Office of Enterprise Assessments
Targeted Assessment of the Double Shell Tank Ventilation Systems at the Hanford Site Tank Farms

September 2016

Office of Nuclear Safety and Environmental Assessments
Office of Environment, Safety and Health Assessments
Office of Enterprise Assessments
U.S. Department of Energy

Table of Contents

Acronyms

AE	Architect-Engineer
AOP	Abnormal Operating Procedure
CAS	Contractor Assurance System
CFR	Code of Federal Regulations
CM	Corrective Maintenance
CSE	Cognizant System Engineer
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
DST	Double Shell Tank
EA	Office of Enterprise Assessments
ECN	Engineering Change Notices
EIR	Event Investigation Report
ESRB	Executive Safety Review Board
ETF	Effluent Treatment Facility
FR	Facility Representative
FY	Fiscal Year
HEPA	High Efficiency Particulate Air
HOLD	Hold Point
IDMS	Integrated Document Management System
LCO	Limiting Condition for Operation
MOP	Management Oversight Program
MT	Modification Traveler
M&TE	Measuring and Test Equipment
NCO	Nuclear Chemical Operator
NMMP	Nuclear Maintenance Management Program
OFI	Opportunity for Improvement
ORP	Office of River Protection
ORPS	Occurrence Reporting and Processing System
PER	Problem Evaluation Report
PM	Preventive Maintenance
SAC	Specific Administrative Control
S/CI	Suspect/Counterfeit Items
SDD	System Design Description
SMP	Safety Management Program
SPF	SmartPlant Foundation
SS	Safety Significant
SSC	Structures, Systems, and Components
SSO	Safety System Oversight
SST	Single Shell Tank
TBD	To Be Determined
TSR	Technical Safety Requirement
WRPS	Washington River Protection Solutions, LLC

Office of Enterprise Assessments
Targeted Assessment of the Double Shell Tank Ventilation Systems
at the Hanford Site Tank Farms

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted a targeted assessment of the effectiveness of management of the safety-significant double shell tank ventilation systems at the Hanford Site Tank Farms. This assessment was conducted within the broader context of a series of targeted assessments of management of safety class or safety-significant structures, systems, and components at DOE sites. The assessment evaluated conduct of operations, configuration management, maintenance, surveillance testing, and compliance with Specific Administrative Controls for flammable gas monitoring. EA also assessed the Washington River Protection Solutions, LLC (WRPS) and DOE Office of River Protection (ORP) feedback and improvement programs.

Overall, WRPS has implemented the programs and processes necessary for effective management of the safety-significant double shell tanks ventilation systems at the Hanford Site Tank Farms. Engineering and configuration control processes and related documentation were satisfactory, and the Cognizant System Engineer program at the Tank Farm generally meets the requirements of DOE Order 420.1B, *Facility Safety*. For the most part, Tank Farms operations personnel are adequately trained to perform specific and routine tasks and generally conduct operations in a manner ensuring that the selected safety systems can reliably perform intended safety functions when required. Procedures are technically adequate to achieve required system alignment and performance. Surveillance and testing activities were properly performed, and WRPS has adequately translated the technical safety requirements into useable procedures and programs. WRPS has also established and implemented the elements of an appropriate assurance system supporting management of Tank Farms safety systems. Managers and subject matter experts are capable, proactive, and focused on effective performance and continuous improvement.

As part of the contractor assurance system, WRPS established a Collective Significance Review committee, with meetings held monthly to identify trends or other indications requiring monitoring or action to ensure the long-term, continued improvement in operations. Overall, the outputs of the committee in the form of additional investigations into trends, concerns, and issues provide a good level of assurance that performance indicators and the collective experience base can identify and affect improvement in operational performance. EA considers the Collective Significance Review process a best practice.

Although overall WRPS performance was satisfactory, EA identified two specific findings requiring management attention to ensure that management of Tank Farms safety systems is fully effective. First, operator training does not ensure that the Tank Farms operators achieve and maintain adequate knowledge of the purpose and function of safety systems and components. Second, WRPS is stretching the technical safety requirements surveillance periods by serial use of the 25 percent surveillance grace period, thereby not meeting the intent of the periodicity requirements established by the safety basis. EA also identified several deficiencies with WRPS performance not rising individually or collectively to the level of a finding. Deficiencies included poor communication between surveillance testing personnel and operations personnel with regard to degraded conditions of instruments under technical safety requirements, inadequate requirements for control of interrelated processes, deficient maintenance performance measures, errors in completed work packages, and lack of documentation of material conditions in annual safety system assessments.

ORP has established and implemented effective programs and processes for conducting contractor oversight. Programs and processes, as well as internal feedback and improvement systems, are effective. ORP has also established appropriate and measurable performance-based incentives related to nuclear safety. With the exception of ORP not conducting triennial assessments of the contractor training program as required by DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, safety system management oversight is effective. Feedback and improvement processes within ORP are effective in addressing and preventing the recurrence of safety system issues.

Office of Enterprise Assessments
Targeted Assessment of the Double Shell Tank Ventilation Systems
at the Hanford Site Tank Farms

1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted a targeted assessment of the effectiveness of management of the safety-significant double shell tank (DST) ventilation systems at the Hanford Site (Hanford) Tank Farms. This assessment was conducted within the broader context of a series of targeted assessments of management of safety class or safety-significant structures, systems, and components (SSCs) at DOE sites.

2.0 SCOPE

This assessment evaluated conduct of operations, configuration management, maintenance, and surveillance testing of the safety-significant DST ventilation systems at the Hanford Tank Farms. EA also evaluated compliance with Specific Administrative Controls (SACs) for flammable gas monitoring of both double shell and single shell tanks and the contractor and DOE Office of River Protection (ORP) feedback and improvement programs.

3.0 BACKGROUND

ORP was established in 1998 to manage the 56 million gallons of liquid or semi-solid radioactive and chemical waste stored in 177 underground tanks at the Hanford Site. ORP serves as DOE line management for the Tank Farms, which maintain the underground storage tanks, and the Waste Treatment and Immobilization Plant, which is under construction and will be used for retrieval and treatment of the waste stored in the underground tanks. The Tank Farms are managed and operated by Washington River Protection Solutions, LLC (WRPS) under contract to ORP. The ORP Tank Operations Division provides Tank Farms oversight.

In the EA Operational Plan for Fiscal Year (FY) 2016, approved September 29, 2015, “Assess nuclear safety management program [SMP] implementation," was identified as an Office of Environment, Safety and Health Assessments priority. Review of the Hanford Tank Farms ventilation systems was included on the final FY 2016 combined schedule of the Office of Nuclear Safety and Environmental Assessments.

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms “deficiencies, findings, and opportunities for improvement (OFIs)” as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also

highlighted in the report and summarized in Appendix C. These deficiencies should be addressed consistent with site-specific issues management procedures.

EA used the following sections of CRAD 31-15, *Safety System Management*:

- SS.1: SS.1: Engineering design documents and analyses are technically adequate and implement the requirements of the documented safety analysis (DSA) such that adequate protection of the public, the workers, and the environment from facility hazards is demonstrated.

- SS.2: Quality assurance practices and processes are implemented in a manner that ensures safety systems will conform to required standards and perform as designed.

- SS.3: Configuration management programs and processes are adequate to ensure that safety systems continue to meet safety basis requirements and changes are properly controlled.

- SS.4: Maintenance activities are properly planned, scheduled, and performed to ensure that safety systems can reliably perform intended safety functions when required.

- SS.5: Surveillance and testing activities are properly performed in accordance with technical safety requirement (TSR) surveillance requirements and SACs.

- SS.6: Operations are conducted in a manner that ensures the safety systems are available to perform intended safety functions when required.

- SS.7: Cognizant System Engineer (CSE) Program implementation is effective in ensuring safety systems can reliably perform as intended.

- SS.8: Federal Safety System Oversight (SSO) Programs are established and effective in ensuring safety systems can reliably perform as intended.

- SS.9: Safety System Feedback and Improvement processes are effective in addressing and preventing the recurrence of safety system issues.

EA examined key documents, such as system descriptions, work packages, procedures, manuals, analyses, policies, training and qualification records, and numerous other documents. EA also conducted interviews of key personnel responsible for developing and executing the associated programs; observed daily tank operations, surveillance testing, and maintenance activities; and walked down significant portions of selected tank farm ventilation systems. The members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. A detailed list of the documents reviewed, personnel interviewed, and observations made during this assessment, relevant to the findings and conclusions of this report, is provided in Appendix B.

EA conducted a previous assessment of the Hanford Tank Farms ventilation systems in April 2013, and this 2016 assessment examined the completion and effectiveness of corrective actions from the findings described in the previous assessment. Results of the corrective action assessments are included in Section 5.10 of this report.

5.0 RESULTS

5.1 Engineering Design Documents

Criterion:

Engineering design documents and analyses are technically adequate and implement the requirements of the DSA such that adequate protection of the public, the workers, and the environment from facility hazards is demonstrated. (10CFR830.122 and DOE-STD-3009-1994 CN 3)

EA reviewed pertinent sections of the DSA, RPP-13033 revision 6, to identify performance requirements for the DST ventilation systems. That information was then used to support reviews of engineering procedures and processes, followed by reviews of engineering deliverables and interviews with key engineering personnel. EA also performed a walk down on DST AW-101, witnessed a demonstration of the monitoring process for flammable gas concentration in the tank headspace, and discussed system operation with the assigned CSEs. The discussion below summarizes the results for those areas.

Procedure and Process Reviews

TFC-ENG-DESIGN-C-10, *Engineering Calculations*, contains a well-designed process for developing, approving, and issuing calculations using the document processing capabilities of SmartPlant Foundation (SPF), a commercial information management software system. Embedded forms are used to ensure key information is provided in most areas. The procedure contains requirements for documenting assumptions with technical justification and addresses unverified assumptions in the Definition Section, where it states that unverified assumptions must be tracked. Attachment A repeats this requirement and states that unverified assumptions must be verified prior to using the calculation results operationally. Attachment A references TFC-ENG-DESIGN-C-25, *Technical Document Control*, for handling of unverified assumptions using the To Be Determined (TBD) process in SPF. Additional guidance in this area is also contained in TFC-ENG-DESIGN-D-06.1, *Engineering Change Control Guidance*.

An interview with a group lead in the Design Engineering organization included a demonstration of the SPF TBD process. This demonstration showed that SPF is used to assign numerically identified TBDs and hold points (HOLDs) in calculations and other technical documents. The TBD and HOLD designations are used somewhat interchangeably. EA noted one HOLD in calculation RPP-CALC-47336. A search of that calculation HOLD in SPF indicated the words “de-entrainer design unknown.” Only the HOLD number was put into the calculation, with no explanation as to the nature of the HOLD. A person other than the original preparer was responsible for revising the calculation to get rid of the HOLD, which was actually concerned with the physical configuration of the duct connecting to the de-entrainer. Fortunately, the original preparer was still available to explain the nature of the HOLD. No unverified assumption was noted in the Assumptions section of the calculation. Only the HOLD number was listed on the coversheet. A similar condition was found in calculation RPP-CALC-49417. This method of tracking open issues in technical documents, while compliant with procedural requirements, is overly reliant on the knowledge of individual contributors and does not provide adequate information within the document to support efficient closure at some later date.

TFC-ENG-DESIGN-P-07, *System Design Descriptions*, uses DOE STD-3024-1998, *Content of System Design Descriptions*, for system design description (SDD) formatting and content, although a new version of STD-3024 was issued in 2011. Changes between those versions were not substantial. Based on the content requirements established in TFC-ENG-DESIGN-P-07, SDDs for safety related systems are required to contain comprehensive discussions of system configuration and performance requirements. SDDs are also required to contain vendor information references.

TFC-ENG-DESIGN-C-52, *Technical Reviews*, defines the various types of reviews performed on engineering products and reflects the complex WRPS organizational structure, with project engineering separate from design engineering, and most design work going to outside architect-engineer (AE) firms. TFC-ENG-DESIGN-C-52 defines review requirements based on the entity performing the work, whether or not technical baseline documents are revised, and the safety significance of the change. Checklists are included to drive appropriate considerations for various types of documents and ensure an adequately rigorous review process. The measures included were adequate for the intended purposes.

The other engineering procedures referenced in Appendix B were adequate in establishing appropriate requirements and well-developed processes to control the activities covered. Overall, the engineering processes reviewed had well-defined procedures, providing clear guidance and frequent cross-references. The SPF document development and routing process provides additional strength by prompting reviews and ensuring a rigorous comment resolution process.

The engineering design change process is discussed in Section 5.2, Configuration Management.

Engineering Deliverable Reviews

EA reviewed RPP-15121, *System Design Description for AW Tank Farm Ventilation Tank Primary System*, and found it compliant with DOE-STD-3024-2011, *Content of System Design Descriptions*. SDDs for the Tank Farms are not part of the safety basis or design basis, but are used as information collectors and are updated when new information becomes available. RPP-15121 proved to be a comprehensive source of information on the design requirements for the system and the measures taken to meet those requirements.

The deliverable review included both calculations and drawings. EA examined representative system piping and instrumentation drawings, tank drawings, and configuration drawings for the tank sampling tree. Drawings for DST AW-101, in particular, were specifically used to validate the flammable gas sampling process discussed below.

