive training curriculum for newly hired IHTs, including formalized classroom training and a program-specific qualification card, WRPS designed the IHT mentoring program to ensure newly hired IHTs have the requisite proficiency in the use of analytical equipment required to perform their duties. The IHT mentoring program pairs experienced IH leads with newly hired IHTs to ensure the newly hired IHTs can demonstrate proficiency using the analytical equipment in real work situations. For example, one IH lead/mentor identified his personal concern that sampling methods and analysis techniques are different for SSTs versus DSTs. Proficiency and experience by IHTs on one did not transfer to the other. He believed that the mentoring helped ensure new IHTs demonstrated proficiency before performing the sampling and analysis on their own. WRPS expects the mentors to phase the newly hired IHTs into their duties under direct supervision until they demonstrate proficiency. However, the WRPS IHT mentoring program lacks direction or guidance related to the mentor/mentee roles, responsibilities, or program goals. WRPS should consider developing a guidance document that describes the IHT mentor/mentee roles and responsibilities for the successful achievement of the program goals.

Opportunity for Improvement: WRPS should consider developing a guidance document that describes the IHT mentor/mentee roles and responsibilities for the successful achievement of the program goals.

Conclusion

WRPS continues to maintain a training program that ensures trained and qualified workers can perform their job functions safely. WRPS requires managers, technicians, operators, instructional staff, maintenance and craft, and scientific staff to meet qualifications established by the company. The training organization ensures that employees' training fulfills the training needed to meet and maintain those qualifications. The WRPS augments the site-wide training at the HAMMER facility with site-specific training to meet the unique demands of work at the tank farms. WRPS initiated a mentoring program to ensure that newly hired IHTs have the requisite proficiency in the use of analytical equipment. However, the WRPS IHT mentoring program lacks direction or guidance related to the mentor/mentee roles, responsibilities, or program goals. WRPS should consider developing a guidance document that describes the IHT mentor/mentee roles and responsibilities for the successful achievement of the program goals. WRPS meets the Safety and Health Training expectations for continued participation in DOE-VPP.

VIII. CONCLUSIONS

Since 2014, WRPS has continued to deal with challenges to worker, public, and environmental safety presented by the waste it manages. Ongoing worker concerns about vapor exposures, differing public perceptions, and the threat posed by degrading tank conditions became foremost when WRPS identified a leak into the annulus of a DST. WRPS used its expertise and worker input to solve the problem in a timely manner. WRPS is also dealing with long-term trust and communication issues with some workers. Many of these issues stem from differing perceptions of the hazards among workers. While some workers are extremely concerned about the hazards posed by tank vapors, many others are not and they believe the use of SCBA for respiratory protection presents more hazards to the workers than the tank vapors. WRPS is trying to resolve this issue using state-of-the-art vapor detection technology, real-time meteorological data, and plume modeling to better understand the locations and mechanisms for vapor exposures. It is also working with the unions to obtain valid test data for other protection methods, primarily APRs, to determine if those methods will protect workers from vapor exposures. Overall, WRPS has a culture that values worker safety and health and encourages workers to raise issues and contribute to issue resolution. The Team recommends that WRPS continue participation in DOE-VPP as a Star site.

Appendix A: Onsite VPP Assessment Team Roster

Management

Matthew B. Moury
Associate Under Secretary for
Environment, Health, Safety and Security

Andrew C. Lawrence
Deputy Associate Under Secretary for
Environment, Health and Safety

Patricia R. Worthington, PhD
Director
Office of Health and Safety
Office of Environment, Health, Safety and Security

Bradley K. Davy
Director
Office of Worker Safety and Health Assistance
Office of Health and Safety

Review Team

Name	Affiliation/Phone	Project/Review Element
Bradley K. Davy	DOE/AU (301) 903-2473	Team Lead, Management Leadership
Michael S. Gilroy	DOE/AU	Employee Involvement, Safety and Health Training
Saprena Lyons	Fluor Idaho Cleanup, LLC/Idaho National Laboratory	Employee Involvement
Brian A. Blazicko	DOE/AU	Worksite Analysis
Richard C. Caummisar	DOE/AU	Hazard Prevention and Control
Jeremy Davis	DOE/Portsmouth Paducah Project Office	Observer