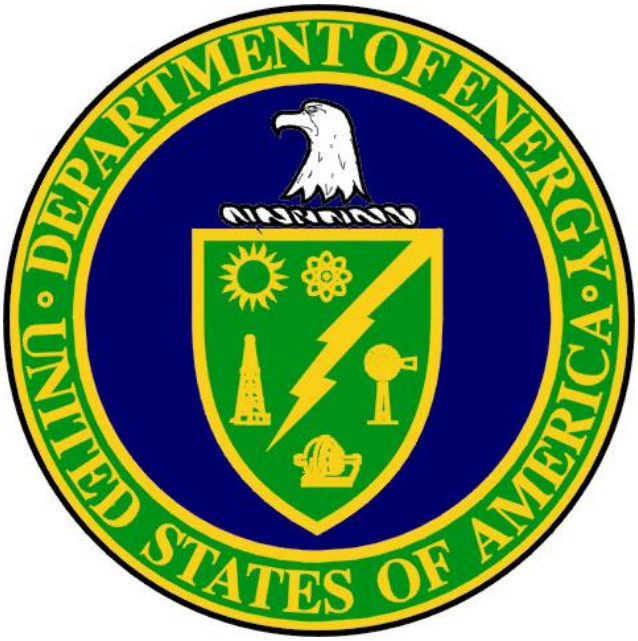
Office of Enterprise Assessments
Assessment of Construction Quality at the Hanford Site
Waste Treatment and Immobilization Plant



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Office of Nuclear Safety and Environmental Assessments
Office of Environment, Safety and Health Assessments
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Acronyms

ASME	American Society of Mechanical Engineers
AWG	American Wire Gauge
BNI	Bechtel National, Inc.
BOF	Balance of Facilities
CAMP	Corrective Action Management Program
CDR	Construction Deficiency Report
CFR	Code of Federal Regulations
CM	Commercial Grade
CR	Condition Report
CRAD	Criteria and Review Approach Document
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
FC	Field Change
FE	Field Engineer
HLW	High-Level Waste
IPIP	Integrated Project Improvement Plan
LAB	Analytical Laboratory
LAW	Low-Activity Waste
MIP	Management Improvement Plan
NCR	Nonconformance Report
NEC	National Electrical Code
NFPA	National Fire Protection Association Code
NQA	Nuclear Quality Assurance
OFI	Opportunity for Improvement
ORP	Office of River Protection
PICA	Post Installed Concrete Anchor
psi	Pounds per Square Inch
PTF	Pretreatment Facility
Q	Quality Related
QA	Quality Assurance
QAM	Quality Assurance Manual
QC	Quality Control
RFE	Responsible Field Engineer
SSC	Structure, System, and Component
WCD	ORP Construction Oversight and Assurance Division
WTP	Waste Treatment and Immobilization Plant

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EXECUTIVE SUMMARY

The Office of Nuclear Safety and Environmental Assessments, within the U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA), conducted an independent assessment of construction quality and the quality assurance program at the Hanford Site Waste Treatment and Immobilization Plant (WTP) from March 14 to 17, 2016. EA performed this assessment in the broader context of an ongoing program of quarterly assessments of construction quality at the WTP construction site.

The scope of this EA assessment included observing ongoing work activities, reviewing the Bechtel National, Inc. (BNI) program for controlling nonconforming conditions, examining the implementation of selected requirements in the BNI quality assurance program, and following up on issues identified during previous assessments.

BNI continues to identify nonconforming conditions involving procured equipment and hardware. Much of this equipment was manufactured and delivered to the project between 5 and 10 years ago, and some of this equipment was supplied by vendors or manufacturers who are no longer in business. As indicated by the procurement deficiencies that EA reviewed, BNI Design Engineering continues to dedicate a large number of personnel and resources to adequately resolve those nonconforming conditions.

Two deficiencies were identified with the BNI's Field Engineering self-assessment function. Fundamentally, there was a lack of clarity in differentiating between performance of "quality verifications" and the different line function of conducting "management assessments/line surveillances."

Overall, with the exception of electrical construction, the construction quality at WTP is satisfactory in the other areas reviewed (pressure testing of piping, structural concrete, and welding inspection activities). EA reviewed closed nonconformance reports and BNI construction deficiency reports and found that BNI has developed appropriate corrective actions to resolve specific deficiencies. Electrical construction weaknesses were identified with completed wiring installations that did not match design drawings, including improper ground wiring and incorrect breaker and wire sizes. Also, though qualified in accordance with BNI procedures, examples where BNI field engineer performance in the area of final inspection and acceptance of commercial grade work activities was inadequate where observed.

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1.0 PURPOSE

The Office of Nuclear Safety and Environmental Assessments, within the U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA), conducted an independent assessment of construction quality at the Hanford Site Waste Treatment and Immobilization Plant (WTP). The onsite portion of this assessment was conducted from March 14 to 17, 2016. This EA assessment was performed within the broader context of an ongoing program of assessments of construction quality at DOE major construction projects. Because of the safety significance of WTP facilities, EA plans to continue the ongoing program of quarterly assessments of the construction quality at the WTP construction site. These assessments are performed to ensure that construction contractors meet the requirements of 10 Code of Federal Regulations (CFR) 830, Subpart A, *Quality Assurance Requirements*.

2.0 SCOPE

The scope of this quarterly assessment of construction quality included observing ongoing work activities, reviewing the Bechtel National, Inc. (BNI) program for controlling nonconforming conditions, examining the implementation of selected requirements in the BNI quality assurance (QA) program, the BNI corrective action program, and following up on issues identified during previous assessments. Design and procurement programs were not included in this assessment.

3.0 BACKGROUND

The DOE Office of River Protection (ORP) manages the 56 million gallons of liquid or semi-solid radioactive and chemical waste stored in 177 underground tanks at the Hanford Site and the WTP, an industrial complex for separating and vitrifying the radioactive and chemical waste in the underground tanks. The WTP is in the design and construction phase.

BNI manages design and construction activities at WTP under contract to ORP. The QA program requirements for design and construction of the WTP referenced in the preliminary documented safety analysis and cited in the BNI contract are American Society of Mechanical Engineers (ASME) Nuclear QA (NQA) -1-2000, *Quality Assurance Requirements for Nuclear Facility Applications*, and DOE Order 414.1C, *Quality Assurance*.