The calculation review looked at several supporting calculations for design changes adding air inlets and exhausters to various DSTs. The review found no technical issues, but noted the weakness described earlier with inadequate explanation for open issues and unverified assumptions (i.e., TBDs and HOLDs).

EA reviewed Modification Traveler (MT) 50043, noting its comprehensive listing of design input documents for the planned change. The MT process was implemented within the last two years to support the design change process, providing a collection point for both design inputs and design outputs and tracking the closure process to completion. Under the MT process, a design change may be implemented by multiple Engineering Change Notices (ECNs) based on the engineering disciplines involved and the complexity of the change. The EA review of ECNs is discussed in Section 5.2, Configuration Management.

Engineering Design Documents Summary

WRPS engineering procedures, processes, and deliverables were technically adequate, based on the review and limited sampling performed. A weakness was noted regarding documentation of TBDs and HOLDs in engineering calculations.

5.2 Configuration Management

Criterion:

Configuration management programs and processes are adequate to ensure safety systems continue to meet safety basis requirements and changes are properly controlled. (DOE Order 420.1B and DOE-STD-1073-2003)

TFC-PLN-23, *Configuration Management Plan*, describes the configuration management process for the Tank Farms. This plan is based on DOE STD-1073-2003, *Configuration Management Program* and is comprehensive in addressing the key areas of that standard. Implementing procedures and documents are referenced where appropriate. TFC-PLN-23 explains compliance with DOE requirements in a clear and straightforward manner.

The design configuration of systems falling under the aegis of this program is well established, as confirmed in the review of engineering deliverables discussed previously.

Within the WRPS change process, a design change may be implemented by several ECNs. The MT is used as a collector document to track the ECNs and Drawing Change Notices associated with a change. Change documents are prepared, reviewed, and approved electronically in SPF. Document processing through SPF helps ensure proper reviews are performed and enhances the effectiveness of the comment resolution process.

TFC-ENG-DESIGN-C-06, *Engineering Change Control*, describes the change process and references other procedures for document control and work control and is consistent with the Configuration Management Plan. TFC-ENG-DESIGN-C-06 requires the identification of affected documents, using the words "technical baseline documents," and refers to HNF-1901, *Technical Baseline Summary Description*, which describes the documents that form the technical baseline for the project. However, the ECN procedure does not require the ECN to document the technical basis for the change. The MT procedure discussed below requires that information, so this minor weakness would only be reflected in those ECNs not connected to an MT.

WRPS requires TFC-ENG-DESIGN-C-56, *Modification Traveler*, to be used for design changes resulting in field work as well as other changes contracted to an outside design agency. The MT identifies impacted documents, design inputs, and design outputs for the change, including all Drawing Change Notices and ECNs issued. As such, it becomes a reference source for the documents, which establish the technical basis for the change. EA confirmed compliance with this requirement through document reviews. This procedure also requires updating of affected essential and support drawings/documents prior to package closure following implementation of the change. In aggregate, this procedure defines a rigorous change process with adequate controls to ensure successful configuration management from a design standpoint.

Further EA document reviews also evidenced a healthy process for identification of documents impacted by design changes. Interviews with WRPS engineering management indicated that ECNs issued to correct prior ECNs for such reasons as the late identification of impacted documents are consistently below the tracking metric established at 2 percent of issued ECNs.

Those interviews also indicated that approximately 75 percent of design change engineering work for the Tank Farms is contracted outside WRPS, generally to one of three local AE firms. Those entities operate under individual quality assurance programs, but are provided with access to SPF. All AE deliverables are processed through SPF. The WRPS chief engineer delegates a design authority for each change.

Each design authority is responsible for ensuring that appropriate design inputs are identified to support the contracted work and that the resulting products receive adequate technical review prior to formal acceptance.

TFC-ENG-DESIGN-C-25 contains basic requirements for routing documents through SPF and for dealing with various exceptions. Once the document flow in SPF is complete, approved documents are transferred to the Integrated Document Management System (IDMS) for retention as records. During the record creation process, the various procedures discussed above and in Section 5.1 require the documentation of related records, such as input documents for a calculation. However, SPF and IDMS are not used to track relationships between documents in a manner that would help identify affected documents when a future change is made. For instance, if a new calculation uses input data from an existing calculation, that existing calculation will likely be listed in the new calculation as a related document. However, if that existing calculation is then revised at some future date, there is no mechanism to identify the fact that it was used in a successor calculation, which might now be impacted.

Configuration Management Summary

The WRPS design change process is complex, in part because of the subcontracting of design work to outside AE firms. However, this process is effective in controlling the many aspects of design change, including identification of affected documents and document updates prior to closure. EA identified a minor issue in which some ECNs are issued without a documented technical justification for the change. The SPF process is being used effectively to control the review and approval process.

5.3 Conduct of Operations

Criteria:

The operator must establish and implement operations practices to ensure that shift operators are alert, informed of conditions, and operate equipment properly. (DOE Order 422.1, Conduct of Operations, Attachment 2)

The operator must establish and implement operations practices for developing and maintaining accurate, understandable written technical procedures that ensure safe and effective facility and equipment operation. (DOE Order 422.1, Conduct of Operations, Attachment 2)

The operator must establish and implement operations practices for initial equipment lineups and subsequent changes to ensure facilities operate with known, proper configuration as designed. (DOE Order 422.1, Conduct of Operations, Attachment 2)

Operator training must be sufficiently comprehensive to cover areas that are fundamental to the candidate's assigned tasks to ensure that personnel are capable of safely performing job duties. The training program must include a core of subjects, such as instrumentation and control and major facility systems, as applicable to the facility and position. (DOE Order 426.2, Attachment 1 Chapter 11.6)

The training program must include on-the-job and classroom training to ensure personnel are familiar with all aspects of their positions, including normal and emergency procedures, administrative procedures, location and function of pertinent safety systems and equipment, and TSRs. (DOE Order 426.2, Attachment 1 Chapter ll.6)

Formal processes have been established to control safety system equipment and system status to

ensure proper operational configuration control is maintained. (DOE Order 422.1, Conduct of Operations, Attachment 2)

EA reviewed institutional- and facility-level operations-related policies and administrative-level procedures, system operations procedures, abnormal/emergency response procedures, and related operator log entries for the SS DST ventilation system. EA observed performance of operator rounds (including safety significant system equipment checks) and also several operator turnovers, control area activities, operator logs, and an operations drill.

Overall, WRPS operators conducted operations in a manner that ensures the selected safety systems are available to perform intended safety functions when required. Procedures, including alarm, abnormal, and emergency response procedures, are technically adequate and maintained to achieve required system alignment and performance.

However, EA identified a deficiency with TSR-related calibration of annulus leak detectors. Based on a review of calibration procedures and interviews with Tank Farms field work supervision, EA identified that two of three level detectors for DST AW-105 did not meet established as-found tolerances for the detectors' float weight when the detector calibrations began on March 29, 2016. Neither technicians performing the calibration nor engineering notified operations that a question about the calibration existed. No log entries were made in the shift operations Shift Manager Log regarding the problem. Even after EA identified the issue during leak detector calibration activities on April 12, operations management made no operability determinations, and WRPS operations had not questioned the operability of the annulus leak detectors as of April 15, 2016. In addition, the shift manager on duty on April 15 stated that he was unaware of the issue and no information had been passed on to him as turnover when he assumed his shift after being on a scheduled break for several days. However, EA notes that the AN/AP Farm area log contained an entry on April 12 documenting the EA concern, but information was not passed on to the shift operations shift manager. In summary, Tank Farms operations staff were not adequately informed of conditions as required by DOE Order 422.1. (**Deficiency**)

EA observed Tank Farms shift routines and operating practices, including rounds on two separate occasions. Both sets of operator rounds (AW Tank Farm and AN/AP Tank Farm) were performed well and all anomalous conditions were properly noted. The AN/AP Tank Farm has established use of electronic rounds using a tablet type device. The use of the device made by MESA uses a software package called Electronic Shift Operations Management System. The electronic rounds were very effective and contain pertinent operational information about various Tank Farms components that are helpful to the operator. EA observed that use of electronic rounds improved the efficiency of taking the rounds and reduced the paper needed to be physically taken into the farms. Overall, Tank Farms workers effectively performed operator turnovers, control area operation activities, and associated operator logs in accordance with applicable requirements.

Tank Farms technical procedures, including normal, abnormal, and emergency procedures, are generally of sufficient detail. Operators follow procedures as written or stop and notify management if conditions arise where the procedure cannot be followed. Procedures are also designated as "continuous use" or "reference use." Most of the procedures reviewed were designated and used correctly (i.e., continuous use procedures were in hand and followed step by step). However, abnormal operating procedures (AOP) are all classified as reference use procedures, meaning that the procedures do not have to be in hand for accurate performance. Because the AOPs are by nature infrequently performed procedures and contain numerous "immediate actions," which are not required to be committed to memory by the operators, the procedures are not correctly categorized. Since the AOP immediate actions are not committed to memory, the procedures must be in hand in order to ensure that the procedural actions are executed correctly. The correct category for these procedures is "continuous use" in accordance with TFC-OPS-

OPER-C-13, *Technical Procedure Control and Use.*

During the onsite data collection on April 17, 2016, a leak occurred in the AY-102 DST into the tank annulus during retrieval operations. WRPS was in the process of retrieving waste in AY-102 and moving it to another DST, fulfilling a commitment to the State of Washington to empty the tank because of a small leak that had been previously identified. WRPS realized the potential for reinitiating the leak when disturbing the tank internals during the retrieval process, and developed a detailed contingency plan. The leak in the tank was identified when the annulus level began to rise. The contingency plan was effectively implemented by the on-shift operations organization following the leak event.

WRPS has established and implemented a training and qualification program for Tank Farms Nuclear Chemical Operators (NCOs). The initial and requalification process is based on a systematic approach to training as required by DOE Order 426.2, *Personnel Selection, Training, Qualification and Certification Requirements for DOE Nuclear Facilities*. The program appropriately covers operator tasks and acceptably identifies tasks requiring training and those requiring over training (periodic retraining is required). The qualification and requalification on-the-job training, on-the-job evaluation, and written examinations address most of the areas required by DOE Order 426.2 for non-reactor nuclear facility operators. NCOs observed were acceptably knowledgeable of assigned routine tasks, such as operator rounds and turnover. However, the NCO training program does not ensure that NCOs are adequately trained in the areas of TSRs and functions of important Tank Farms safety systems, and thus does not adequately maintain and enhance operator knowledge and skills through operator continuing training as required by DOE Order 426.2. (See **Finding-WRPS-02**.)

During observation of operator rounds on two different occasions, EA assessors asked several questions about the function and purpose of important DST ventilation system equipment, including the purpose of the DST inlet high efficiency particulate air (HEPA) filter (to prevent an unfiltered release to the environment if vacuum is lost in the tank) and the reason for identifying the ventilation exhausters in the TSRs (e.g., to prevent the build-up flammable gas, which could lead to deflagration). Each of the two NCOs were unable to provide the correct responses. A review of the NCO qualification and requalification process determined that functions of key plant systems and equipment and basic knowledge of the Tank Farms TSRs was not included in the NCO training and qualification program as required by DOE Order 426.2. However, EA identified that some training has been previously provided on TSRs and flammable gas requirements to NCOs but was not contained in the qualification program.

An EA review of corrective actions in the WRPS issues management system noted some corrective actions involving operator training that only required 80 percent attendance in order to complete the action. Both operations and training management indicated that 80 percent was the organization's expectation for attendance at operator continuing training. WRPS management also noted that reaching the goal of 80 percent was difficult for the organization to consistently achieve (e.g., 2 of the last 4 quarters of continuing training were 62 and 66 percent attendance, respectively). Management further indicated that WRPS does not consider operator continuing training as part of operator requalification, contrary to the requirements of DOE Order 426.2, Section 7 and 8, and the associated WRPS Training Implementation Matrix. During a bi-weekly WRPS Conduct of Operations Council meeting, senior WRPS management made statements to the group in attendance that continuing training is "not related to operator requalification." WRPS has no other training mechanism to address items in the NCO task-to-training matrix identified as "over train" other than operator continuing training. Of the 98 NCOs under the Tank Farms continuing training program, no operator attended all of the last 4 quarterly continuing training sessions. Twenty-four NCOs missed 2 of the 4 sessions and 5 NCOs missed 3 of 4 sessions.

Therefore, NCOs are not receiving continuing training associated with maintaining their knowledge, skill, and ability to expected levels of performance as operators. There is currently no mechanism to ensure

that the continuing training is completed prior to completion of the requalification process and no evaluation is performed to ensure that NCO qualification/proficiency is maintained if operator-related continuing training is missed. The following are some of the WRPS operator continuing training topics covered during the last two years that affect operator continuing knowledge and skill:

- Standards and expectations
- Changes to the facility
- Lessons learned
- Log keeping
- Lockout/tagout
- Incident report corrective actions
- Operator routines.

During a maintenance evolution on April 13, 2016, a job requiring a lockout/tagout was released by operations for work to remove some piping and valves on a caustic and acid solution line at the Effluent Treatment Facility (ETF). The lines were to be drained of all liquid prior to release for work. However, when the pipe fitter began to loosen bolts on a valve flange the worker observed liquid coming from the flange and immediately re-tightened the flange to stop the flow of liquid. Contrary to the requirements of WRPS procedure DOE-0336, *Hanford Site Lockout/Tagout Procedure*, operations did not properly lock out and drain the system prior to authorizing the maintenance work.

