



U.S. Department of Energy  
**Office of River Protection**

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07-WTP-205

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HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER (ALSO KNOWN AS TRI-PARTY AGREEMENT) INTERIM MILESTONE M-62-01, "SEMI-ANNUAL COMPLIANCE REPORT FOR THE WASTE TREATMENT AND IMMOBILIZATION PLANT (WTP)," FOR JANUARY 1 THROUGH JUNE 30, 2007

This letter transmits the U.S. Department of Energy, Office of River Protection, Semi-Annual Compliance Report (Attachment) required by Interim Milestone M-62-01 for the period January 1 through June 30, 2007.

As stipulated in the M-62-01 milestone, this report includes project summaries of accomplishments, issues encountered, and actions being taken.

If you have any questions, please contact me, or your staff may contact John R. Eschenberg, Project Manager, Waste Treatment and Immobilization Plant Project, (509) 376-3681.

Sincerely,

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WTP:BLN

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Attachment  
to  
07-WTP-205

The U.S. Department Of Energy (DOE)  
Office of River Protection (ORP)  
Semi-Annual Project Compliance Report for the  
Waste Treatment and Immobilization Plant (WTP)  
January 1, 2007 – June 30, 2007

**U.S. DEPARTMENT OF ENERGY (DOE)  
OFFICE OF RIVER PROTECTION (ORP)  
SEMI-ANNUAL PROJECT COMPLIANCE REPORT FOR THE  
WASTE TREATMENT AND IMMOBILIZATION PLANT (WTP)  
January 1, 2007 – June 30, 2007**



**U.S. DEPARTMENT OF ENERGY  
OFFICE OF RIVER PROTECTION  
2440 Stevens Center Place  
Richland, Washington 99352**

**June 30, 2007**

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**LIST OF ACRONYMS**

ABAR	Authorization Basis Amendment Request
AFA	antifoam agent
AIP	agreement in principle
ANSI	American National Standards Institute
BNI	Bechtel National, Inc.
BOF	Balance of Facilities
CAR	Corrective Action Request
CIO	Continuous Improvement Opportunity
CTE	critical technology element
DBVS	Demonstration Bulk Vitrification System
DCMA	Defense Contract Management Agency
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
EAC	estimate at completion
Ecology	Washington State Department of Ecology
EFRT	External Flowsheet Review Team
EIA	Electronic Industries Alliance
EVMS	Earned Value Management System
FY	fiscal year
HFFACO	<i>Hanford Federal Facility Agreement and Consent Order</i>
HGR	hydrogen generation rate
HLW	High-Level Waste [Facility]
HPAV	hydrogen in piping and ancillary vessel
ICE	independent corrosion engineer
IRP	Issue Response Plan
JHA	Job Hazard Analysis
LAB	Analytical Laboratory
LAW	Low-Activity Waste [Facility]
LBL	LAW Facility, BOF, and LAB
LMI	LMI Government Consulting
MT	metric ton
NQA	Nuclear Quality Assurance
OECM	Office of Engineering and Construction Management
OEM	Office of Environmental Management
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
PEP	Pretreatment Engineering Platform
PJM	pulse jet mixer
PNNL	Pacific Northwest National Laboratory
PT	Pretreatment [Facility]
PVS	Paxton Vierling Steel
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RF	resorcinol formaldehyde
RGM	revised ground motion
RPP	River Protection Project

TLFL           times to lower flammability limit  
TRA           Technology Readiness Assessment  
TRL           Technology Readiness Level  
USACE        U.S. Army Corps of Engineers  
VPP           Voluntary Protection Program  
WTP           Waste Treatment and Immobilization Plant Project

**U.S. Department of Energy, Office of River Protection**  
**River Protection Project – Waste Treatment and Immobilization Plant Project**  
**Semi-Annual Compliance Report**  
**Per Hanford Federal Facility Agreement and Consent Order Milestone M-62-01**

**1.0 INTRODUCTION TO M-62-01 – RPP – WTP PROJECT COMPLIANCE REPORT**

As required by the *Hanford Federal Facility Agreement and Consent Order* (HFFACO) (Ecology et al. 1989) Milestone M-62-01, this Semi-Annual Project Compliance Report (M-62-01O) reflects the status of the U.S. Department of Energy (DOE), Office of River Protection (ORP) Waste Treatment and Immobilization Plant (WTP) Project for the period from January 1, 2007, through June 30, 2007. As detailed in M-62-01, this report documents ORP's compliance with the HFFACO Milestone M-62-00 series requirements; updates WTP Project progress, activities, and issues relative to those milestones; and identifies activities expected in the near future.