The WTP complex consists of the Pretreatment Facility (PTF) for separating the waste into low activity and high-activity waste, the High-Level Waste (HLW) Facility where HLW will be immobilized in glass; the Low-Activity Waste (LAW) Facility where the low-level waste will be immobilized in glass; the Analytical Laboratory (LAB) for sample testing; and the balance of facilities (BOF) that will house support functions. Construction work is essentially complete for the LAB and most BOF buildings. ORP staff members, primarily the WTP Construction Oversight and Assurance Division (WCD) staff, provide oversight of construction activities at the WTP.

Construction work activities are deferred in the PTF pending satisfactory resolution of technical questions regarding separation and processing of the waste and the design life of PTF equipment. Construction is slowed in the HLW Facility pending resolution of technical issues involving the waste treatment process.

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 conducted this assessment of WTP construction quality processes in accordance with the *Plan for the Office of Enterprise Assessments Review of the Hanford Site Waste Treatment and Immobilization Plant Construction Quality*, dated March 2016. This assessment considered the requirements of 10 CFR 830, Subpart A, and DOE Order 414.1C, which specify that the contractor must use appropriate national consensus standards to implement DOE QA requirements.

This EA assessment focused on installation and termination of electrical cables, as well as certain portions of the following criteria and review approach documents (CRADs):

- CRAD 45-52, *Construction – Piping and Pipe Supports*
- CRAD 64-15, *Construction – Structural Concrete,* and
- CRAD 64-20, *Feedback and Continuous Improvement Inspection Criteria and Approach – Contractor.*

EA reviewed procedures, specifications, drawings, and records; interviewed key personnel responsible for construction and inspection work activities; and conducted site walk-downs to observe work activities and inspect WTP components. EA conducted several construction site walkthroughs with WCD staff to determine whether work activities were completed in accordance with the appropriate design drawings, specifications, and installation procedures. EA observed a piping pressure test; inspection of welds on piping in the LAW Facility; and drilling and quality control (QC) inspection of holes drilled in a floor slab in the LAW Facility for installation of Q undercut post installed concrete anchors (PICAs). EA reviewed the training and qualification program for BNI construction field engineers (FEs); nonconformance reports (NCRs), construction deficiency reports (CDRs), and condition reports (CRs) that BNI identified under its corrective action program; and the BNI Management Improvement Plan (MIP). EA also reviewed corrective actions to address wiring deficiencies in an installed electrical cabinet that were identified in June 2015 and examined previously completed installation and termination of electrical cables in electrical cabinets.

Section 5.0, Results, includes brief descriptions of the activities that EA evaluated during this assessment, as well as the results of the assessment. Items for follow-up are summarized in Section 8.0. Supplemental information, including the members of the EA assessment team, the Quality Review Board, and EA management, is provided in Appendix A. Key documents reviewed, interviews conducted, and work activities observed are listed in Appendix B.

5.0 RESULTS

The national consensus standard and basis for the BNI QA program is ASME NQA-1-2000. BNI Document 245909-WTP-QAM-QA-06-001, *Quality Assurance Manual*, provides a detailed description of the application of the 18 NQA-1-2000 requirements to the WTP. The QA Manual (QAM) establishes a management system of planned and systematic actions necessary to ensure that structures, systems, and components (SSCs) perform satisfactorily in service.

5.1 BNI Corrective Action Programs

Criteria:

A process shall be established to identify, control, document, evaluate, and correct conditions adverse to quality. Records shall be maintained documenting the corrective action program, including documentation of objective evidence of satisfactory implementation of corrective actions. (NQA-1, Requirement 16; Policy Q-16.1 of the WTP QAM; and DOE Order 414.1C)

Identified conditions adverse to quality shall be documented, evaluated, and corrected in a timely manner. Objective evidence shall demonstrate satisfactory implementation of corrective actions and performance improvement. Issue data shall be analyzed for performance trends and appropriately communicated up the contractor management chain to influence senior management company priorities. (NQA-1, Requirement 16; Policy Q-16.1 of the WTP QAM; and DOE Order 414.1C)

EA reviewed the BNI corrective action program, including NCRs and CDRs, and selected management programs that BNI developed to resolve deficiencies identified by several DOE organizations. EA's observations are discussed in more detail below.

Review of Nonconformance and Condition Reports

BNI Procedure 24590-WTP-GPP-MGT-044, *Nonconformance Reporting and Control*, defines the requirements for identifying, documenting, reporting, controlling, and dispositioning nonconforming conditions associated with Q and commercial grade (CM) SSCs at the WTP. According to 24590-WTP-GPP-MGT-044, SSCs designated as Q (previously classified as Quality-List or QL) in the design documents must be constructed or manufactured in accordance with the WTP QA program and the ASME NQA-1 standard. Additionally, 24590-WTP-GPP-MGT-044 requires SSCs designated in the design documents as non-Q (i.e., CM) to be constructed in accordance with CM standards, such as the Uniform Building Code, or purchased as CM items from vendors who are qualified CM suppliers.

EA reviewed the 52 NCRs that BNI issued between December 23, 2015, and March 16, 2016, and the 64 CDRs that BNI issued between January 5 and March 16, 2016, to evaluate the types of nonconforming issues, as well as their apparent causes and subsequent corrective actions. The NCR categories included 11 NCRs related to construction or installation errors, including damage to installed components resulting from construction activities; 23 NCRs for procurement and supplier deficiencies; 2 NCRs for engineering design deficiencies; 12 for inadequate commercial grade dedication performance by engineering to qualify commercial grade items for use in Q applications; and 4 for subcontractor or materials handling issues. The NCRs related to inadequate commercial grade dedication and procurement and supplier deficiencies are currently being evaluated by Design Engineering, which will determine the corrective actions required to resolve the deficiencies. Most of the open NCRs that are backlogged require review by Design Engineering.

BNI categorized the CDRs as follows: 19 for BNI construction deficiencies, 25 for procurement and supplier deficiencies, 5 for engineering errors, 6 for maintenance issues or for materials identified with expired shelf life, and 9 for deficiencies in subcontractor work. Nine of the supplier CDRs were initiated to document welding deficiencies, primarily undersized welds on tanks (vessels) that were installed in the LAW Facility several years ago.

As EA previously noted, procurement deficiencies continue to challenge the BNI Design Engineering organization. Each procurement issue requires an evaluation by Design Engineering on a case-by-case basis. Many of these issues involve equipment delivered several years ago. Some equipment with identified deficiencies was supplied by vendors or manufacturers who are no longer in business. The number and variety of procurement deficiencies has required Design Engineering to dedicate a large number of personnel to resolve the identified problems. These issues significantly impact the construction schedule. Resources were reallocated replacing construction craftsman with additional engineers to resolve design and procurement deficiencies.