Tank Farms operation relies on several interrelated processes (i.e., processes that are used by the facility but are provided by organizations outside WRPS Tank Farms organization). These processes include water provided by Mission Support Alliance, steam provided by Johnson Controls, and electrical power provided by the City of Richland. The processes are provided under agreement with the respective companies and organizations. However, the WRPS conduct of operations matrix incorrectly identifies DOE Order 422.1, Section 2.m, *Control of Interrelated Processes*, as not applicable to Tank Farms. The matrix requires revision to state that the section does apply and Tank Farm operations and agreements with organizations providing interrelated processes must be reviewed and revised as necessary in order to comply with control of interrelated process requirements. (**Deficiency**)

Operations Summary

Overall, Tank Farms operations personnel conduct operations in a manner that ensures the availability of the selected safety systems to perform their intended safety functions when required. Procedures are technically adequate to achieve required system alignment and performance. For the most part, operations personnel are acceptably trained to perform specific basic and routine tasks. Shift routines, operating practices, and detailed procedures generally provide operations personnel with a current operational awareness and verification of normal configuration of the selected safety systems with the exception of DST annulus leak detector calibration procedures that do not require notification to operation if unexpected as-found results are observed. However, management attention is needed to ensure that Tank Farm operators achieve and maintain adequate knowledge and skill as required by DOE Order 426.2 for operator qualification. Additionally, attention is needed to address deficiencies related to maintaining awareness of safety equipment conditions, lockout/tagout, and the incorrect determination that DOE Order 422.1, Section 2.m, is not applicable to Tank Farms.

5.4 Maintenance

Criteria:

The safety system is included in the nuclear facility maintenance management program and the DOE approved Nuclear Maintenance Management Plan. (DOE Order 433.1B)

Maintenance processes for the system are in place for corrective, preventive, and predictive maintenance and to manage the maintenance backlog; and the processes are consistent with the system's safety classification. (DOE Order 433.1B, Attachment 2)

The system is periodically inspected in accordance with preventive maintenance (PM) requirements. (DOE Order 433.1B, Attachment 2)

The reliability of the SSC is maintained through performance of vendor recommended PM requirements. (DOE Order 433.1B, Attachment 2)

Maintenance activities associated with the system, including work control, post-maintenance testing, material procurement and handling, and control and calibration of test equipment, are formally controlled to ensure that changes are not inadvertently introduced, that the system fulfills its requirements, and that system performance is not compromised. (DOE Order 420.1B, Chapter V, and DOE Order 433.1B, Attachment 2)

EA assessed selected elements of the WRPS maintenance program, including plans and programs; corrective maintenance (CM) and PM; periodic inspections; maintenance configuration control and conduct; training; and processes for precluding introduction of suspect/counterfeit items (S/CIs). Assessment activities also included detailed walkthroughs of the DST ventilation system; review of a sample of CM and PM records from the previous three years for the selected system; interviews with key maintenance management and staff; review of the Occurrence Reporting and Processing System (ORPS) reports from the last three years; observation of maintenance and calibration activities performed during the onsite data collection period; and attendance at routine daily Tank Farms maintenance meetings.

At the beginning of the onsite assessment, WRPS management stated that the Tank Farms maintenance process was working well. WRPS management further stated that maintenance backlogs were high and that a goal had been established to reduce the number of backlog corrective and PM work orders by 50 percent before the end of the FY.

Nuclear Maintenance Management Plan and Program

Maintenance of safety system SSCs is acceptably addressed in the DOE-approved nuclear maintenance management program (NMMP) for the Tank Farms, as required by DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*. The NMMP also complies with DOE Order 430.1B, *Real Property Asset Management*, as it relates to maintenance of those assets. The NMMP references and is supported by multiple implementing maintenance procedures, and the implementing documents mostly reflect NMMP requirements.

However, the PM program as described in TFC-OPS-MAINT-C-12, *Preventive/Predictive Maintenance Administration*, does not require that PMs are completed on or before the due date. WRPS routinely allows PMs to enter the PM grace period, which is typically 25 percent of the PM interval. The program does not require action until the PM goes past the end of the grace period (also referred to in the program procedure as the "late due date"). A review of the PM due list for April 2016 identified numerous items

that are past the due date. Some of the items, including an environmental compliance PM for annual aerosol testing of a DST HEPA filter, were past the 25 percent grace period and thus overdue. At least two TSR related items had reached over 60 days of the 90-day grace period without the required PM being performed, and no justification for the delay had been documented. This approach (i.e., managing the PM program to the grace period) is contributing to the large backlog of Tank Farms PMs (over 100) and does not meet the requirements of WRPS NMMP and DOE Order 433.1B for PM, which states "contractor organizations must conduct all maintenance of SSCs that are part of the safety basis in compliance with an approved NMMP." The PM program, credited in the NMMP, further credits a PM technical basis document prepared by engineering to establish required PM requirements for SSCs to ensure reliability of equipment. Therefore, not performing prescribed PM on SSCs that are part of the safety basis, without technical justification, violates the WRPS NMMP. (See **Finding-WRPS-01**.)

Furthermore, interviews with maintenance management that included discussion of the status of CM and PM backlogs indicated that when PMs are performed, WRPS management resets the due date to the date of performance. Therefore, over a period of time, required PMs are not performed on Tank Farms equipment at the frequency prescribed in the program for Tank Farms. For example, an annual HEPA filter aerosol test that is performed at the end of its grace period each time over a 10-year period would result in 8 tests in 10 years versus 1 each year. This example illustrates where the WRPS PM program does not meet the requirements of DOE Order 433.1B, the DOE-approved WRPS NMMP, and the associated guidance of DOE Guide 433.1-1A, *Nuclear Facility Maintenance Management Program Guide for Use with DOE Order 433.1B*. (See **Finding-WRPS-01**.)

Although not a requirement, DOE Guide 433.1-1A, section E.2.1.2, *Scheduling PMs*, states “Delays in the performance of scheduled PMs beyond their defined period should require escalating approval.” Because WRPS routinely allows use of the grace period without justification and approval from such organizations as systems engineering, operations, and facility management, the PMs are not being performed as intended.

The maintenance program is appropriately identified as a SMP and receives self-assessments biennially. WRPS has properly performed these self-assessments and has placed corrective actions for identified issues into the issues management program.

During the onsite portion of the assessment, the DST ventilation system was in acceptable condition with only a few SSCs out of service or in an alarm condition. Although some mechanical dampers exhibited considerable amount of surface rust, the observed condition did not affect function or manipulation of the dampers according to operations staff. One of the alarm conditions related to the AP and AY-102 DSTs, which were experiencing a high pressure condition (low vacuum). These conditions resulted from an alteration of the system to add new pumps to those tanks to support AY-102 to AP-102 retrieval activities. The pumps were added without adequately sealing around the equipment, which allowed additional air in-leakage into the tanks. This additional air made it difficult to maintain tank pressures below the alarm set point and/or TSR values, causing operator compensatory measures to be implemented for personnel safety for any work occurring in the AP farm and frequent entry into limiting conditions for operation (LCOs) for AY-102. This condition will not be corrected until the AP and AY/AZ exhausters are replaced with larger capacity fans. Proper scoping of the pump addition modification could have prevented repeated LCO entries and operator work arounds.

Corrective, Preventive, and Predictive Maintenance

Generally, WRPS has implemented acceptable CM and PM processes for the DST ventilation system except as noted above. Predictive maintenance has not been implemented for the DST ventilation system to date. However, WRPS management stated that vibration monitoring is being considered.

Maintenance processes are consistent with the systems' safety-significant designation. Maintenance processes, including provisions for CM, PM, and covering safety systems for Tank Farms, are addressed in the NMMP and Tank Farms procedures for work control, TFC-OPS-MAINT-C-01, *Tank Operations Contractor Work Control*, and TFC-OPS-MAINT-C-12. The work control process acceptably identifies the hazards, associated controls, and work steps for each activity (i.e., CM or PM), and a work package is generated specifically for that scope of work. However, the WRPS work scheduling process is managing work weekly with little future planning, allowing for many items to be merged into the schedule at the last minute instead of ensuring that work is planned in advance to ensure that craft resources, parts, and associated work packages are ready at least two weeks before the scheduled performance. WRPS management is aware of the problem and is working to implement an eight-week work scheduling process.

PM activities for Tank Farms safety systems are performed by craft assigned to each specific area of the Tank Farms and are developed for certain types of facility equipment. The maintenance activities associated with the DST ventilation system are discussed in associated SSDs and are generally consistent with vendor recommendations and industry practice for these systems. For example, DST ventilation exhaust fans receive annual inlet/exhaust HEPA filter aerosol testing, calibration of system instrumentation, and exhaust fan inspections. Seasonal PMs are also performed for system heat trace equipment.

Periodic Inspections

In addition to PM activities on the DST ventilation system, CSEs perform annual evaluations of the system through a system health report. System availability, maintenance, and configuration attributes are analyzed and scored for each safety system at the Tank Farms. The reports evaluate data that relates to the system, such as number of hours of availability during the period, the maintenance backlog for the system, and any outstanding engineering changes that have not been finalized. However, the system health reports do not evaluate the physical condition of equipment. (See Section 5.6, Cognizant System Engineer Program.)

Performance Measures

WRPS uses three performance measures for the maintenance program, the CM backlog, the PM backlog, and the deferred maintenance items. The March 2016 rolling 3-month average for CM and PM backlogs are substantially high at 430 and 117, respectively. However, WRPS management has established a goal of reducing the backlogs by 50 percent in 2016. Performance in the area of deferred maintenance items (PMs that have exceeded the grace period and have been formally deferred) is very good in that only 4 PMs have been deferred during FY 2016.

One concern is that the performance measures discussed above do not capture all types of maintenance issues requiring corrective action and lessons learned as required by DOE Order 433.1B. For example, issues relating to the quality of CM and PM work packages and work package execution are not reflected in the existing set of maintenance performance measures. (**Deficiency**)

Conduct of Maintenance

A limited number of CM and PM activities were performed during the onsite data collection period. However, EA was able to observe five maintenance activities (four PMs and one CM activity). One of the PMs was the annual aerosol testing of the DST ventilation system inlet HEPA filter tests in the AW Tank Farm in accordance with procedure 3-VBP-156, *Exhauster-Related HEPA Filter In-Place Leak Test (Aerosol Test)*. The six tests observed were successfully completed using a test procedure that is

consistent with ANSI N510-1989 requirements for HEPA filter testing. The procedure was designated continuous use and was followed step by step. However, the procedure did not contain specific steps for attaching the three different Tygon hoses (i.e., aerosol supply, HEPA filter upstream, and HEPA filter downstream) to the intake control center test ports of each DST ventilation system. Although no step was included in the procedure, the WRPS craft technicians made the connections. Lack of steps specifying required action(s) is a concern related to performance of technical procedures under DOE Order 422.1, *Conduct of Operations*.

Additionally, WRPS does not conduct the HEPA filter test in the credited direction, i.e., the inlet HEPA's purpose is to filter flow coming from the DST should a loss of vacuum occur. The filtering of the inlet is related to Tank Farms environmental compliance and is not credited for safety basis purposes. The test configuration tests the filter in the normal flow rather than the credited flow direction. No technical evaluation has been performed to justify testing in the non-credited direction.

The second PM activity was a Beryllium sampling activity (Work Package # 206358) in an electrical cabinet in Building 272-WA. Although the sampling is performed by industrial hygiene technicians, the part of the evolution that EA observed involved electricians securing power and performing safe-to-work checks to allow the industrial hygiene technicians to take their samples, and then after samples were taken, restoring power to the cabinets. The work package was of acceptable detail, all groups involved in the job actively participated in the pre-job brief, and the work was properly performed.

Another activity observed was a PM on electrical breakers and motor control centers at the ETF. Electricians performed the PM using procedure ETF-EL22052, *DS Series Circuit Breaker Inspection and Testing*. The electricians found electric contacts of one of the breakers to be on the lower end of the acceptable tolerance range. Although the clearance met the procedural specification, the electricians conservatively contacted the engineer to provide guidance on how to proceed. The engineer instructed the electricians to use the breaker as-is and to change out the contacts during the next PM cycle. The electricians exhibited a good questioning attitude. The PM was properly performed, and no issues were identified.

The last PM that EA observed was the annual calibrations of the DST Annulus Leak Detectors in the AW Tank Farm, April 12–13, 2016. The Tank Farms TSR requires the leak detectors for monitoring the space between the inner and outer tank shells for leakage from the inner tank. The detectors measure the buoyancy of a plummet or displacer attached to a wire to determine annulus level. The weight of the plummet is a key parameter in the instrument's accuracy. While it is possible for debris or some liquid to accumulate on the plummet, it is unlikely because it rests just above the bottom of the annulus and is not typically touching any liquids or solids. A weight difference could also be the result of a compromised measurement circuit in the instrument. The technicians performed the calibrations using procedure 6-LDD-485, *ENRAF Series 854 Annulus Leak Detection Gauges Calibration and Maintenance*, which is consistent with the vendor manual except as noted in the second paragraph below.