**Hanford Site Background:** Hanford tank waste consists of approximately 190 million curies contained in 53 million gallons of mixed radioactive and hazardous waste stored in underground storage tanks at the Hanford Site in Richland, Washington. This tank waste will be remediated through treatment and immobilization to protect the environment and meet regulatory requirements. DOE determined through the "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, WA" (62 FR 8693) that the preferred alternative to remediate the Hanford tank waste is to:

- Pretreat the waste to prepare it for processing and vitrification;
- Immobilize the low-activity waste for onsite disposal; and
- Immobilize the high-level waste for ultimate disposal in the national repository.

**WTP Complex Description:** The River Protection Project (RPP) WTP complex is being designed, constructed, and commissioned for DOE by Bechtel National, Inc. (BNI) at the Hanford Site under DOE Contract No. DE-AC27-01RV14136.<sup>1</sup> The WTP will be designed, constructed, and permitted to treat and immobilize radioactively contaminated waste to support the RPP mission.

The WTP complex will receive waste in batches from Hanford's double-shell tank system, operated by the Tank Farm Contractor, through a pipeline system interface. The pretreatment process will separate (or continue to refine) the waste into low-activity waste and high-level waste fractions for vitrification. The vitrification process will combine pretreated tank waste with glass-forming materials and melt the mixture into a liquid that is poured into stainless steel containers, where the hot glass cools and hardens. Each container will then be sealed in preparation for storage and permanent disposal. The dangerous waste and radioactive constituents will be destroyed, removed, or immobilized in this durable glass matrix through

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<sup>1</sup> Contract No. DE-AC27-01RV14136 between the U.S. Department of Energy and Bechtel National, Inc., dated December 11, 2000.

the WTP process. The immobilized low-activity containerized glass waste will be disposed on site and the immobilized high-level containerized glass waste will be disposed at the national repository.

The WTP complex waste-processing facilities include the waste-separating Pretreatment (PT) Facility, the glass-making High-Level Waste (HLW) Vitrification Facility, and the glass-making Low-Activity Waste (LAW) Vitrification Facility. These process facilities are supported by the WTP complex Analytical Laboratory (LAB) for process testing and the WTP Balance of Facilities (BOF) for infrastructure services.

This compliance report reviews each of the WTP Project functional areas, as well as the overall project. Financial data is through June 2007, unless otherwise noted. WTP Project status is also provided monthly through the Project Manager's Meeting and the Quarterly Milestone Review Meeting reports.

## 2.0 WTP PROJECT ACCOMPLISHMENTS AND ISSUES

### 2.1 Progress to Date

#### 2.1.1 ORP – Project Management

**Estimate at Completion (EAC):** On December 22, 2006, DOE approved a new performance baseline for the WTP Project in accordance with DOE O 413.3A, *Program and Project Management for the Acquisition of Capital Assets*. This new performance baseline is based upon the May 2006 EAC that the WTP Contractor (BNI) provided to DOE; recommendations from the U.S. Army Corps of Engineers (USACE) independent validation review; an external independent review of the baseline change proposal; and the recommendation of DOE's Office of Engineering and Construction Management (OECM). The total project cost for the WTP Project has increased from \$5.781 billion to \$12.263 billion and the expected contract completion date has been extended from July 2011 to November 2019. In addition to the total project cost of \$12.263 billion, the May 2006 EAC also addressed "Unknown Unknown" risks. These risks, while not specific, had a basis from historical considerations of pioneer process plants, and the potential for \$700 million in increased costs was assumed. The December 2006 Performance Baseline assumes a funding level of \$690 million for fiscal year (FY) 2007 and each of the outyears.

**Safety Record:** WTP Project employees achieved a major safety milestone: On June 7, 2007, the project logged 2,000,000 job-hours without a day away from work incident. The last safety incident that resulted in an employee missing a day of work occurred on December 14, 2006. Improving the safety culture among the WTP workforce has been a team effort with DOE, BNI, Washington Group International, the building trades, union leadership and manual and non-manual employees. ORP and BNI continue to work together to reinforce and improve the workforce-wide safety culture; see Section 2.2.10 for detail.