Corrective Action

In 2012, ORP recognized the growing concern with the BNI corrective action timeliness. BNI prepared an Integrated Project Improvement Plan (IPIP) (Ref: 24590-WTP-PL-MGT-12-0012). ORP again identified systemic weakness associated with the BNI Corrective Action Program in Audit Report number U-13-QAT-RPPWTP-001, *Bechtel National, Inc. Quality Assurance Program Requirements 3, 4, 5, 8, 15, and 16*, dated October 28, 2013. Subsequently, in June 2015, the DOE Office of Enforcement signed a consent order with BNI resulting in a financial penalty and BNI commitments to resolve several systemic weaknesses, including its Corrective Action Management Program (CAMP). In response to the consent order and at ORP's direction, BNI developed a MIP to integrate 51 management improvement initiatives (MIP-01–MIP-88), including those from the IPIP. The MIP is described in BNI document number 24590-WTP-PL-MGT-14-0006, *Managed Improvement Plan*.

After CAMP corrective actions were completed, BNI conducted an effectiveness review using an independent team (Ref: 24590-WTP-SAR-OE-15-0004, *Corrective Action Management Program (CAMP) Effectiveness*, dated January 5, 2016). The report in part addressed corrective action backlogs as a "key insight," specifically stating, "Risk management is a key ingredient to effective backlog control, and not every condition or issue has the same risk profile." Overall, the report concluded that CAMP corrective actions provide a reasonable assurance that the WTP Project has achieved, and is on a path to sustain and continuously improve, a CAMP that fully meets all ORP contractual requirements." Since the issuance of the report, CAMP performance has not improved as expected.

WTP has many open NCRs, CDRs, and CRs. Twenty-five percent of the NCRs and CDRs are attributed to construction, exceeded only by supplier nonconformances (about 35 percent of the total). Currently, the resolution of NCRs, CDRs, and CRs is considered part of the work performance. An interview of the BNI Lead Project Control Specialist found that the total project cost does not include any special funding necessary to resolve the many open NCRs, CDRs, and CRs. The monthly rate of initiated NCRs and CDRs appears to have decreased over the past nine months, but so too has the number of onsite construction craft workers. It is to BNI's credit that the workforce remains willing to formally document nonconformances as management strives to reduce the NCR and CDR backlog. This commitment was consistently communicated by FEs during interviews. In contrast, the BNI contractor assurance system metric for CAMP timeliness indicates an adverse trend over the last four months, the average age of open CRs (Level A, B, and C) growing to 424 days.

The Field Engineering Manager has communicated the organization's goals for closing NCRs and CDRs to his FEs. Two performance metrics on the WTP Project Health Dashboard are monitored, one for NCR

and CDR Legacy backlog reduction and one for NCR and CDR Current Year backlog reduction. The FE organization previously attempted to develop a "significance level" for NCRs and CDRs to address relative risk. The effort was abandoned due to the inability to make reasonable estimates of engineering disposition and impacts that engender confidence. Currently, the BNI FE prioritizes efforts to close NCRs and CDRs based on system turnover. Open NCRs specific to a system receive prioritized attention about 6 months prior to system turnover, and open CDRs are addressed about 8 weeks prior to system turnover. This is a reasonable closure strategy.

BNI and federal organizations are aware of the CAMP CR backlog issue. Most recently, BNI reported that it was progressing toward closing the MIP corrective action intended to address the CR backlog. The most recent BNI Performance Improvement Review Board, Meeting #167, indicates recognition of these trends, but no specific decisions or actions originated. A DOE Office of Inspector General report from February 2016 identified a number of issues associated with the BNI CAMP, including the growing backlog. The DOE Office of Environmental Management communicated the Office of Inspector General report to BNI on February 22, 2016, indicating its intention to direct BNI to implement a "prioritization process" and reduce the backlog of CRs. Accordingly, the CR backlog is in need of BNI senior management attention.

The ORP calendar year 2014, 2015, and 2016 Incentive B – Award Fee Plans incentivized cause analysis and corrective action, specifically stating "corrective actions are timely, prioritized by importance, and appropriately targeted." The BNI 2015 Performance Evaluation and Measurement Plan Self-Assessment (24590-WTP-RPT-MGT-16-001, Rev 0—for the calendar year 2015) emphasizes the successful improvement of the CAMP, but does not reference the performance regarding the NCR and CDR backlog. ORP rated the area of QA at 50 percent (Satisfactory) in 2014; the 2015 score card has not yet been issued. The ORP 2014 Incentive B – Award Fee Report only identified "key positives." Since ORP identified systemic weakness associated with the BNI Corrective Action Program in 2013, ORP has not used the performance fee mechanism to encourage BNI to reduce the growing CR backlog.

BNI Corrective Action Programs Conclusion

Overall, actions related to construction quality within BNI corrective action programs are adequately implemented; however, though driven by efforts to improve employee performance, the high rate of issue reporting (most at Level C and D) challenges BNI's ability to respond to more significant issues. NCRs and CDRs are not categorized or prioritized with a significance level. EA will continue to monitor BNI's progress addressing identified issues and BNI efforts to reduce the backlog of unresolved issues.

5.2 Installation of Post Installed Concrete Anchors

Criteria:

Work, such as concrete construction, shall be performed in accordance with approved procedures, design drawings, and other design basis documents, including applicable codes and standards. The procedures, instructions, and drawings shall include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed results have been satisfactorily attained (NQA-1, Criterion 5; Policy Q-5.1 of the WTP QAM; and DOE Order 414.1C)

Records shall furnish documentary evidence that items or activities meet specified quality requirements. (NQA-1, Requirement 17; Policy Q-17.1 of the WTP QAM; and DOE Order 414.1C).

Post Installed Concrete Anchors (PICAs) are installed in the concrete structure after the concrete has hardened and attained its design strength in order to provide anchorage for equipment in locations where

embedded plates and cast in-place anchor bolts are unavailable. EA and a WCD site inspector observed preparation of ten drilled holes for installation of Q PICAs that provide anchorage for a skid mounted ammonia/air dilution apparatus on Elevation 48 of the LAW Facility. The skid was to be welded to 12 one-inch thick baseplates. Each baseplate was to be anchored by four PICAs. The type of PICA specified on the design drawing, BNI drawing number 24590-LAW-S1-S15T-00147, are 3/4 inch diameter maxibolt anchors. The maxibolt is installed in a 7/8 inch diameter hole that is undercut using a specialized cutting tool that enlarges the hole at a specified distance below the concrete surface. The tool expands the base of the round hole by cutting a cone shaped depression, into which the maxibolt base is expanded using a torque wrench or hydraulic tool. The requirements for installation and QC inspection of the maxibolts are specified in BNI Construction Procedure 24590-WTP-GPP-CON-3205, *Post Installed Concrete Anchors*.