Prior to observing the activity, EA raised questions on April 12 with Tank Farms work supervisors about the operability of certain detectors where calibrations had been started but had been suspended. On March 29, 2016, all three AW-105 detectors were taken out of service for calibration. Technicians found two of the detectors with measured weights more than 10 grams heavier than the established criteria. In accordance with the procedure, engineering was contacted and the procedure was simply suspended at that point and the calibration was not completed. The procedure did not require notification to operations for an operability determination even though the accuracy of the instrument was questionable when the weights did not agree. Tank Farms maintenance staff stated that they considered the instrument operable because the calibration due date had not been exceeded. Therefore, the Tank Farms operations organization was not notified of the potentially inoperable instruments until EA raised the issue on April

12, 2016. An operability determination was also not performed when operations was notified of the instrument issue on April 12. The unit that did not have a weight discrepancy was calibrated on April 12. Engineering determined the discrepancy was acceptable on April 13, and the remaining calibration procedures were successfully completed during the EA observation on April 13. (See Section 5.3, Operations.)

Even though the calibration procedure discussed above established the plummet weight difference criteria of 10 grams, the vendor manual states that a difference of greater than 3 grams requires a calibration using vendor supplied weights as a standard. There is no technical evaluation by WRPS justifying this discrepancy from the vendor recommended value and process. Engineering has established an issue in its issues management program (WRPS-PER-2016-0682) to address the concerns identified by EA associated with the leak detectors and the calibration procedures.

EA observed a CM activity (Work Package #170969) involving ETF acid and caustic piping removal on April 14, 2016. The job required the use of compressed air to open two air-operated valves where the power had been previously removed to allow the acid and caustic residual liquid to drain into the catch basin. The job was part of a modification to remove piping and valves in the ETF polisher acid and caustic lines. The steps in the work package were sufficiently detailed and the work was conducted in accordance with the work package. During the pre-job brief, workers discussed attempting to disconnect the flange connection to remove the valves on the previous day when one worker observed liquid coming out of the flanged connection. The worker immediately retightened the flange bolts, placing it in a safe condition and stopping further leakage, and appropriately exited the area. After contacting ETF management, the workers participated in discussion with operations and engineering managers and staff to determine a safe solution for moving forward with the valve and piping removal. During the discussion it was concluded that operations had not completely drained the line prior to releasing the work package for work to begin. (See Section 5.3 of this report.)

Calibration of Tank Farms measuring and test equipment (M&TE) is addressed in procedure TFC-OPS-MAINT-C-07, *Control and Calibration of Measuring and Test Equipment*. All M&TE observed in use during the maintenance activities discussed above were within the established calibration frequency. (See Section 5.5, Surveillance and Testing, for additional detail on equipment calibration and M&TE.)

EA reviewed a sample of 32 PM, 38 PM/calibrations, and 21 CM work packages conducted during the last three years against the requirements of TFC-OPS-Maint-C-01. The work packages were appropriately constructed with adequate work instructions, work performance documentation was appropriately completed, documentation of post maintenance testing was consistent with the work description, and the packages showed that equipment was left in an operable status. The completed packages were predominantly in accordance with the procedure requirements. However, some errors resulted in incomplete packages, including the following:

- Missing Operations shift manager signature for accepting work as properly completed (21 examples)

- Several cases where a table or instructions required by a procedure were not included in package (13 examples)

- A few level 3 work orders lacked detail as to what was performed or how the work was tested or replaced components calibrated. (4 examples)

- One level 1 work order was missing the level of detail required by procedure for work performed.

These examples did not raise concerns about equipment status, but indicate a lack of attention to detail during work package closeout. (**Deficiency**)

Procurement, Receipt Acceptance, and Suspect/Counterfeit Items

WRPS has established an acceptable process for procuring safety-significant spare parts through RPP-8411, *WRPS Procurement Process Description*, and associated implementing procedures. However, the safety-significant DST ventilation system currently has no structures, systems, or components that are designated as safety significant. Since the components of the systems are classified as "general service," the parts are procured as commercial grade items without any specific commercial grade dedication. EA identified no issues in this area.

WRPS has implemented a thorough process to guard against S/CIs. TFC-ESHQ-Q_C-C-3, *Control of Suspect/Counterfeit Items*, is used to implement the S/CI prevention process. In addition, all current WRPS craft and system engineers receive S/CI training so that, as work is performed and systems are walked down, any existing S/CI can be identified and dispositioned. EA sampled training records for the required S/CI training and found no issues.

Maintenance Summary

Overall, WRPS has established a maintenance program that meets most of the DOE Order 433.1B requirements. The contractor has addressed the requirements through the NMMP and its implementing documents. Procedures for conducting CM are effective in restoring functionality of Tank Farms equipment following equipment failure. The work activities observed were performed in accordance with established controls, work hazards were properly identified and controlled, and maintenance workers exhibited good questioning attitudes and conduct of operations behavior. However, management attention is needed to improve the scheduling and implementation of PMs and to improve quality of CM and PM work packages and work package execution which is not reflected in the existing set of maintenance performance measures.

5.5 Surveillance and Testing

Criteria:

Requirements relating to test, calibration, or inspection assure: that the necessary operability and quality of safety SSCs is maintained; that facility operation is within safety limits; and that limiting control settings and LCOs are met. (10 CFR 830 Subpart B Appendix A, G.6, Table 4, (5))

Instrumentation and M&TE for the system are calibrated and maintained. (10 CFR 830.122, Criterion 8)

This section discusses EA's assessment of the WRPS surveillance testing program of the tank ventilation systems to maintain compliance with the Tank Farms' approved TSRs and SACs. EA reviewed completed surveillance testing packages, including six calibrations of TSR equipment, and seven functional tests. All TSR-related activities were properly completed and met established acceptance criteria.

EA observed a partial performance of the AW Farm Exhauster B-Train response test and calibration. Procedure 3-FCD-738, *ANSI N13.1 Compliance for AW Exhausters*, a continuous use procedure, was thorough and effective for verifying the operation of the exhausters and was followed properly by the technicians. The M&TE used for the calibration was the proper equipment and was within its calibration

cycle.

The Tank Farms DSA describes a potential hazard due to buildup of flammable gases within DSTs. Conditions which could result in a deflagration or detonation are prevented by continuous air flow provided by the tank exhauster systems. Flammable Gas Monitoring frequency supporting TSR SAC requirements is established by tables in the TSR and implemented by procedure TF-OPS-IHT-001, *IHT Flammable Gas Surveillances on Double Shell Tanks*. An important aspect in the use of the flammable gas detectors is the purge time required to ensure that the instrument is fully sampling the intended air space. The tanks are monitored at pre-determined frequencies to ensure that flammable gases are not allowed to accumulate. TF-OPS-IHT-001 describes use of an Industrial Scientific iTX Multi-Gas Monitor and iSP Pump to determine concentration of potentially flammable gases as a percentage of the lower flammable limit, with an action level established at 25 percent of that limit. Flow from the tank into the iTX Monitor is driven by the iSP Pump attached to the monitor. EA noted a concern that the procedure did not provide or reference a basis for determining the required purge times.

EA observed a field demonstration in which a flammable gas reading was obtained for DST AW-101. EA requested, and was provided with, flow rate test data for the iSP pumps. Based on this information, EA generated a calculation that validated the procedural purge time for a representative tank.

EA concluded that, although surveillance procedure TF-OPS-IHT-001 does not reference any technical basis for the purge times listed for each tank, the purge times are adequate to ensure that valid measurements are taken as required by TSR 3.7.1.

EA observed several annulus leak detector calibrations. TSR 3.5.1 requires verification every 48 hours that the DST annulus waste level is less than or equal to 15 inches. Verification is accomplished by three DST leak detectors located in the annulus region between the inner and outer shells of the tanks. Not only are the detectors required for TSR compliance, they are also required for compliance with the Tank Farms environmental permit. Only one operable detector is required for TSR compliance, but all three units are required to be operable to comply with the environmental permit. Calibration procedure 6-LDD-485 makes the environmental requirement clear, but does not mention the TSR surveillance requirement. WRPS addressed this concern by placing it in the issues management system (WRPS-PER-2016-0682).

During the onsite data collection, EA raised concerns about procedure inadequacies, including one related to the technical basis of as-found acceptance criteria for a plummet weight in the 6-LDD-485 procedure. These issues are discussed in more detail in Section 5.4 of this report, including the issues management item WRPS filed to address the concerns. Although the alarm set point for TSR compliance on the annulus leak detectors is 15 inches, the procedure establishes the set point at 0.25 inches, which is extremely conservative, giving a significant safety margin and early indication of a leak.

As noted in Section 5.4, the calibrations on two of the three annulus leak detectors for AW-105 were suspended due to a measured plummet weight higher than allowed in the procedure. This fact was not communicated to Operations and operability was never questioned. The third leak detector was not reading on the remote operator station, but was being read locally on operator rounds. Since the TSR requires one operable leak detector, the requirement was met by taking these local readings, which could easily have resulted in a TSR violation since Operations did not know that the other two leak detectors had questionable readings.

EA interviewed the CSE for the Automatic Temperature Monitoring System, which is used to ensure that tank transfers are only performed when ambient temperatures will preclude freezing. The system is only used between October 1 and March 31. The thermocouple operability is verified every four years by PM procedures. The thermocouples and their associated connection wiring are routinely replaced on a 20-

year cycle. As mentioned in Section 5.4, Maintenance, the schedule for PMs is reset to the date of performance, allowing the total time between PMs to continue to increase. These PMs also fall into that practice.

M&TE Calibration Program

The Tank Farms have four tool rooms that maintain the M&TE used for calibrating plant equipment. Procedure TFC-OPS-MAINT-C-07 adequately defines the processes that identify, label, store, calibrate, and issue M&TE. Procedure TFC-OPS-MAINT-C-06, *Notification and Evaluation of Out-of-Calibration Measuring and Test Equipment*, appropriately instructs users in handling M&TE that does not meet accuracy requirements.

Each month, the M&TE scheduled for calibration is sent to Energy Northwest Standard Laboratory to be calibrated in accordance with the National Institute of Standards and Technology traceable program. The M&TE is returned with a report showing each range that was calibrated and whether its as-found data was within tolerance. If the as-found data is not within tolerance, a notice of discrepancy is generated to evaluate the equipment that used this M&TE in the field. Each work order is analyzed by engineering to determine whether it is potentially impacted by the errors in the M&TE. If errors in the M&TE did affect field calibrations, Operations is notified immediately by engineering and the plant equipment is recalibrated. This process is effective and meets the requirements of TFC-PLN-02, *Quality Assurance Program Description.*

EA reviewed two notice of discrepancies that were recently completed on two pieces of M&TE, a digital thermometer and a flow calibrator. The digital thermometer, which is used regularly on operator rounds, failed its calibration on the -200 degrees Celsius scale because of a loose connection. Since the scale was not used on any of the readings taken by the instrument, WRPS engineering determined the calibration failure had no effect in the field. The flow calibrator, however, had been checked out from the tool room for six different calibrations. Engineering reviewed these six work orders and determined that the instrument was actually only used once. That field device, an air rotameter, was immediately recalibrated under another work order. The as-found data on the recalibration of the rotameter was within tolerance, and no adjustments were necessary.

Surveillance and Testing Summary

Overall, the surveillance testing, calibration, and inspection programs adequately maintain the SSCs in a condition that ensures the TSRs are satisfied. The M&TE maintenance and calibration program is well organized and effective. The observed surveillance and testing activities for the Hanford Tank Farms were properly performed and adequately translate the TSRs into useable procedures and programs. However, the DST annulus leak detector calibration observed during the EA assessment revealed a problem with the procedure that could have resulted in a TSR violation. Additionally, as described in Section 5.4, the temperature monitoring system PM schedule is being stretched as the PM interval is reset each time a PM is performed, even if it is performed after the original due date but within the grace period.

5.6 Cognizant System Engineer Program

Criteria:

The DOE contractor has established a system engineer program to ensure continued operational readiness of systems within the program scope. (DOE Order 420.1 B Chapter V)

The System Engineer Program must be applied to active safety class and safety-significant SSCs as defined in the facility's DOE approved safety basis, as well as to other active systems that perform important defense-in-depth functions, as designated by facility line management. (DOE Order 420.1B Chapter V.2)

Hazard category 1, 2, and 3 nuclear facilities must have a System Engineer Program, as well as a qualified CSE assigned to each system within the scope of the Program. (DOE Order 420.1B Chapter V.3)

Within the CSE element, EA reviewed the CSE program, CSE training and qualifications, CSE roles and responsibilities, safety system assessments (including the last four system health reports for the selected system), operations and maintenance technical support, and some aspects of configuration management. EA also conducted interviews with engineering management and two CSEs and participated in a detailed system walk down with one of the CSEs.

CSE Program Documents

The CSE program for the Hanford Tank Farms is defined in TFC-ENG-FACSUP-P-01, *TOC System Engineer Program*. The CSE program describes the responsibilities of the CSE and adequately addresses the requirements of DOE Order 420.1B, *Nuclear Safety*, Chapter V, *Cognizant System Engineers*. In addition, the program also identifies the CSE as Design Authority. In this role, the CSE is responsible for design output accuracy and the technical adequacy of the design process. WRPS has assigned two individuals as CSEs for the DST ventilation systems. One of the CSEs chiefly performs the role of Design Authority and the other maintains cognizance over system performance and provides support to operations and engineering.