From project inception through the end of June 2007, WTP employees have worked in excess of 34 million hours with only 218 Occupational Safety and Health Administration (OSHA) recordable injuries. Thus, the cumulative OSHA recordable injury rate for the entire project is 1.2 injuries per 200,000 hours worked. By comparison, the OSHA recordable rate for the construction industry nation-wide is 5.6 injuries (by the Bureau of Labor and Industry as of December 2005), and for DOE construction contractors, 2.2 injuries.

#### 2.1.2 WTP Complex Design and Construction

**Project Overview:** Design, procurement, and construction activities continue at the LAW Facility, BOF, and LAB (LBL). Design, limited procurement, and site maintenance are continuing at the PT and HLW Facilities. Construction on PT and HLW Facilities was halted by the end of FY 2006 pending resolution of seismic issues. For FY 2007, Congressional restrictions were placed on seismic-related procurement and construction activities of PT and HLW Facilities until the Secretary of Energy certifies to the Congressional defense committees that the final seismic and ground motion criteria have been approved by the Secretary, and that the WTP Project Contracting Officer has formally directed that the approved seismic criteria be used for the final design of the PT and HLW Facilities. Consequently, the sequence of WTP activities has been changed to accelerate the design and construction of the LBL and to delay construction of the PT and HLW Facilities while design for these two facilities is advanced.

This approach will create more time between completion of design and start of construction of a given facility component for the PT and HLW Facilities. In June 2006, ORP updated their report, *Basis for the Secretarial Certification of the Final Seismic Criteria*, incorporating the updated seismic responses from PNNL's evaluation, for review by Headquarters and others. The final report will be issued in July 2007, for Secretarial certification. The final seismic design criteria will conservatively remain the RGM of 2005.

Another option involves the LAW Vitrification Facility where the seismic issues (and other issues) identified in 2005 did not impact construction. This has given rise to the concept known as "Start LAW First" where the LAW Vitrification Facility would start operations in 2014, approximately 5 years earlier than the WTP PT Facility and the HLW Vitrification Facility. However, the LAW Vitrification Facility was designed to receive pretreated feed from the WTP PT Facility in accordance with its waste feed specifications. Alternate, tank farm-based pretreatment facilities are needed to implement this concept. Furthermore, this early operating strategy would put additional volumetric demands on existing secondary waste treatment facilities. While a decision to start operations of LAW early has not been made, the WTP Project is in the process of developing a revised baseline schedule to incorporate the "Execution Revision" (ER) strategy for completing construction of the LAW Facility first.

Issues associated with the maturity of technology in the WTP design have been evaluated by independent DOE Review Teams and in DOE's design oversight process. The most notable evaluation was the "Comprehensive External Review of the Hanford Waste Treatment Plant Flowsheet and Throughput" (CCN 132846) completed in March 2006 by the Expert (External) Flowsheet Review Team (EFRT). The EFRT was a team of external, distinguished senior professionals from private industry and academia that BNI commissioned in December 2005 to evaluate the technological aspects of the WTP process and evaluate whether the plant will operate as designed. The EFRT identified 28 separate technical issues, some of which had not been previously identified by the WTP Contractor or DOE. A number of these issues originated from limited understanding of the technologies that comprise the WTP flowsheet. In response, BNI developed Issue Response Plans (IRP) for each of the major issues. DOE reviewed and approved the IRPs as they were completed, and BNI is in the process of implementing the plans.

In addition, to more effectively manage the technology risks associated with the WTP, DOE conducted a Technology Readiness Assessment (TRA) to assess the technical maturity of the WTP design. The TRA was patterned after guidance established by the U.S. Department of Defense (DoD) (DoD 2005). TRA teams evaluated each tank farm-based pretreatment technology and each supplemental LAW immobilization technology using Technology Readiness Level (TRL) assessment techniques. The assessment utilized a slightly modified version of the TRL Calculator originally developed by Nolte et al. (2003) to determine the TRL for the critical technology elements (CTE). CTEs are those technologies that are essential to successful operation of the facility, that are new, or are being applied in new or novel ways or in new environments. The TRA teams conducted the evaluations using information from available documents and interviewed vendors and subject matter experts to obtain additional insights into the documented state of technology development, project definition, and deployment. The assessment report for LBL has been issued; the reports for the PT and HLW Facilities, as well as the TRA for the supplemental or Start LAW First concept are under review.