EA observed a craftsman using the undercut tool to enlarge the base of each round hole, and then clean out the concrete dust and particles. Before undercutting a hole, the craftsman performed a calibration check on the undercut tool to verify the tool was not worn and would cut the specified diameter cone. A QC inspector appropriately witnessed the calibration check and the undercutting operations. After the undercutting was completed and the drill holes were cleaned out, the QC inspector examined each one to verify the undercut was completed and that no reinforcing steel was encountered during the drilling operations. The results of the QC inspections were adequately documented in the Work Plan documents. The PICAs for the skid anchorage are designated as PICA number 24590-LAW-PICA-CON-16-0023.

The work and QC inspection activities that EA observed for preparing the drill holes for Q undercut anchor installation were performed in accordance with the BNI Construction Procedure. The work activities were continuously observed by a QC inspector, and results were documented as required by the BNI QA program.

5.3 Piping Pressure Tests

Criterion:

Construction and pre-operational tests, such as pressure testing operations for piping systems, shall be conducted in accordance with methods approved by the design organization. Test procedures shall include test requirements, acceptance criteria, test prerequisites, inspection hold points, and instructions for recording data. Testing shall be observed by qualified inspection personnel. Test results shall be recorded and evaluated by qualified personnel. (NQA-1, Requirement 11; Policy Q-11.1 of the WTP QAM; and DOE Order 414.1C)

EA observed a hydrostatic piping pressure test that was performed on a section of a fire service loop main piping that was relocated in preparation for construction of the Effluent Management Facility. The WTP site work process for conducting leak testing is specified in Construction Procedure 24590-WTP-GPP-CON-3504, *Pressure Testing of Piping, Tubing and Components*. The requirements for hydrostatic pressure testing of fire service mains are specified in the National Fire Protection Association Code (NFPA) 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, Section 10.10.2.2, *Hydrostatic Test*. The hydrostatic criteria specified in the NFPA Code requires fire service main piping be pressurized to a minimum test pressure of 200 pounds per square inch (psi), or 50 psi above the normal system working pressure, whichever is greater. The test pressure is required to be maintained for a minimum of two hours. Acceptance criteria specified in the NFPA Code is no visible leakage and no more than a 5 psi decrease in test pressure during the two hour hold time. Additional acceptance criteria in the NFPA Code permits adding water to restore the system pressure. The quantity of water is based on piping diameter and length within the test boundary. For the piping configuration

tested, 1.5 gallons of water was permitted to be added after the two hour hold time to restore the system pressure.

EA attended the pre-test briefings, reviewed drawings and test data sheets, examined the testing apparatus, and verified that the calibration stickers on the instruments used during the pressure test (pressure gauges and digital flowmeter/totalizer) were current and that whip restraints were installed on pressure hoses. Before the pressure tests, EA examined the sections of the piping system and examined the valve lineup and pressure test tags attached to the valves. The normal system working pressure is 175 psi. Therefore, a minimum test pressure of 225 psi was specified, based on 50 psi added to the normal system working pressure of 175 psi. EA witnessed initial system pressurization and system walk-downs performed by the test (field) engineer to check for leakage prior to start of the test hold time. The test engineer verified that the pipe joints were visible and accessible for inspection after the test hold time. After the test pressure was attained, a leak was observed at a joint. The test was discontinued, the system depressurized, and the joint was repaired.

After the repairs were completed, EA witnessed the hydrostatic test pressurization sequence and verified that the fire service main piping was pressurized to the minimum designated test pressure of 225 psi and held without adding water to the system for the two hour hold time. The test pressure at the start of the test was increased to 235 psi to allow a margin for a pressure drop during the hold time. BNI FEs initiated the system walk-down after two hours to inspect the piping for leakage. EA observed the walk-downs and inspections that BNI Field Engineering personnel performed. No leaks were identified. The system press had decreased by approximately 5psi during the 2.5 hours required to complete the pressure test hold time and perform the walk-downs after the 235 psi test pressure had been attained. The system pressure was restored after a gallon of water was added. A calibrated digital flowmeter was used to measure the quantity of water. This constituted a successful test.

The implementation of the pressure testing program was satisfactory for the sample that EA reviewed.

5.4 Concrete Placement Records

Criteria:

Work, such as concrete construction shall be performed in accordance with approved procedures, design drawings, and other design basis documents, including applicable codes and standards. The procedures, instructions, and drawings shall include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed results have been satisfactorily attained. (NQA-1, Criterion 5; Policy Q-5.1 of the WTP QAM; and DOE Order 414.1C)

Records shall furnish documentary evidence that items or activities meet specified quality requirements. (NQA-1, Requirement 17; Policy Q-17.1 of the WTP QAM; and DOE Order 414.1C)

EA reviewed the results of QC tests performed on concrete samples from the seven Q concrete placements in the HLW Facility between October 6, 2015, and February 26, 2016. Four of the placements were in HLW Facility walls, and three were in interior floor slabs. The tests included slump, temperature, and unit weight testing performed on the freshly mixed concrete and unconfined compression tests performed on concrete cylinders that were moist cured in the concrete laboratory. The unconfined compression test results are used to verify the concrete quality and demonstrate that the concrete meets the design strength requirements. The concrete design strength is based on the results of the unconfined compression tests performed on concrete test cylinders that were moist cured in the concrete field laboratory for 28 days. One concrete cylinder was tested at 7 days and a set of two at 28 days. The 7-day test result provides an early indication of the 28-day concrete strength and shows that the

concrete that was placed can be expected to meet design requirements. The unconfined compression strength of concrete increases approximately 20 to 25 percent between the age of 7 days and 28 days. The methods for sampling the concrete, casting and curing the cylinders, and performing the unconfined compression tests are specified in American Society for Testing and Materials International standards.

The unconfined compression tests performed on nine sets of concrete cylinders from the four HLW Facility wall pours showed that the concrete strength at 28 days in these placements ranged between 6,050 and 7,240 psi. The average 28-day strength for these test cylinders was 6,620 psi, well in excess of the 5,000 psi design strength. For two HLW Facility concrete slab placements, four sets of concrete cylinders were tested at an age of 28 days. These tests showed that the 28-day concrete strength ranged from 6,870 to 7,590 psi, with an average strength of 7,100 psi.