During initial interviews with WRPS management during the planning visit in March 2016, EA asked the system engineering manager's perspective on the status of the CSE Program. The manager stated that the WRPS CSE program is working well, although the CSEs are somewhat overloaded. The manager went on to say that many of the requirements for routine CSE activities, including documented system walkdowns, comprehensive system notebooks, and the frequency of system health reports, have been reduced or eliminated in order to allow the CSEs more time to accomplish design and support functions.

CSE Training and Qualifications

DOE Order 420.1B requires CSEs to be trained and qualified as Technical Support Personnel in accordance with DOE Order 5480.20A, *Personnel Selection, Training, Qualification and Certification Requirements for DOE Nuclear Facilities*. The Order also requires the following specific training topics to be included: related facility safety bases; system functional classification and bases; codes and standards applicable to assigned systems; system design, procurement, replacement, and related quality assurance requirements; and the existing condition of the systems. The WRPS Tank Farms CSE training program is described in the *Qualification Card for Cognizant System Engineer* (350976) and includes requirements for education, experience, and initial and continuing training. WRPS prepared a task analysis to support the CSE qualification card. These requirements align with the training and qualification requirements in DOE Order 420.1B.

The CSEs interviewed were knowledgeable of the DST ventilation systems and also have substantial ventilation design experience. The CSEs are qualified to perform both Design Authority, as well as the more cognizant system responsibility described in the DOE Order 420.1B. However, the CSE qualification process does not fully equip a CSE candidate without substantial design experience to perform the role of Design Authority.

Periodic Safety System Assessments

EA reviewed the current CSE program as is relates to safety system assessments and noted that periodic assessments are performed and the results are briefed to management. EA also noted that WRPS made several changes to CSE program requirements in January 2016 that may adversely impact the ongoing effectiveness of the program, as discussed later in this section. Two of the changes include:

- Prior to January 2016, system walk downs were required to be performed monthly and documented. However, WRPS deleted the requirements and made the system walk downs optional.

- TFC-ENG-FACSUP-D-01.2, *System Notebook Preparation*, required system notebooks to be a comprehensive and readily available source of current and historical information about a safety system and a valuable resource for CSEs, component engineers, and others, including DOE SSO personnel. After the January 2016 change, TFC-ENG-FACSUP-D-01.2 made the system notebook's only purpose to support CSE duties and provide information that is not available through some other electronic source.

Periodic safety system assessments are conducted in accordance with TFC-ENG-FACSUP-D-01.1, *Engineering System Monitoring, Performance, and Reporting Guidance Document*. This procedure describes the methodology to perform annual system health reports. However, system health reports lack important details necessary to determine ongoing performance and reliability of the safety system as described below.

System assessments (i.e., annual system health reports) do not document observed physical condition of equipment, contrary to DOE Order 420.1B requirements. This is further complicated by WRPS not requiring CSEs to perform periodic system walk downs. DOE Order 420.1B requires information from physical observation of the system and its components through opportunities like system walk downs to be included in the system assessment (the health report). (**Deficiency**)

The scope of System Heath scoring criteria is too narrow to capture important attributes that can affect system health. Other than availability (i.e., how much the equipment operated during the year), maintenance backlog, and outstanding engineering changes, no other objective criteria (e.g., numbers of performance functional failures, degraded equipment parameters, unplanned LCO entries, and unplanned regulatory impacts) have been established to determine a more accurate valuation of system health. Additionally, the scoring criteria are the same for all systems in the program despite all systems having significant differences. For example, DST ventilation systems have significantly different components from the electrical distribution system.

In addition to annual system health reports, CSEs present quarterly safety system health presentations to WRPS senior management. Although all of the system presentations cover the system health score for the previous quarter, the remainder of the presentation content is up to the individual CSE. The presentations to senior management are a good practice, but the information is not always leveraged to promote improved system health and reliability. For example, the DST ventilation system presentation for fourth quarter 2014 presents the system health score card for each of the Tank Farms areas. However, there is no discussion of the physical condition and risk related issues associated with the ventilation system, such as the backlog of annulus ventilation system maintenance (only 50 percent of needed CM was performed during the quarter). In addition, CSEs do not present the plans for correcting such system vulnerabilities.

Operations and Maintenance Technical Support

The WRPS ventilation CSE with most of the support responsibility provides acceptable support to both operations and maintenance. EA noted some examples during the onsite data collection, including documented CSE review of corrective and PM activities and assisting operations and maintenance during walk downs prior to conducting Tank Farms evolutions.

Configuration Management

The CSE has a significant responsibility in maintaining design control over assigned systems. As noted above, the CSE is responsible for maintaining the configuration of his or her system consistent with system drawings and design. The CSE also reviews and approves the adequacy of design changes to the safety system. When CSEs perform walk downs of systems, the CSE examines system configuration, including equipment labeling to ensure the system is properly aligned and reflects the as-built drawings. Other aspects of the WRPS configuration management program are discussed in Section 5.2 above.

Cognizant System Engineer Program Summary

WRPS has established a CSE program at the Tank Farms that generally meets the requirements of DOE Order 420.1B, although some specific issues detract from the effectiveness of the program. Specifically, the CSE qualification program does not cover all roles and responsibilities of the position and system assessments do not reflect physical condition of the system.

5.7 Federal Safety System Oversight Program

Criterion:

Federal SSO Programs are established and effective in ensuring safety systems can reliably perform as intended. (DOE Order 426.1, Appendix D)

The ORP Tank Operations Division has two qualified SSO engineers, one for mechanical systems and one specifically for ventilation systems, and a third SSO engineer going through qualification to be an Instrumentation and Controls specialist SSO. Review of SSO tasking over the previous two quarters indicated very active SSO of contractor activities. Further, the ORP SSO review of the contractor's *2016 Double-Shell Tank System Integrity Assessment Report* indicated a high level of technical knowledge of, and involvement in, the operation and integrity of the DSTs at Hanford.

The task records and interviews indicated frequent SSO engineer hands-on field observations of ventilation equipment in the Tank Farms. These SSO observations are augmented by a strong ORP Facility Representative (FR) presence in the Tank Farms. There is also an extensive record of SSO engineering reviews of Tank Farms equipment and review of contractor engineering analyses. However, review of SSO training and qualification records indicated that although both current SSO engineers were highly qualified technically, one had not maintained the site-specific training required to physically access the Tank Farms. Although ORP, through the activities of the SSO engineers and FRs, has maintained oversight of the Tank Farms, inability of an SSO engineer to physically inspect assigned equipment limits his effectiveness**.** ORP management took actions to have the SSO complete required training to restore his Tank Farms access.

5.8 Quality Assurance

Criterion:

*Quality assurance practices and processes are implemented in a manner that ensures safety systems will conform to required standards and perform as designed. (*DOE Order 420.1B Attachment 3, 3.a (7))

The safety systems under review, DST ventilation systems, while currently designated as safety significant in the DSA, were designed and constructed as commercial grade. A limited review of the quality program elements confirmed that when implemented, the program contains the necessary elements to maintain the quality level of a safety system. DOE-approved *WRPS Quality Assurance Program Description,* TFC-PLN-02, describes WRPS's commitment to the contract and regulatory requirements, including 10 CFR 830.122, Subpart A, ASME NQA-1, and DOE Orders incorporated into the contract. Graded procurement, receipt inspection, vendor certification, and other program elements are implemented and verified as discussed in this report Section 5.9, *WRPS Feedback and Improvement Program.* To the extent the quality requirements are applicable to the ventilation system, the implementation was found to be satisfactory.

5.9 WRPS Feedback and Improvement Program

Criteria:

Identify the causes of problems and work to prevent recurrence as a part of correcting the problem. (10 CFR 830.122 Criterion 3)

Contractors must monitor and evaluate all work performed under their contracts to ensure work performance meets the applicable requirements for environment, safety, and health; including quality assurance, integrated safety management, safeguards and security, cyber security, and emergency management. (DOE Order 226.1B Attachment 1 Section 1)

EA evaluated the establishment and implementation of feedback and improvement programs and processes that affect nuclear safety-significant systems at the Tank Farms. EA reviewed program and process documents, interviewed responsible managers and staff, and evaluated samples of process outputs, such as assessment and trend reports, performance indicator reports, lessons learned publications, event analysis reports, and problem evaluation reports (PERs). WRPS managers indicated a generally good knowledge of the program elements and the weaknesses that exist in implementations. A formal plan is approved that captures management's intentions to improve the contractor assurance system (CAS).

Assessment Program

The assessment program includes a spectrum of formal, documented assessment types (e.g., external, independent, management, special, management observations, and quality assurance surveillances). The formal assessment program is implemented through a structured integrated planning process and maintained in a schedule that integrates ORP assessment activities. In addition to company-level assessment procedures, such organizations as Engineering have issued guidance documents for the conduct of assessments. Periodic assessments that are mandated by DOE directives or regulations, such as SMP reviews, are designated as "management assessments" and are identified, monitored, and included in the integrated assessment schedule.

Assessment planning uses a technical basis document that is maintained for use in the selection of required and recurring assessments to develop the integrated assessment schedule, which is approved by the executive safety review board (ESRB). Scheduled assessments for 2014 through 2016 examined by EA reflected an appropriate variety of nuclear safety related reviews by the various responsible organizations. WRPS last performed DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, triennial assessment of DOE-STD-1070-94, in 2013, and the next assessment is not scheduled. The scheduled assessment FY2015-0PS-M-0126 - *Training DOE Order 426.2 Systematic Evaluations of Training and Qualification Programs* covers the scope described in the DSA section 12.4.A, but does not include the scope in DOE-STD-1070, as required by DOE Order 426.2. Postponement or cancellation of scheduled assessments are graded according to assessment type and require concurrence by the team lead and responsible manager, including the level 1 manager, and the ESRB sponsor for corrective action effectiveness reviews. The ESRB as a group is not informed of changes to planned assessments. Completed postponement or cancellation forms for FY 2016 to date showed appropriate bases and approvals for schedule changes, but records were not readily retrievable for most changes.

EA reviewed the reports for over 30 formal management, independent, and specialty assessments conducted by WRPS in 2014, 2015, and 2016, as well as a sample of external assessments, quality surveillance reports, and management observation reports. Formal assessment reports are documented in consistent formats with the assessment plans and CRADs attached and summarized in the body of the report. In most cases, specific checklists of criteria and compliance results were used and were attached to the report. The Assessment Manager appropriately evaluated and scored a selection of competed reports and provides feedback to the team leader. Most of the formal reports EA reviewed were well-documented, value-added evaluations of programs and/or performance. For example, management assessments of programs, such as in-service surveillance and maintenance, are scheduled yearly as a SMP review. An independent assessment performed by quality assurance of engineering reflected thorough review resulting in the identification of both compliance and insightful performance issues. An external assessment of WRPS Safety Basis Implementation by the parent organization was similarly insightful. Recurring assessment of TSRs are also conducted by the Operations organization. The breadth of issues raised by these independent and external reviews of programs underscore their value. These assessments identified many issues useful for correction and continuous improvement of safety management processes and performance.

Despite these rigorous, value-added assessments, the program is hampered by occasionally insufficient rigor by team members, team leaders, and management reviewers and approvers in ensuring the accuracy and completeness of assessment reports. Areas noted include:

- Independent assessments performed by the quality organization are not reviewed and evaluated by the Assessment Program Manager.

- SMP assessment scope generally focuses on the DSA/TSR described attributes of the programs. While not credited by the DSA, the complete program is important to its health but has not been reflected in the scope when performing assessments.

- Scope and purpose statements, objectives and criteria, and the checklists documenting the assessments are not always accurate or consistent.

- The wording of conclusion statements is not always accurate (e.g., “implemented” means more than the requirements have been flowed down into procedures).

- Formal identification of areas found deficient or needing improvement are not documented in PERs for trending and diagnostic capabilities.

- Assessment team leaders complete a web-based training course on assessment techniques and a qualification card, unless they are otherwise qualified under the ASME Nuclear Quality Assurance Standard (NQA-1) as lead auditors/assessors. These qualification processes are not equivalent in that assessment team leaders and members have no proficiency expectations. The current qualified Lead Assessor list contains over 150 personnel, many of whom are not active in performing assessments.

WRPS managers conduct frequent, documented field observations that provide direct interaction between managers and workers performing various field activities, affording opportunities for mentoring; communicating management expectations; and improving understanding of field conditions and issues related to work documents, worker knowledge and behaviors, and overall work planning and control performance. The requirements and process for implementing the management oversight program (MOP) are appropriately detailed in an administrative procedure and implemented by the top three levels of management in organizations that perform field activities. WRPS managers perform between 250 and 300 documented observations and worksite visits monthly. Observation details are effectively documented in an online database and observed problems are addressed on the spot and/or through the PER process as appropriate. Data on management participation in the work site visit and observation program is effectively monitored by Contractor Assurance and reported as indicators on the monthly Tank Farms Performance Dashboard (described below under Performance Indicators).

A sufficient number and scope of surveillances are performed annually to evaluate the quality of work activities at the Tank Farms. These surveillances are planned and scheduled annually and primarily address verification of proper fabrication and testing and work conducted by subcontractors and suppliers, including follow-up on corrective actions to address previously identified issues. EA reviewed a sample of ten quality assurance surveillance reports generated in 2015 and 2016 and concluded that the surveillance activities were well documented and provide valuable assurance of quality and feedback for improvement of safety systems.