Design for the WTP project is 78% complete and construction is 29 % complete (based on hours). An average of 740 personnel (439 craft and 301 non-manual staff) was working on site, down from a peak of about 2,050 personnel in March 2005. For FY 2007, a second Congressional restriction was placed on the amount of funds that can be utilized for the WTP Project, pending a recommendation by the Defense Contract Management Agency (DCMA) to approve the contractor's Earned Value Management System (EVMS), as well as subsequent approval by the Secretary. DCMA conducted a certification audit of the contractor's EVMS in late November 2006 (see Section 2.2.2 ).

**Pretreatment Facility:** The revised baseline of \$12.263 billion and schedule completion of November 2019 for WTP was approved by the Deputy Secretary on December 22, 2006. Since then, the detailed schedule has been revised further to incorporate the "Execution Revision" (ER) strategy of completion of LAW Facility first, maintaining the project completion of 2019. The ER was also necessitated by the Congressional restriction on the construction of the PT Facility until certification of the final seismic criteria by the Secretary of Energy; addition of Expert (External) Flowsheet Review Team (EFRT) scope; and the proposed throughput capacity increases for the WTP. Secretarial certification will be obtained when the ground motion spectra evaluated based on the soil characterization data collected from the deep boreholes confirms that the current design basis revised ground motion (RGM) is bounding.

In accordance with the Congressional restriction, construction of the PT Facility has been suspended since January 2006, and the only ongoing construction activity has been installation of permanent stairways and support of BOF installation of underground transfer lines. The current focus for the PT Facility is on resolution of major technical issues relating to caustic leaching, pulse jet mixer (PJM) overflow, vessel mixing, vessel erosion, hydrogen in piping and ancillary vessels (HPAV), capacity modifications, and the revised ground motion issue. Construction on the PT Facility is planned to restart during the first half of FY 2008.

BNI determined there was a possibility that more than one PJM could overflow simultaneously; this is referred to as a multiple overflow (MOB). In order to validate the current design criteria, tests using two PJM arrays and simulants were designed. Testing of an 8 PJM array was completed and the testing subcontractor has recently completed installation of the 4 PJM array. Testing of this configuration will start early next month. With the exception of cooling jackets, PJM cones, and vessel nozzles installation, vessel fabrication has been on hold pending resolution of technical and permitting issues. The technical issues are nearly resolved and the project continues to work with regulators on the permitting issues.

DOE has directed the contractor to proceed with a number of facility modifications to increase the WTP capacity. The major changes involved increasing the size of the ultrafilters, modifying process vessels to allow leaching to be initiated earlier in the process and at a higher temperature, and increasing the capacity of the cesium ion exchange columns. BNI has been reassessing the design and the changes that will be necessary to accommodate these capacity modifications.

Civil/Structural Engineering continues to work on the concrete walls and slabs as time is available. The LBL Facilities have priority; therefore, work on the PT Facility fills gaps in the LBL schedule. Civil/Structural Engineering completed the rebar design for sections of the 56' elevation slab and wall sections for the 56' to 77' elevation walls ahead of schedule.

Mechanical Systems has been deeply involved in developing the IRPs associated with the EFRT comments. Since many of the EFRT issues involve the PT Facility, it is critical that they be resolved quickly so that PT Engineering can resume activities with confidence in the sound technical basis of their work.

In September 2006, BNI recommended that the baseline cesium ion exchange resin be changed from Superlig® 644 to spherical resorcinol formaldehyde (RF). DOE approved RF as an equivalent resin. As design authority, BNI will determine which of the two resins is best suited for the waste and operation of the facility while taking into account the cost and schedule impacts associated with each resin.

Mechanical Handling has proposed replacing three jib cranes in the PT hot cell with a second bridge crane. The proposed second bridge crane would operate only in the remote decontamination and maintenance area of the hot cell. This change would resolve some issues associated with maintenance of the jib cranes, and would also improve the availability of the main hot cell crane for operations in the hot cell.