The concrete placed in a floor slab on February 26 had not attained an age of 28 days at the time of this review, so only the 7-day compression test results were available. The unconfined compressive strength for one cylinder tested at 7 days was 4,710 psi. The quality of concrete at the WTP plant is satisfactory. The results of the unconfined compression strength of the concrete at 28 days continues to exceed the specified design strength by 1,000 psi or more for all classes of structural concrete placed at WTP.

The concrete testing records demonstrated that the concrete meets or exceeds design specification requirements.

5.5 WCD Welding Inspection Program

Criterion:

Special processes that control or verify quality, such as those used in welding, shall be performed by qualified personnel using qualified procedures in accordance with specified requirements. (NQA-1, Requirement 9; Policy Q-9.1 of the WTP QAM; and DOE Order 414.1C)

The WCD site inspectors perform independent inspections of one or more inspection attributes on approximately five percent of Q welds they select at random. Welds selected for inspection include structural steel, piping, pipe supports, vessel (tank) welds, and weld repairs. Most welds that WCD examine are Q, but the WCD staff also includes some CM welds in their independent sample. The site inspectors also select some welds for examination that have unique configurations or geometry and differ in some aspect from routine site welding operations.

EA observed a WCD site inspector perform an independent visual inspection of one fit-up and four final pipe welds in the LAW Facility. These welds had been pre-selected by the WCD site inspector as DOE designated witness points. The welds examined are listed in Appendix B. The WCD site inspector verified that the acceptance criteria for visual examination of the piping welds specified in *Bechtel Nondestructive Examination Standard, Visual Examination VT-ASME* were met. The WCD site inspector also reviewed the field welding checklists, weld wire draw slips, and drawings associated with the four final welds inspected, and verified that the correct filler materials and weld processes were used to complete the welds and that the size and type of welds matched the construction drawings.

The implementation of the WCD welding inspection program was satisfactory for the sample that EA reviewed.

5.6 Electrical Construction Activities

Criterion:

Electrical equipment that performs a safety function shall be installed in accordance with approved procedures, design drawings, manufacturer's instructions, and other design basis documents, including applicable codes and standards. The procedures, instructions, and drawings shall include or reference appropriate quantitative or qualitative acceptance criteria for determining that prescribed results have been satisfactorily attained. (NQA-1, Requirement 5; Policy Q-5.1 of the WTP QAM; and DOE Order 414.1C)

EA inspected installed electrical equipment in the LAW Facility and LAB to determine whether electrical cable installation and termination work was performed in accordance with design documents (i.e., specifications and drawings). EA also reviewed corrective actions to resolve a WCD finding from June 2015.

Review of Corrective Actions for Emergency Trip Switch Installation

The EA construction quality review from June 2015 identified three discrepancies with an emergency trip switch that was installed in LAB Control Room A-117 in accordance with a design engineering approved field change (FC) that revised the original design drawing issued for construction. The purpose of the emergency trip switch is to isolate power to two electrical panels powered from Motor Control Center MCC-60002. The discrepancies were as follows: (1) Wiring details shown on the FC drawing were different than shown on the wiring schedule. The wiring connections were made in accordance with the wiring schedule, not the drawing; (2) The wiring details shown on the FC drawing did not correctly show the as-built MCC wiring details and ground-fault relay; and (3) The wire size used to connect the emergency trip switch exceeded the maximum size acceptable for those terminals. WCD documented these discrepancies in WCD finding S-15-WCD-RPPWTP-006-F03 and CDR 24590-WTP-CDR-CON-15-0336. EA reviewed the resolution of these issues and concluded that the corrective actions were adequate. The FC drawings and wiring schedules were corrected. WCD verified that the corrective actions were completed and closed the finding.

Cable Installation and Termination

EA inspected electrical equipment on several floors of the LAW Facility, including a random sample of installed cables to verify that the actual cables that had been installed matched those listed on cable pull cards. No discrepancies were identified. For the sample inspected, the data on the pull cards and the installed cables were in agreement.

In the LAB, EA inspected two sample hoods and a glove box and found the electrical installation acceptable. Current electrical conditions prohibited opening the electrical cabinets to verify internal wiring, but the conduit numbers and sizes and breaker sizes were inspected and consistent with design documents.

EA examined electrical control panel LFH-PNL-00041, part of the LAW Container Finishing Handling System. Two nonconforming conditions were identified. The first was that a blue conductor was landed on the ground bus, contrary to the National Electrical Code (NEC) that requires ground wires to be a bare conductor, a green insulated conductor, or a green insulated conductor with a yellow stripe. The controlled electrical design drawing, BNI drawing number 24590-LAW-J4-LFH-00014, specifies the wiring details for the pressure switch, showing that the wiring for pressure switch LPH-PS-2254, adjacent to control panel LFH-PNL-00041, is a three conductor, #14 American wire gauge (AWG) -size wire. The

drawing shows a green conductor connected to the ground bus, a black wire connected to the common of the pressure switch, and a white conductor connected to the normally open contact of the pressure switch. The SETROUTE cable card, 24590-LAW-STTC-E-15-0883, shows the blue conductor connected to the ground bus, which is how the switch was installed. The wiring details shown on the SETROUTE cable card do not correspond with the electrical design drawing.

	Drawing - 24590-LAW-J4-LFH-00014	SETROUTE Cable Card – 24590-LAW-STTC-E-15-0883	Field Installation	NEC Requirement
Pressure Switch – Common	Black	Black	Black	N/A
Pressure Switch – Normally Open	White	Red	Red	N/A
Pressure Switch – Ground	Green	Blue	Blue	Bare, Green, or Green w/ yellow stripe

The wiring details shown on the design drawing comply with the NEC, but the cable card does not. The wiring was installed in accordance with the cable card. Although most of the interviewed electricians, supervisors, and FEs say that wiring is done in accordance with design documents and not the cable cards, EA previously observed the practice of installing wiring and terminations in accordance with the cable cards and not the design drawings, and the number of wiring errors that have been identified during previous EA construction quality reviews indicates this practice has continued.