Event Reporting and Analysis

WRPS has established procedures for identifying, notification and reporting, investigating, and periodically analyzing performance trends for occurrences as required by DOE Order 232.2, *Occurrence Reporting and Processing of Operations Information*, and other DOE directives and associated guidance. EA reviewed a sample of event investigation reports (EIRs) for six 2015 and 2016 events and the 2016 occurrence reports submitted through April 2016 and recent examples of performance analysis reports (that include non-reportable events) to evaluate these processes and their effectiveness. The WRPS analysis and conclusions in the quarterly performance reports reviewed by EA address the appropriate scope of operational and non-operational events and issues and sufficiently evaluated the data sets for adverse trends.

The last safety system review in 2013 identified a finding, WRPS-F&I-1/WRPS-PER-2-13-0766, which states, "WRPS is not effectively implementing the initial event investigation process as specified in procedure OPS-OPER-C-14, *Initial Event Investigation Process*, and Section 2.5 of TFC-PLN-02, *Quality Assurance Program Description*." WRPS revised the procedure to institute new training and qualification requirements for the investigation team lead, improving the rigor of investigations. Review of the PER and corrective action record (IDMS) did not contain evidence of closure (revised procedure or new qualification card), but the documents were viewable from other sources. The following paragraph describes additional problems that detract from the quality of event investigation.

- The WRPS occurrence reporting, non-compliance tracking system reporting, and initial event investigation lack integration. The occurrence reporting procedure specifies that the Shift Manager or 222-S Operations Manager, as appropriate, make required notifications of events and ensures that a PER is submitted to document and disposition the event or condition and determines whether an investigation of the occurrence is appropriate with reference to TFC-OPS-OPER-C-14, *Initial Event Investigation Process*. This procedure describes prompt investigative actions to be taken to support occurrence reporting if the event meets certain criteria (e.g., reportable category 1 or 2) with subsequent evaluation and disposition of the issue(s) managed by the PER process. A graded investigation process is appropriate, but not described well. The interfaces with the Occurrence Reporting, Price Anderson Amendments Act reporting (non-compliance tracking system), and PER procedures (TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*, TFC-ESHQ-PAAA-C-01, Price-Anderson Amendments Act Evaluation and Reporting, and TFC-ESHQ-Q_C-C-01, *Problem Evaluation Request*, respectively) are not well defined. The ORPS reporting procedure (OPER-C-24) refers to the investigation procedure (TFC-OPS-OPER-C-14) in a couple places (e.g., site preservation, and as a reference), but does not describe how the two procedures integrate, and neither of these procedures make reference to the Price Anderson reporting process.

The following examples illustrate the problems with event investigations that do not fully support corrective action development:

- An investigation report (EIR-2016-009, *AOP-015 Entry in AP07A-WT-TBX-002 Cabinet*) performed under instruction by an unqualified investigator was lacking in detail and rigor to present a complete summary of facts upon which to base recommendations for action. Given the importance of the tank vapor issue, the investigation lacks the accuracy and content needed to develop actions to prevent recurrence.

- EA reviewed EIR-2016-008, *Unplanned Shutdown of AW Farm Primary Ventilation*. Two NCOs, stated to be "knowledgeable and experienced" by the investigation report, who had not performed that task before improperly isolated the incorrect de-entrainer, resulting in the ventilation shutdown. The investigation report stated that the pre-job briefing was not adequate, the operations supervisor and NCOs did not understand the system operation, and the two procedures used for flushing and system operation do not branch effectively. The recommended action was to make the flushing procedure stand alone for valve operation, but did not address the lack of operations personnel training regarding system operation. The system is considered safety significant in the DSA, and personnel who operate it are required to be trained in accordance with DOE Order 426.2. *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities* (See Section 5.3 of this report and **Finding-WRPS-02**.)

Performance Indicators

At the company level, approximately 40 indicators are reported monthly in a "Performance Dashboard," addressing safety and health, conduct of operations, environmental management, engineering, radiological control, emergency preparedness, problem identification and resolution, performance assessment, and management focus areas. Each indicator is identified as a leading or lagging indicator; reflects performance over the past year; identifies the objective, measure, goals, and performance thresholds (i.e., red, yellow, green, and blue rating levels); and analysis and action statements. The indicators are reasonably effective in support of the contract-level performance goals.

The *Performance Indicator Program* procedure (TFC-PRJ-PC-C-11) specifies that level 1 and 2 managers are to analyze the indicators for which they or "performance indicator owners" are assigned for

adverse trends each month and are directed to submit a PER for any adverse trend. Interviews and records reflect management engagement and effective implementation of the program. The performance indicator program procedure works in conjunction with procedure TFC-ESHQ-Q-C-C-06, *Trend Analysis Process*, for analysis responsibilities of the company's Contractor Assurance Manager and staff. Procedure TFC-ENG-FACSUP-D-01 describes the CSE's role in system monitoring and analysis of performance data. As discussed under Section 5.6, Cognizant System Engineer Program, the CSE engagement in analysis of performance can be improved. Identified trends are identified in the PER system for tracking and resolution. PERS themselves are coded for trending during the frequent PER screening meetings. The program reflects active management attention and is generally effective in establishing appropriate metrics and measurement of progress.

Engineering has successfully established and maintains organization-level performance indicators addressing such areas as ECN backlog, design errors, and ventilation system performance. Each indicator report has a red/yellow/green/blue rating; includes a definition, measures, goals, analysis, and action descriptions; and addresses monthly performance over a 12-month period. Similar to the company-level performance indicators, when actions are identified on the Performance Dashboard sheet there is no PER notation of designation of an action owner or the method of managing the specified action(s). A recent management assessment (FY2015-MAINT-M-0123) recorded a finding (WRPS-P-2015-2005) that most managers in the maintenance area were not aware of the performance indicators being tracked, nor how to use them. This level of assessment results supports the effectiveness of the CAS. Additional concerns with maintenance performance measures are discussed in that subject section of this report.

Issues Management

WRPS has established an adequate issues management program and processes to document, evaluate, and correct deficiencies and promote continuous improvement using a graded approach. It is particularly beneficial that the PER system encourages a zero-threshold, formal identification, evaluation, and management system for all levels of process and performance problems and OFIs. Procedures and guidance documents define the requirements and processes for conducting apparent and root cause analysis. An ESRB of top-level company managers meets monthly to review, discuss, and approve reports and actions relative to oversight of the integrated safety management system, environmental management system, SMP, and safety culture; corrective action management and reporting systems; assessment program; and other concerns, such as tank leakage and vapors. Longstanding and regularly maintained program improvement plans are in place for the Engineering, Conduct of Operations, CAS, and many other organizations' programs. A collective significance review process brings company Environment, Safety, Health, and Quality; Engineering; Maintenance; Production Operations; and CAS management and staff; organization assurance staff, and bargaining personnel together regularly to review and discuss feedback and performance data sets for common themes and areas needing further review or action, with recommendations reported to senior management.

WRPS established a Collective Significance Review committee, with meetings held monthly to identify trends or other indications requiring monitoring or action to ensure the long-term, continued improvement in operations. Chaired by the CAS Manager, the committee is composed of appointed managers across the organization's various disciplines for the review of input from a variety of sources for identifying trends, including ORP monthly reports or other indications requiring action. Presentations and deliberations are designed to "detect performance issues at a low level before they become consequential; assist in identifying the most risk-significant or important issues on which to act; identify issues that need further analysis and intervention; and assist in identifying and resolving cross-organizational performance issues." EA reviewed minutes of meetings and packages prepared for meetings. Overall, the outputs of the committee in the form of additional investigations into trends, concerns, and issues provide a good level of assurance that performance indicators and the collective experience base can identify and affect

improvement in operational performance. EA considers the Collective Significance Review process a best practice.

EA reviewed more than 50 completed and in-process PER documents, including those PERs generated during the 2013 DOE safety system assessment and PERs associated with the event reports discussed in other sections of this report. Although WRPS has documented, evaluated, and effectively resolved most issues using the PER process, the program's effectiveness is limited by minor implementation weaknesses. Except for higher significance events, closures are not subject to review beyond the responsible manager. EA identified and informally provided WRPS several examples where the documentation of completed corrective actions was missing or evaluation and disposition of PERs was weak (e.g., closed without the responsible manager understanding the problem, justifications for not taking corrective action) or not sufficiently rigorous or comprehensive to provide a full understanding of the issue or fully effective actions to prevent recurrence.

EA reviewed the action to close the following finding from the 2013 safety system review: Finding WRPS-F&I-2/WRPS-PER-2013-0767, which states, "The implementation of issues management processes by WRPS has not been fully effective in ensuring that the extent and causes of problems are fully and accurately investigated and that these processes result in appropriate, effective corrective actions and recurrence controls." The PER procedure (TFC-ESHQ-QC-C-01, *Problem Evaluation Request*) was revised to incorporate improved guidance for extent of condition. EA reviewed examples of extent of condition reviews, including a few that were Price Anderson Amendment Act reportable, and found them to be exercised appropriately and generally effective. Proper action was also taken to improve understanding of responsible managers relative to PER process expectations and the extent of condition process through a Corrective Action Management Bulletin. Action items identified in the Corrective Action Management Program reflect a positive management commitment to continuous improvement in Contractor Assurance System.

Lessons Learned

WRPS has established and implemented an effective operating experience/lessons learned program that identifies, evaluates, and provides for appropriate application of lessons learned generated from external operating experience and internal activities, conditions, and events. The program includes an intranet site and a designated company coordinator who maintains formal documentation and manages screening activities, subject matter expert evaluations, and application actions. The lessons-learned intranet website contains hotlinks to WRPS internally generated lessons learned documents, as well as the DOE Headquarters lessons learned website and database. Participation in the OPEXSHARE collaborative lessons-learned database is evident and positive.

The fulltime, designated company coordinator effectively maintains the site procedure, interfaces with the OPEXSHARE lessons-learned administrator, and inputs lessons to that database. A specialty assessment of the lessons learned program effectiveness was conducted in 2015 (FY2-15-OPI-S-0319) that recorded some OFIs but concluded the program was effectively implemented. Although the quality of the report was lacking (criteria not aligned with objectives, some OFI statements unclear), the scope of the review was a good self-assessment of the program. The coordinator maintains a spreadsheet of the externally generated lessons that are screened, the assignment and status of subject matter expert review, the evaluation results (including actions to be taken and when taken) and PERs that are written, when appropriate.

A positive benefit of the WRPS use of the OPEXSHARE lessons-learned system is the feature of a non-mandatory feedback mechanism for reporting lesson quality or usefulness and whether or how viewers applied the lesson. Additionally, the application of lessons learned is one of the current performance

indicators the coordinator monitors that is rolled up to the WRPS Performance Dashboard. Use of lessons learned as a performance indicator is a positive indication that management intends to learn from mistakes.

Based on problems experienced during fabrication and construction of the AX Farm ventilation system, WRPS commissioned an independent design verification and collection of problems to be fixed in early 2015. A valuable report of lessons learned and design improvements RPP-RPT-58659, *AX and AP Farm Ventilation System Design Lessons Learned*, dated February 17, 2016 was prepared by KURION, a waste technology company, summarizing several sources of feedback. The issues were not yet entered into a PER or OPEXSHARE by April 2016, leaving the feedback of ongoing design and installation work to informal methods.

Activity-Level Feedback and Improvement

As discussed in Section 5.1, post-job reviews were performed, but the traceability of the feedback lacks rigor. EA reviewed closure of the 2013 Finding Maint-1: WRPS produced no evidence to substantiate that the supervisor properly reviewed and addressed the post-job feedback included in four of the five CM work packages that were reviewed. WRPS subsequently revised TFC-OPS-MAINT-C-02, *Pre-Job Briefings and Post-Job Reviews*, to include specific supervisory responsibilities and then conducted training on the procedure.

WRPS Feedback and Improvement Program Summary

With some minor exceptions, WRPS has established defined feedback and improvement programs, processes, and implementing documents supporting the effective management of Tank Farms safety systems. A well-structured assessment program is implemented that adequately assesses programs, processes, and performance related to the management of Tank Farms safety systems. However, a few weaknesses in attention to detail as applied in planning, performing, and documenting assessment activities and issues management processes have resulted in corrective actions not always being accurately and rigorously implemented to ensure that problems are effectively addressed. While some concerns were identified as detailed above, the event reporting and investigation processes were found to be generally compliant and effective in support of the reporting and corrective action development processes. With exceptions noted in Section 5.4 of this report, WRPS has established and maintains a suite of appropriate performance indicators and associated analysis to assist management in monitoring performance levels in key areas affecting nuclear safety and prompting further evaluation or corrective actions when warranted and as a tool for driving continuous improvement. WRPS has established and implemented the elements of an appropriate assurance system supporting Tank Farms management of safety systems. Managers and subject matter experts are capable, proactive, and focused on effective performance and continuous improvement.