The second nonconformance with control panel LFH-PNL-00041was that the conductors and breaker feeding the cabinet were undersized. The name plate on the cabinet states a 40 Amp supply is required. The vendor drawing, DARTRON IND drawing number DAR-SS-314-BTL, for the control panel shows that a 40 Amp supply is required and also specifies minimum size 8 AWG conductors. Power to control panel LFH-PNL-00041 is supplied from a 20 Amp breaker from MCC-20104, cubicle 7KL. The conductors supplying this cabinet were 12 AWG, two sizes smaller than required by the vendor. The BNI design drawing incorrectly showed a 20 Amp breaker and #12 AWG conductors. The electricians completed the installation in accordance with the BNI design drawing. Although the requirement for a 40 Amp load was posted on the name plate, the electricians did not catch this error.

BNI issued CDR number 24590-WTP-CDR-CON-16-0076 to document and correct the above discrepancies. Further review of these issues by BNI disclosed that identical errors (incorrect breaker and wire sizes) were found in control panel LFH-PNL-00003. WCD issued a finding (S-16-WCD-RPPWTP-003-08) to address correction of these discrepancies.

EA and WCD continue to find discrepancies between BNI electrical design and construction documents. EA intends to continue to focus on electrical design and construction in future assessments.

5.7 Construction Field Engineering Training Programs and Qualifications

Criterion 1:

Each organization shall provide for indoctrination, training, and qualification of personnel performing or managing activities affecting quality. (NQA-1 Requirement 2; Policy Q-02.4 of the WTP QAM; and DOE Order 414.1C)

Criterion 2:

Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures, or drawings that include or reference appropriate quantitative or qualitative acceptance criteria. (NQA-1, Requirement 5; Policy Q-05.1 of the WTP QAM; and DOE Order 414.1C, DOE 0 226.1B)

Procedure 24590-WTP-GPP-WPHA-001, *Work Control and Work Packaging*, is the fundamental BNI procedure for planning and approving work. The Construction FE, also identified as the Task Lead, is responsible for developing the work package to include applicable drawings and specifications, which implement appropriate codes and standards, and appropriate quality inspection methods. EA interviewed several FEs, all of whom had thorough knowledge of the work control process.

BNI Procedure 24590-WTP-GPP- RATR-TR-1000, *Training Program*, and BNI Procedure 24590-WTP-GPP-RACN-FE-3100, *Field Engineering Qualifications*, establish the requirements for the training and qualification program for FEs in their technical discipline. Each interviewed FE was able to describe his or her qualification program, including required reading, discussion of applicable standards with his or her supervisor, specific training classes, and practical experience. WTP training and qualification records are readily available for all job disciplines and associated employees on the company webpage and accurately document the training and qualifications of each FE interviewed.

BNI Procedure 24590-WTP-GPP-CON-7101, *Construction Quality Control Program*, specifies FE activities, including day-to-day monitoring and verification of construction activities. Each interviewed FE communicated his or her approach to monitoring work in progress prior to final acceptance. The FEs shared a common interest in correctly completing construction work, having it accepted, and avoiding nonconformances and rework.

BNI Procedure GPP-WPHA-001, *Work Control and Work Packaging*, requires the Responsible FEs (RFEs), including the Task Lead, to verify that work was accomplished in accordance with the requirements specified in the referenced design documents, the information necessary to document completed work was recorded, all requisite signatures were obtained, and required testing was performed. The FEs are responsible for performing final inspections and acceptance of CM work activities at WTP. FE inspections are documented in accordance with various processes, depending upon the type of inspection specified in the BNI Construction procedures that control the work activity (e.g., 24590-WTP-GPP-CON-7114, *Field Inspection Report*; 24590-WTP-GPP-CON-3303, *Raceway Systems*; and 24590-WTPGPP- CON-3305, *Electrical Cable Termination*).

During a pressure test of fire service loop piping, the Piping FE participated in the pre-job briefing, walked down the job to ensure proper valve alignment, observed pressure system set-up configuration, examined calibration stickers on measuring equipment, and walked down pipe joints to verify integrity at test pressure. The Piping FE's observed actions were consistent with the requirements specified in BNI Construction Procedure 24590-WTP- GPP-CON-3504, *Pressure Testing*.

Over the past five years, EA has identified a variety of nonconforming construction conditions after work completion, including improperly tensioned bolts as evidence by tensioning splines left in place; tensioning bolts exposed to the elements contrary to referenced specifications that could result in failure of the bolts to tension properly; kegs of steel fasteners stored in a wet environment; open pipe penetrations subject to contamination; poor PICA material control and installations; and electrical equipment labeling and breaker sizing issues. These are examples of conditions adverse to quality that the Field Engineering or QC organizations overlooked.

The FE Manager stated that when nonconformances are found after work is completed and accepted, the issue is communicated to the FE discipline lead. If possible, the discipline lead assigns the task of initiating the NCR for Q work or CDR for CM work to the RFE who missed the issue. The NCR or CDR is evaluated by FE management to determine whether the case is isolated or whether there is evidence of a more systemic issue. If the latter, a CR is also written. Based on the outcome of the evaluation, the RFE who missed the issue may undergo remedial training or further mentoring. If the RFE has a prior history of missed issues, his or her qualification may be suspended until he or she can be requalified.

The work control documents (i.e., work plans) that the FEs prepared were adequate, containing enough details and instructions to perform construction work activities. The BNI training program for FEs is adequate. The FEs are qualified through training and experience to ensure that work is performed properly through day-to-day monitoring and verification of construction activities. Although the FEs generally exhibit a strong commitment to getting the job done correctly, there are examples in which inadequate attention to detail or lack of a questioning attitude resulted in acceptance of work that did not meet design requirements. However, when mistakes are made, the FEs stated there is no reluctance or fear of reprisal to initiating NCRs and CDRs or CRs, as needed. The volume of construction-related NCRs and CDRs indicate many missed opportunities to ensure quality work prior to acceptance.

Although qualified in accordance with BNI procedures, there are examples when BNI FE performance in the areas of final inspection and acceptance of CM work activities was inadequate. EA intends to continue to focus on the inspection and acceptance of CM work in subsequent assessments of WTP construction quality.

5.8 Self-Assessment and Quality Assurance Surveillance

Criterion:

Quality Assurance surveillances and other management/independent assessments shall be scheduled in a manner to provide coverage, consistency, and co-ordination of ongoing work; shall be performed by knowledgeable personnel; and shall be performance based of sufficient scope and depth to identify issues as soon as practicable. Surveillance/assessment results shall be documented in sufficient detail to identify the activity covered, identify the individual(s) performing the surveillance/assessment, and document results and any necessary compensatory corrective actions. (NQA-1 Requirement 18; Policy Q-02.2 of the WTP QAM; and DOE Order 414.1C).