5.10 ORP Feedback and Improvement Program

Criteria:

DOE ORP has established and implemented an effective SSO program for qualifying staff to apply engineering expertise in its oversight of the assigned safety systems and to monitor performance of the contractor's CSE program. (DOE Order 426.1, Appendix D)

DOE ORP has established and implemented effective processes for monitoring and assessing contractor programs for ensuring effective design, configuration management, maintenance, and operation of safety systems. (DOE Order 226.1B)

DOE ORP and its contractors have included the review of safety systems in the evaluation and approval of the startup and restart of nuclear facilities and activities. (DOE Order 425.1D)

In addition to the focused review of the ORP SSO program, EA performed an assessment of the establishment and implementation of ORP programs and processes for conducting oversight of WRPS management and operation of nuclear safety systems and ORP internal feedback and improvement systems and performance. The current scope was limited to review of the ORP program and process documents, interviews of responsible managers and staff, and evaluation of samples of process outputs (e.g., assessment schedules, surveillance and operational awareness reports, issues management data, contract performance-based incentive criteria, evaluations, and ORP self-assessments). Review of ORP assessment planning identified that ORP is not scheduling and performing DOE Order 426.2 required triennial assessments of WRPS training. (**Deficiency**)

Other than failure to perform triennial assessments of WRPS training, ORP has established and implemented adequately defined contractor oversight and feedback and improvement programs. ORP has established formal contractor oversight and self-assessment programs and implementing procedures that provide for a comprehensive, risk-based prioritized assessment of nuclear safety programs and performance and effective management of identified issues. A formal process has been established and implemented for identifying, planning, scheduling, performing, and monitoring surveillance activities that are integrated into the WRPS assessment schedule. Formal processes have been established for evaluating the contractor's quarterly event analysis report, safety basis management, startup/restart of nuclear facilities, issue reporting and resolution, and staff technical qualification.

ORP SSO engineers, nuclear safety engineers, subject matter experts, and FRs effectively conduct operational awareness reviews and formal surveillances of specific functional or topical areas; document routine operational awareness activities; and follow-up on corrective actions to identified issues related to health, safety, environment, and nuclear safety. Recent ORP monthly reports have provided insightful evaluations of WRPS corrective action effectiveness, and because WRPS takes these for action, the feedback is improving the quality of corrective action management. ORP surveillances are appropriately planned and scheduled on an annual basis and have been integrated into the contractor's integrated assessment schedule. Schedules are changed or supplemented as appropriate and maintained throughout the year. An ample number of about 140 formal ORP oversight activities were incorporated into the WRPS integrated assessment schedule for FY 2016. In addition, hundreds of less formal oversight activities, such as field observations, meeting attendance, and document reviews, are documented annually in a searchable ORP operational awareness database. This substantial number of assessment activities provide a good basis for the ORP monthly reports. These reports commendably communicate oversight assessment and operational awareness activities and the resulting findings and observations to the contractor, with specific expectations for corrective actions and formal responses requested for issues of higher significance.

ORP employs a variety of appropriate performance-based incentives to prioritize and monitor contractor performance in ensuring or improving nuclear safety. Areas with defined incentives, objectives, and criteria/measures for FY 2016 include Integrated Safety Management System culture, management field presence and feedback and improvement, equipment status and control, improve CSE and work practices, disciplined conduct of engineering, improve self-identification of issues, improve work planning/conduct of operations, and reduce delinquent PM performance. Many of the incentives and measures support the effective management and sustained operability of safety systems.

ORP Feedback and Improvement Program Summary

Overall, ORP has established and implemented effective programs and processes for conducting oversight of WRPS management and operation of nuclear safety systems, and ORP safety system feedback and improvement processes are effective in addressing and preventing the recurrence of safety system issues. Other than not scheduling and performing DOE Order 462.2 required triennial assessments of WRPS training, ORP staff appropriately implement oversight programs and processes. ORP has also established appropriate and measurable performance-based incentives related to nuclear safety.

5.11 Review of Actions Taken Addressing Items Identified in EA April 2013 Review of the Hanford Tank Farms Safety System Management

Criterion:

Identify the causes of problems and work to prevent recurrence as a part of correcting the problem. (10 CFR 830.122 Criterion 3)

April 2013 Finding	WRPS Action Taken	WRPS Status/EA Evaluation
Finding Maint-1: WRPS produced no evidence to substantiate that the supervisor properly reviewed and addressed the post-job feedback included in four of the five CM work packages that were reviewed.	Post-job review procedure (TFC-OPS-MAINT-C-02) was revised, including specific supervisory responsibilities, and training was conducted.	**Closed/Adequate**
(CLOSED) Finding Maint-2: Compliance with the S/CI procedure training required by TFC-ESHQ-Q_C-C03, *Control of Suspect and Counterfeit Items*, Section 4.9, "Training," could not be demonstrated.	Procedure was revised. Issues with required reading administration were discovered and corrected. 14-QSR-006 identified the gap and initiated 2014-PER-0071. A specialty assessment was performed in June 2014 (FY2014-ESHQ-S-0323) on S/CI that included follow-up on this issue.	**Closed/Adequate**
(CLOSED) Finding Ops-1: The current implementation of procedures for aligning and verifying valves during waste transfer operations, as well as the human factors deficiencies in the valve positioning procedure, does not meet the human factors standards for development and use of procedures established by WRPS, thereby increasing the likelihood of errors in valve positioning	Procedures were revised so that operators do not need to take two procedures into the field. HNF-IP-1266 was updated to allow double valve isolation of waste transfer valves to be performed by a waste transfer procedure, resolving the generic issue.	**Closed/Adequate**
(CLOSED) Finding CSE-1: Contrary to WRPS procedure TFC-ENG-FACSUP-D-01.2, *System Notebook Preparation*, the Retrieval and Closure mechanical systems notebook has not been kept up to date, and previous WRPS system notebook corrective actions, including corrective actions for the most recent PER on this topic (WRPS-PER-2012-0486), have not been effective in maintaining the notebook.	Criteria for notebook maintenance was revised (TFC-ENG-FACSUP-D-01.2), the notebooks were brought into compliance, and a MOP (WRPS-MOP-2014-2972) was performed to review completed actions. The EStars links to the IDMS record only go to the PER print file.	**Closed/Adequate**

April 2013 Finding	WRPS Action Taken	WRPS Status/EA Evaluation
(CLOSED) Finding WRPS-F&I-1: WRPS is not effectively implementing the initial event investigation process as specified in procedure OPS-OPER-C-14, *Initial Event Investigation Process*, and Section 2.5 of TFC-PLN-02.	The procedure was revised and new training and qualification requirements for the EIR team lead were instituted. The IDMS record does not contain evidence of closure (procedure, qualification card).	**Closed/Adequate**
(CLOSED) Finding WRPS-F&I-2: The implementation of issues management processes by WRPS has not been fully effective in ensuring that the extent and causes of problems are fully and accurately investigated and that these processes result in appropriate, effective corrective actions and recurrence controls as required by DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*; 10 CFR 830, Subpart A, *Quality Assurance Requirements*; WRPS TFC-ESHQ-QC-C-01; and WRPS TFC-PLN-02.	The PER procedure (TFC-ESHQ-QC-C-01) was revised to incorporate improved guidance for extent of condition.	**Closed/Adequate**

EA found the actions taken in response to the above listed findings from EA's 2013 review of WRPS safety system management at the Hanford Tank Farms adequately addressed the findings.

6.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and implement corrective action plans for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1A to manage these corrective action plans and track them to completion. In addition to the findings, deficiencies that did not meet the criteria for a finding are listed in Appendix C, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

Finding-WRPS-01: Contrary to DOE Order 433.1B, the WRPS PM program is not maintaining safety SSCs in accordance with the DOE-approved NMMP in that PMs are not required to be performed on or before the established due date and are not being performed at the required frequency.

Finding-WRPS-02: Contrary to the requirements of DOE Order 426.2, NCO operator training is not ensuring that operators achieve and maintain adequate knowledge and skills.

7.0 OPPORTUNITIES FOR IMPROVEMENT

No OFIs were identified during this assessment.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: March 15-17, and April 11-21, 2016

Office of Enterprise Assessments (EA) Management

Glenn S. Podonsky, Director, Office of Enterprise Assessments
William A. Eckroade, Deputy Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Deputy Director, Office of Environment, Safety and Health Assessments
Patricia Williams, Director, Office of Worker Safety and Health Assessments
Gerald M. McAteer, Director, Office of Emergency Management Assessments

Quality Review Board

William A. Eckroade
John S. Boulden III
Thomas R. Staker
William E. Miller
Patricia Williams
Gerald M. McAteer
Michael A. Kilpatrick

EA Site Lead for Office of River Protection

Robert E. Farrell

EA Assessors

Robert E. Farrell – Lead
Charles R. Allen
James M. Boyd
Frank A. Inzirillo
Glenn W. Morris
Eric R. Swanson

Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- Training records for two qualified Safety System Oversight (SSO)Engineers
- Training records for one SSO undergoing qualification
- *Tank Farms Safety System Oversight Self-Assessment*, M-15-AMTF-Tankfarm-018, August 12, 2015
- ORP/SSO Report 26027, Review of NCR and WRPS-PER-2016-0150 for gap between freeze protection thermocouple conduit and enclosure
- ORP/SSO Report 26140, Review of SIS Coverage in System Health Reports, February 12, 2016
- ORP/SSO Report 26141, Closure Verification of WRPS-PER-2015-2684, February 23, 2016
- ORP/SSO Report 26272, Review of TF-16-NCR-005 and WRPS-PER-2016-0209 for Freeze Protection Thermocouple short circuit due to insulation trimmed too short, March 1, 2016
- ORP/SSO Report 27402, Review of CAP for Level 2 Finding, S-15-AMTF-TANKFARM-029-F02, System Engineering Program not adequately applied to retrieval systems, March 9, 2016
- ORP/SSO Report 27519, Review of White Paper on portable combustible gas monitors (CGMs), March 21, 2016
- ORP/SSO Report 26216, IAS 16317 (Review of supporting documentation for the 242-A Evaporator safety significant seismically-qualified steam isolation valve), February 19, 2016
- ORP/SSO Report 24536, Investigation of recent C111 retrieval shutdowns with focus on Hydraulic Power Unit (HPU) failures that may be linked to recent resetting of the high temperature interlock, October 16, 2015
- ORP/SSO Report 24888, Review of WRPS Supplemental Corrective Action Plan (CAP) for A-14-AMTF-TANKFARM 001-F01; "Inadequate Review/Accuracy of Rounds/Data Sheets/Checklists that Impact Documented Safety Analysis (DSA) Implementation," December 30, 2015
- ORP/SSO Report 24870, Review of the Low Activity Waste Pretreatment System (LAWPS) 30 percent Design Proposed RCR Resolutions from WRPS, December 23, 2015
- ORP/SSO Report 24868, Review of Rev E of the 2016 IQRPE Double-Shell Tank System Integrity Assessment Report (DSTAR), December 23, 2015
- ORP/SSO Report 22984, Double-Shell Tank System IQRPE Integrity Assessment Project Review, March 6, 2015
- ORP/SSO Report 22673, IAS 14087 (Readiness for next IQRPE Integrity Assessment), February 4, 2015
- ORP/SSO Report 24808, SSO-CSE Monthly Ventilation Meeting, December 10, 2015
- ORP/SSO Report 24628, Level 2 Assessment IAS#15134, Ventilation System Upgrades for 2012-2, November 2, 2015
- ORP/SSO Report 24160, IAS14092, AP Farm Exhauster Upgrade, September 8, 2015
- ORP/SSO Report 23669, IAS 15299, Maintenance Management of DST VTP Systems, July 7, 2015
- ORP/SSO Report 22926, Level 2 Assessment IAS 15126, Effectiveness of the CSE Recommendations Program, March 2, 2015
- ORP/SSO Report 27557, Level 2 Assessment IAS 161541, Management of Technical Baseline Documents for New AP Exhauster, March 24, 2016
- TFC-ENG-DESIGN-C-06, *Engineering Change Control*, Rev K-2, 10/1/15
- TFC-ENG-DESIGN-C-09, *Engineering Drawings*, Rev E-4, 3/14/16
- TFC-ENG-DESIGN-C-10, *Engineering Calculations*, Rev B-9, 7/21/15
- TFC-ENG-DESIGN-C-25, *Technical Document Control*, Rev F-3, 7/21/15
- TFC-ENG-DESIGN-C-52, *Technical Reviews*, Rev A-8, 11/10/15
- TFC-ENG-DESIGN-C-55, *Design Subcontract Deliverable Review*, Rev A-3, 9/29/15
- TFC-ENG-DESIGN-C-56, *Modification Traveler*, Rev C-1, 11/10/15