EA reviewed BNI procedure 24590-WTP-GPP-MGT-036, Rev 5, *WTP Self-Assessment and Line Surveillance*. The Scope section states, “This procedure applies to WTP employees conducting or participating in an SA [Self-Assessment] or LS [Line Surveillance].” This procedure is confusing for a number of reasons. For example, a definition for “performance-based assessment” is provided, but the term is not used in the procedure. The definition for “self-assessment” is specified, but reflects only a document based review. The definition of “line surveillance” conveys the expectation for observing the work in progress and verifying documentation. Accordingly, GPP-MGT-036 does not clearly and consistently establish requirements for self-assessments and surveillances as required by DOE O 414.1C, Attachment 2, Section 3.i, which states, “Ensure that managers assess their management processes and identify and correct problems that hinder the organization from achieving its objectives. **(Deficiency)**

The FE Manager indicated that the construction organization follows BNI Procedure GPP-CON-7114 instead of GPP-MGT-036 for conducting line surveillances. Yet the WTP records contain two surveillances conducted in 2015 by the FE organization in accordance with Procedure GPP-MGT-036. The EA December 2013 construction quality review report states, "Field Engineering conducted no performance-based self-assessments, observed no work in progress, conducted no interviews, and

collected/evaluated no data." This observation was subsequently captured by BNI in 24590-WTP-PIER-MGT-13-0743-D. The closure documentation for this observation in part states that, "WTP Field Engineering Manager determined that review of work in progress is part of the normal work process for Field Engineering, and although such work process assessments are not formally documented as assessments, they accomplish the same purpose." "Review of work" in this context is driven by the QA requirements in DOE Order 414.1C, *Quality Assurance*, Attachment 2, CRD, item 3.h., *Inspection and Acceptance Testing*. This is specified in the BNI QAM, Section 2.1.4. In contrast, management assessments and line surveillances are driven by CRD, item 3.i, *Management Assessment*. This is also specified in the BNI QAM, in which Section 1.3.1 states that managers are to "assess their organizations and functions to determine how well they use resources and meet their objectives, identify strengths or improvement opportunities, and correct problems." The Field Engineering organization does not distinguish between performance of "quality verification" and "management assessments/line surveillances." **(Deficiency)**

EA reviewed the 2016 WTP Integrated Assessment Plan, Rev 0, developed per WTP-GPP-MGT-057, *WTP Integrated Assessment Planning and Scheduling*, to examine the targeting of planned assessments with respect to construction work performance. The scope of 2016 FE self-assessments includes pipe supports, lockout/tagout, annual quality assessment, and liner plates. The BNI QA organization has planned a series of independent assessments for 2016 that will focus on several areas, including work control, construction (i.e., LAW Facility), cathodic protection, and testing (i.e., LAW startup testing). These selected assessments are consistent with GPP-MGT-057. BNI has not scheduled many important work areas as self-assessment topics, (e.g., instrumentation, piping and pipe supports, and conduit and cable tray supports).

EA reviewed completed FE self-assessment and surveillance reports from January 2015 to present. The FE organization conducted 31 self-assessments and 2 surveillances. One involved work observation and was a good example self-assessment (24590-WTP-SAR-CON-15-0002, *Electrical Cable Terminations*, dated February 11, 2015). The assessment report satisfactorily provided a scope, specified requirements, lines of inquiry, observed data, and conclusions. The report made a recommendation to develop cable termination training for FEs. A review of Electrical FE training and qualification record samples indicates this recommendation was implemented by a required training course a few months after the report was issued, demonstrating an effective use of the feedback information to drive improvements. However, the rest of the reviewed self-assessment and surveillance reports were documentation reviews and interviews with no performance review aspects.

The BNI QA surveillances by the BNI QA organization provide a more independent evaluation of field work. Since January 2015, QA has performed 61 surveillances of different aspects of the company. Two of these surveillances focused on WTP Field Engineering construction, including a field weld checklist (a good example of a documentation review) and a versaflow placement for a melter 1 lid (a good example of work performance observation). Both assessment reports satisfactorily provided a scope, specified requirements, lines of inquiry, observed data, and conclusions. From previous interviews with the BNI QA Deputy Manager, the selection of planned QA surveillances is not made in collaboration with the Field Engineering Manager. This may be missing an opportunity to collaborate more effectively to focus on areas that need attention.

BNI satisfactorily plans and performs QA surveillances and independent assessments to acquire performance information. However, the BNI self-assessment program performs a minimal number of performance-based assessments. Collaboration between the FE organization and the QA organization could enhance the selection of assessment topics. The one performance-based self-assessment performed by FE demonstrated the FE organization's ability to recognize construction weaknesses and improve the work process. However, FE performance of quality verification activities does not constitute

management self-assessment. Quality verification is a normal line function performed by FE. A management self-assessment by FE would evaluate FE performance of a line function such as quality verification.

6.0 FINDINGS

EA identified no findings during this assessment. Deficiencies that did not meet the criteria for a finding are listed in Appendix C of this report, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified no OFIs during this assessment.

8.0 ITEMS FOR FOLLOW-UP

EA previously identified that the Authority Having Jurisdiction in the electrical area was delegated to BNI by prior ORP management around 2004, and identified this as a conflict of interest. ORP performed a review of the issue and made recommendations to ORP management. At the time of this review, those recommendations were under ORP management review. EA will follow ORP's resolution of this issue in subsequent reviews of WTP construction quality.

EA will perform additional reviews of the BNI self-assessment process; resolution of open CRs, NCRs, and CDRs; and implementation of the MIP. EA will continue to monitor BNI's progress addressing identified issues and BNI efforts to reduce the backlog of unresolved issues. EA will continue to follow up on inspection of welding activities, piping and pipe supports, pressure testing of piping, cable pulling, and installation of electrical and mechanical equipment. In addition, EA will continue to review corrective actions taken by BNI to resolve PICA installation deficiencies and previously identified electrical issues.

Appendix A
Supplemental Information

Review Dates

Onsite portion conducted March 14-17, 2016

Office of Independent Enterprise Assessments 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 Hanford Site

Robert E. Farrell

EA Team Composition

Robert E. Farrell – Team Lead
Joseph J. Lenahan
James M. Boyd
Michael A. Marelli

Appendix B
Documents Reviewed, Interviews, and Observations

Documents Reviewed

- Construction Procedure 24590-WTP-GPP-CON-3504, Rev. 13, Pressure Testing of Piping, Tubing and Components, February 25, 2016
- Construction Procedure 24590-WTP-GPP-CON-3205, Rev. 5, Post Installed Concrete Anchors, January 28, 2016
- Construction Procedure 24590-WTP-GPP-CON-3203, Rev. 10, Concrete Operations (Including Supply), August 20, 2015
- Specification No. 24590-WTP-3PS-FA02-T0004, Rev. 7, Engineering Specification for Installation and Testing of Post Installed Concrete Anchors and Drilling/Coring of Concrete, April 29, 2014
- Specification No. 24590-WTP-3PS-DB01-T0001, Rev. 8, Engineering Specification for Furnishing and Delivery of Ready Mixed Concrete, March 26, 2007
- Procedure 24590-WTP-GPP-MGT-044, Rev. 5, Nonconformance Reporting and Control, February 25, 2016
- Procedure 24590-WTP-GPP- MGT-036, WTP Self-Assessment and Line Surveillance, Rev. 5, March 31, 2015
- Document number 24590-WTP-MN-CON-01-001-10-09, Rev. 8, Bechtel Nondestructive Examination Standard, Visual Examination VT-ASME, August 8, 2013
- Document number 24590-WTP-QAM-QA-06-001, Rev. 16, Quality Assurance Manual, December 22, 2014
- Drawing Number 24590-LAW-S1-S15T-00147, Rev. 1, LAW Vitrification Building Main Building Anchorage for LVP-SKID-00003, Ammonia/Air Dilution Skid @ TOC EL (+) 48'-0"
- Construction Deficiency Report numbers 24590-WTP-CDR-CON-16-0001 through -0067. CDR numbers 16-0034, -0035, and -0042 were not issued
- Nonconformance Report numbers 24590-WTP-NCR-CON-15-0232 through -0236 and 16-0001 through -0047
- Specification No. 24590-WTP-3PS-E00X-T0004, Rev. 10, Engineering Specification for Installation of Cables, January,
- Drawing number 24590-LAW-EC-LVE-00006, Sheet 2, Rev. 6, Motor Control Center Schedule LVE-MCE-20104
- Drawing number 24590-LAW-J4-LFH-00014, Rev. 1, LAW Vitrification Interconnection Diagram North Shard Tray System LFH-SMPLR-00005 and LFH-SMPLR-00001
- SETROUTE CARD 24590-LAW-STTC-E-15-0883, Rev. 0, SETROUTE "To" Termination Installation Card for LFH-PS-2254
- Vendor Drawing DAR-SS-314-BTL, Sheet 2, Rev. F, LAW North Equipment Control Cabinet
- CDR 24590-WTP-GCA-MGT-15-01289, S-15-WCD-RPPWTP-006-F03 – Level 3 Finding – WCD Identified Three Examples Where BNI's Electrical Design and/or Installation Was Less-Than-Adequate – CCN 282212
- Specification No. 24590-WTP-3PS-EW00-T0001 Rev. 3, Engineering Specification for Power, Control, and Instrumentation Cable, Medium Voltage Power Cable and Fiber Optic Cable (Safety), July 1, 2011
- Construction Procedure 24950-WTP-GPP-CON-3304, Rev. 4, Electrical Cable Installation, November 24, 2015
- Construction Procedure 24590-WTPGPP- CON-3305, *Electrical Cable Termination*
- Construction Procedure 24590-WTP-GPP-CON-7114, *Field Inspection Report*
- Construction Procedure 24590-WTP-GPP-CON-3303, *Raceway Systems*

- Construction Procedure 24590-WTP-GPP-CON-7101, Rev 11 *Construction Quality Control Program*
- Construction Procedure 24590 GPP-WPHA-001, Rev 7 *Work Control and Work Packaging*
- Construction Procedure 24590- WTP-GPP- RATR-TR-1000 *Training Program*
- Construction Procedure 24590-WTP-GPP-RACN-FE-3100, *Field Engineering Qualifications*
- Construction Procedure 24590-WTP-GPP-MGT-057, *WTP Integrated Assessment Planning and Scheduling*
- Selected Field Engineer Qualification Records
- Performance Improvement Review Board – Meeting #167 minutes
- 24590-WTP-SV-QA-16-013, *Field Weld Checklist WR-25*
- 24590-WTP-SV-QA-16-016, *Versaflow Placement for a Melter 1 Lid*
- 24590-WTP-SAR-OE-15-0004, *Corrective Action Management Program (CAMP) Effectiveness* dated 1/5/16
- 24590-WTP-SAR-CON-15-0002, *Electrical Cable Terminations*

Interviews

- BNI WTP Site Manager
- BNI Field Engineering Manager
- BNI Area Construction Superintendents
- BNI Field Engineers
- BNI Welding Engineers
- BNI QA Manager
- BNI QC Manager
- BNI QC Inspectors
- BNI Electricians and pipe fitters

Observations

- Observed performance of one hydrostatic pressure test.
- Witnessed a WCD site inspector perform visual inspection of five piping welds in the LAW. Welds inspected were fit-up for weld GB002 on FWCL 24590-LAW-FWCL-CON-16-00265, and final visual inspection of welds FSOF002 on FWCL 24590-BOF-FWCL-CON-15-00352, FSOF002 on FWCL 24590-BOF-FWCL-CON-15-00380, weld GB002C1 on FWCL 24590-LAW-FWCL-CON-15-00199, and weld GB002C1 on FWCL 24590-LAW-FWCL-CON-15-00195.
- Witnessed undercutting and inspection of holes drilled in a floor slab in the LAW for installation of Q undercut PICAs for anchorage for LVP-SKID-00003, Ammonia/Air Dilution Skid.
- Examined installed and terminated cables in the LAW and LAB.
- LAB Facility, CDR-CON-14-0057 inspection for closure

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.

- Bechtel National, Inc. procedure 24590-WTP-GPP-MGT-036, Rev 5, *WTP Self-Assessment and Line Surveillance*, does not clearly and consistently establish requirements for self-assessments and surveillances as required by DOE O 414.1C, Attachment 2, Section 3.i, which states, "Ensure that managers assess their management processes and identify and correct problems that hinder the organization from achieving its objectives.

- The Field Engineering organization has not adequately identified the difference between performance of "quality verification" and "management assessments/line surveillances" as required by DOE O 414.1C, Attachment 2, Sections 3.h and 3.i which state,
  "(1) Inspect and test specified items, services, and processes using established acceptance and performance criteria.
  (2) Ensure that managers assess their management processes and identify and correct problems that hinder the organization from achieving its objectives."