- RPP-13033 revision 6, *Tank Farms Documented Safety Analysis*
- HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*
- TFC-ENG-DESIGN-D-06.1, *Engineering Change Control Guidance*, Rev A, 2/25/16
- TFC-ENG-DESIGN-D-51, *ECN Preparation and Work-Completion Walkdown*, Rev A-3, 9/30/15
- TFC-ENG-DESIGN-P-17, *Design Verification*, Rev D-15, 9/29/15
- TFC-ENG-DESIGN-P-07, *System Design Descriptions*, Rev C-2, 9/29/15
- TFC-ENG-STD-45, *Design and Installations for Potentially Flammable Atmospheres*, Rev A, 9/29/15
- TF-OPS-IHT-001, *IHT Flammable Gas Surveillances on Double Shell Tanks*, Rev D-5, 3/25/15
- TFC-PLN-23, *Configuration Management Plan*, Rev B-4, 5/7/15
- TFC-PLN-136, *Engineering Design Program*, Rev B, 3/8/16
- iTX Multi-Gas Monitor Instruction Manual P/N 1709-5753 Revision 5
- TF-OPS-IHT-004 D1, *Preparation and Field Use of iTX Multi-Gas Monitor and iSP Sampling Pump*
- TFC-ENG-DESIGN-P-53, *Design Authority Technical Review*, Rev A-4, 9/29/15
- TFC-ENG-DESIGN-P-54, *Checking of Engineering Documents*, Rev A-5, 10/29/15
- RPP-CALC-42014, Rev 0, *AN/AW Exhauster Stack Platforms*
- RPP-CALC-47196 Rev 0, *241-AP Fan Capacity and Sizing Calculation*
- RPP-CALC-47198 Rev 1, *241-AP Exhauster Heater Capacity and Sizing Calculations*
- RPP-CALC-48176 Rev 1, *241-AP Exhauster Train Sun Shield Support Analysis*
- RPP-CALC-49417 Rev 1, *AP Exhauster Drain Stress Analysis*
- RPP-15121, *System Design Description for AW Tank Farm Ventilation Tank Primary System*
- RPP-CALC-47336
- RPP-RPT-58659, *AX and AP Farm Ventilation System Design Lessons Learned*, dated February 17, 2016
- TFC-PLN-03, *Engineering Program Management Plan*, Rev G-3, 8/19/15
- HNF-1901, *Technical Baseline Summary Description*, Rev 4, 12/21/15
- ECN-711096, *AP Farm Exhauster Refurbishment and Installation – Mechanical/Piping Package*
- ECN-711252, *AP Farm Air Inlet Station Design*
- ECN-711658, *AP Exhauster Maintenance Receptacles*
- ECN-711661, *AN Farm DST Flow Monitoring Mechanical Installation*
- ECN-711694, *AP Exhauster Sample return Line Heat Trace – 300 Degree Fahrenheit Cable*
- MT-50043, Rev2, *DST Flow Monitoring*
- H-2-834110-1
- H-2-85141-1
- H-2-85141-2
- H-2-85141-3
- H-2-85141-4
- H-2-85141-5
- H-2-85141-6
- H-2-85141-7
- H-14-010501 SH 001-26
- H-14-020601 SH 001-19
- H-14-102410-1
- H-14-102410-2
- H-14-102410-3
- H-14-020101 SH 001-16
- H-14-020101 SH 002-11
- H-14-020101 SH 003-17

- H-14-020101 SH 004-14
- H-14-020102 SH 001-12
- H-14-020102 SH 002-18
- H-14-020102 SH 003-10
- H-14-020102 SH 004-05
- H-14-020102 SH 005-04
- DOE-0336, Hanford Site Lockout / Tagout Procedure
- CSO-TR-128, AP-102 Tank Pressure Temporary Round Sheet
- Continuing Training Course # 352003 Handout
- EABO-11051 R6, *AY/AZ Farm SEG 1 Work Activities Industrial Hygiene Sample Plan*
- RPP-PLAN-60610, *Tank 241-AY-102 Contingency Plan – Operations Phase*
- RPP-RPT-63141, *Structures, Systems and Components (SSC) Status & Health Report TOC Ventilation Systems*, various revisions
- Tagout AN-16-07, Lockout Tagout Authorization Form.
- *Tank Operations Contractor Training Implementation Matrix*. Revision 426.2-1-9/14
- TF-AOP-020, *Tank Farm Abnormal Operating Procedure*
- TFC-PLN-05, *Conduct of Operations Implementation Plan*
- TFC-PLN-61, *Tank Operations Contractor Training and Qualification Plan*
- TFC-ENG-DESIGN-P-07, *Engineering Assessments*
- TFC-ENG-FACSUP-D-01.1, *Engineering System Monitoring, Performance, and Reporting Guidance Document*
- TFC-ENG-FACSUP-D-01.2, *System Notebook Preparation*
- TFC-ENG-FACSUP-P-01, *TOC System Engineer Program*
- TFC-ENG-STD-43, *Engineering TOC Systems, Structures, and Components Boundaries, Selection Basis, Description and Implementation*
- TFC-OPS-MAINT-C-06, *Notification and Evaluation of Out-of-Calibration Measuring and Test Equipment*
- TFC-OPS-MAINT-C-07, *Control and Calibration of Measuring and Test Equipment*
- TFC-OPS-MAINT-C-12, *Preventive/Predictive Maintenance Administration*
- TFC-PLN-05, *Conduct of Operations Implementation Plan*
- TFC-PLN-114, *Conduct of Operations Improvement Plan*
- Various Preventive Maintenance Work Packages
- Various Corrective Maintenance Work Packages
- Various operator and CSE training documents
- DE-AC27-08RV14800, *WRPS Contract*, Modification No. 330
- RPP-MP-003, *Integrated Environment, Safety, and Health Management System Description for the Tank Operations Contractor*, Rev 6-E, 9/25/15
- 2016 *Contractor Assurance Management Plan*, 3/3/16
- TFC- PLN-119, *Radiation Protection Program Assessment Plan*, REV B-6, 11/18/15
- TFC-BSM-AD-C-10, *Differing Professional Opinions Resolution*, REV A-6, 4/5/16
- TFC-BSM-CP_CPR-C-20, *Subcontractor Oversight*, REV A-3, 12/1/14
- TFC-BSM-HR_MA-C-02, *Employee Concerns Program*, REV B-9, 6/23/11
- TFC-CHARTER-32, *Executive Safety Review Board*, REV F-5, 11/30/15
- TFC-CHARTER-42, *Conduct of Operations Council*, REV C-1, 6/30/15
- TFC-CHARTER-44, *Collective Significance Review*, REV C-2, 2/18/16
- TFC-ENG-ADMIN-D-07, *Engineering Assessments*, REV D-6, 2/18/16
- TFC-ESHQ-AP-C-01, *Management and Specialty Assessments*, REV H, 3/14/16
- TFC-ESHQ-AP-C-02, *Independent Assessments/Audits*, REV E-7, 1/21/16

- TFC-ESHQ-AP-C-03, *Management Observation Program*, REV C, 3/2/16
- TFC-ESHQ-AP-C-09, *Lead Independent Assessor/Lead Auditor Certification,* REV B, 11/16/15
- TFC-ESHQ-PAAA-C-01, Price-Anderson Amendments Act Evaluation and Reporting, REV D-4, 12/16/15
- TFC-ESHQ-Q_ADM-C-11, *Root Cause Analysis*, REV D-4, 10/5/15
- TFC-ESHQ-Q_C-C-01, *Problem Evaluation Request,* REV M-2, 3/9/16
- TFC-ESHQ-Q_PP-P-02, *Quality Assurance Surveillances*, REV E-1, 7/30/14
- TFC-ESHQ-S_SAF-C-12, *Safety Inspections*, REV A-1, 11/3/14
- TFC-ESHQ-S_SAF-P-06, *Safety and Health Assessments*, REV C-1, 12/30/15
- TFC-OPS-MAINT-C-02, *Pre-Job Briefings and Post-Job Reviews*, REV E-7, 3/7/16
- TFC-OPS-MAINT-STD-02, *Work Planning And Work Instruction Development,* REV C-9, 12/16/15
- TFC-OPS-OPER-C-14, *Initial Event Investigation Process*, REV F-1, 8/28/13
- TFC-OPS-OPER-C-24, *Occurrence Reporting and Processing of Operations Information*, REV D-6, 8/27/15
- TFC-OPS-OPER-C-28, Lessons Learned, REV D-3, 7/11/13
- TFC-OPS-OPER-C-57, *Event Notification*, REV A-10, 4/21/16
- TFC-PLN-10, *Assessment Program Plan*, REV E-3, 5/31/13
- TFC-PLN-32, *Tank Operations Contractor Safety Management Programs*, REV B-28, 3/10/15
- TFC-PLN-39, *Pbs-Orp-0014 Enterprise Risk & Opportunity Management Plan*, REV H, 3/4/15
- TFC-PLN-83, *Assurance System Program Description,* REV B-9, 8/3/15
- TFC-PLN-116, *Subcontractor Oversight*, REV E-3, 5/31/13
- TFC-PRJ-PC-C-11, *Performance Indicator Program*, REV B, 11/19/14
- TFC-PRJ-PM-C-06, *Operational Readiness Process*, REV B-7 6/25/14
- TFC-PRJ-PM-C-07, *Startup Management Self-Assessment*, REV B-7, 1/14/15
- TFC-PRJ-PM-C-09, *Readiness Assessment,* REV C-2, 12/1/14
- TFC-PRJ-PM-C-25, REV A-8, *Readiness Verification Checklist* 12/11/13
- FY2014-OPS-X-0201, Assessment of WRPS Safety Basis Implementation
- FY2014-WRPS-I-0007, Industrial Hygiene Equipment Services (IHES) Triennial Assessment
- FY2015-0PI-M-0124, Performance Assessment (SMP)
- FY2015-0PS-S-0305, End Point Assessment Report WRPS-PER-2013-1676
- FY2015-OPS-S-0305, Endpoint Assessment Technical Safety Requirements and Environmental Calibration PMs Administrative Barriers Review PER-2013-1676
- FY2015-WRPS-I-0003, Independent Assessment of WRPS Preventive Maintenance Program
- FY2015-WRPS-l-0009, Independent Assessment of Tank Farm Projects Work Planning, Control, and Field Execution
- FY2016-OPS-S-0355, *Limiting Condition for Operations* (LCO) 3.1
- FY2016-OPS-S-0357, TSR Annual Assessment 2015
- FY2016-SSTR- S-0301, End Point Assessment (EPA) Report FY2016-SSTR-S-0301, WRPS-PER-2013-1595
- FY2016-WRPS-I-0001, Mission Support Alliance
- Performance Trends & Recurring Occurrence Analysis Quarterly Report October 2014 through September 2015

Interviews

Contractor Personnel

- Engineer
- Operators (2)

- Shift Operations Managers (2)
- Shift Supervisors (2)
- Shift Technical Engineer
- Design Engineering Manager
- Design Engineering Group Lead
- Deputy Manager for Engineering Process Improvements/Staffing
- Ventilation System Cognizant System Engineers (2)
- Engineering Programs Manager
- Projects and Integrity Engineering Manager
- ORP Nuclear Safety Division Director
- ORP Tank Farm Ventilation SSO
- Area Managers (2)
- AZ Team Maintenance Mgr.
- AZ Team Shift Manager
- Cognizant System Engineer (2)
- Deputy Production Operations Manager
- Field Work Supervisors (3)
- Maintenance Manager
- Nuclear Chemical Operators (4)
- Operations Engineer (2)
- Production Operations Manager
- Production Operations Training Lead
- Shift Managers (4)
- System Engineering Manager
- Tank Farm Operations Training Manager
- Tank Farm Training Manager
- Contractor Assurance Manager
- Corrective Action Manager
- Performance Assurance Manager
- Occurrence Reporting Coordinator
- Contractor Assurance Coordinator
- Regulatory Compliance Officer
- Production Operations Engineering Manager
- Production Operations Technical Support Manager
- Cognizant System Engineering Manager
- Cognizant System Engineer (2)
- Quality Assurance Manager
- Quality Assurance Engineer (2)
- Quality Procurement Engineer (2)

DOE ORP Personnel

- Office Manager
- Deputy Office Manager
- Deputy Assistant Manager Tank Farms Project
- Assistant Manager Technical and Regulatory Support
- Safety and Health Division Director
- Quality Assurance Division Director
- Tank Farms Operations Division Director

- Facility Representatives (several)
- Safety System Oversight Engineers (3)
- Performance Assurance Manager
- Subject Matter Experts (several)

Observations
- Team Daily Meetings
- Daily Meetings
- Evolution
- Walkdown
- AN/AP Farm operator rounds (using Electronic Shift Operations Management System)
- AP-102 Tank Pressure Temporary Round Sheet implementation
- AW Farm operator rounds
- Compliance Surveillance on AW farm Exhauster
- Conduct of Operations Council Meeting
- Corrective maintenance activities (2)
- Log out tag out removal
- Multiple shift turnover meetings
- Multiple pre-job briefs
- NCO on-the-job training on Electronic Shift Operations Management System log keeping system
- Preventive maintenance activities (5)
- Various Shift Turnovers
- Walk down of AW farm with System Engineer
- ESRB Meeting
- AW Tank Farm Tour
- PER Screening Meeting
- Plant Review Committee Meeting (pressure transmitter PISA)
- Quality Assurance/CAS ORP/WRPS Interface Meeting
- Facility Representative Monthly Meeting
- Conduct of Operations Council Meeting

Appendix C
Deficiencies

Deficiencies that did not meet the criteria for a finding are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- Contrary to the requirements of DOE Order 422.1, Section 2.b, *Shift Routines and Operating Practices*, and Section 2.h, *Control of Equipment and System Status*, operation staff were not informed of questionable as-found conditions of TSR-related instruments.

- The WRPS Conduct of Operations program has not implemented the requirements of DOE Order 422.1, Section 2.m.

- Contrary to the requirements of DOE Order 433.1B, the WRPS tank farm maintenance performance measures do not capture all types of maintenance issues requiring corrective action and lessons learned.

- Contrary to the requirements of WRPS work control procedure TFC-OPS-MAINT-C-01, completed work packages performed during the last three years contained minor errors.

- Contrary to the requirements of DOE Order 420.1C, annual system assessments (which WRPS calls system health reports) do not include material condition.

- ORP is not planning, scheduling, and performing DOE Order 426.2 required triennial assessments of WRPS training.