Construction was suspended in December 2005 with minor exceptions. Stairways up to the 56' elevation are being installed along with some minor stairways within the building. These permanent stairways will take the place of the scaffolding stair towers that were put in place during construction and will improve the safety of the facility now and after construction is resumed.

Procurement activities have remained at a fairly low level because of: (1) Congressional restriction on procurement of critical equipment that requires seismic design; (2) impacts from the resolution of recommendations and issues by the EFRT; and (3) impacts from HPAV issues. The hot cell crane fabrication and factory acceptance testing were satisfactorily completed at the vendor's facilities.

**Low-Activity Waste Vitrification Facility:** BNI Engineering has assigned a rotating group of engineers to the melter fabricator's (Peterson) shop to assist in resolving design issues. Previously, BNI and Peterson resolved these issues using formal channels, which resulted in long lead times. Having knowledgeable BNI personnel on site will allow quicker turnaround time for problems. Of note, a review of the melter lid fabrication schedule shows that the delivery could be reduced by several months if all six lid sections are fabricated in parallel. However, the current configuration requires significant welding that could result in unacceptable lid warping. A redesign of the melter lid has been proposed to reduce the cooling requirements, and the size of the cooling coils will reduce lid design complexity. BNI will perform a thermal analysis of the design change to ensure the lid temperature remains within design parameters. To support melter fabrication, Peterson is ramping up the number of personnel in their shop. These actions are intended to ensure the melter arrives on site by December 2008, a BNI commitment to the Secretary.

BNI's Construction and Startup groups have been working for several months to prepare the processes and procedures necessary to test the wet process overhead crane (crane 8). Construction plans to use the crane to install components and piping in the wet process cells.

The crane is the first component or building that is to be turned over for operations. BNI is preparing the procedures for future component turnover to Operations.

LAW Construction started annex steel erection on May 24, 2007, and is expediting the import bay structural steel anchor bolts to allow a 4-month acceleration of steel erection. Delivery of annex structural steel from Hirschfeld Steel had been in abeyance during March 2007 awaiting resolution of quality assurance (QA) issues resulting from BNI's exemption of a subcontractor from performing source inspections of steel vendors. BNI relied on vendor records and performance history to assure that the steel met nuclear quality requirements. BNI was able to resolve the LAW steel QA issues and all annex steel has been received on site.

Construction of the LAW Facility adjunct structures is progressing. Construction crafts completed the placement of the annex basemat and installation of container import bay rebar. Craft is also installing conduit and preparing mudmat forms for melter assembly pads. Melter assembly pad mudmats and underground conduit are being installed to support future basemat placement.

Melter bus acceptance and installation has opened a large work front. Ventilation ducting immediately below the bus-work is being installed, followed by piping, cable trays, and cable. Approximately 8,000 liner feet of piping will be installed north of the melter pour caves. The procurement for the melter offgas spools has been issued. Due to the size and complexity of the melter spools, their installation is a driver for the design and installation of the piping in the wet process cell. Commercial Grade Dedication issues with the spools were recently resolved.

Construction crews are making progress with the following ongoing activities: Annex basemat rebar, anchor bolts, grounding straps, and construction aids are being installed. Concrete placement forms are being installed to support the annex basemat. Piping and hanger installation is proceeding on the -21', 3', and 28' elevations. Conduit installation is proceeding on the -21' and 3' elevations. Cable tray is being installed at the 28' elevation. Ventilation ducting and insulation is being installed at the -21', 28', and 48' elevations. Fan coil units are being installed on the 28' elevation. Fireproofing repairs are underway at the -21', 3', 28', and 48' elevations. Shield plates are being installed over the pour caves. Annex basemat construction joints and grounding straps are being installed. Structural steel and decking is being painted on the -21', 3', 28', and 48' elevations. Transformers and panels are being installed at the 3' elevation northeast corner. Millwrights are aligning the shield door tracks on the north and south container export bay. Construction forces are installing concrete placement forms for the 14' to 24' container export bay south wall.

**High-Level Waste Vitrification Facility:** The WTP Project is in the process of developing a revised baseline schedule to incorporate the "Execution Revision" (ER) strategy for completing construction of the LAW Facility first, EFRT scope, and capacity modifications. Congressional language restricts the construction of HLW until the certification of the final seismic criteria is obtained from the Secretary of Energy. Based on that, the construction of the HLW Facility has been suspended since January 2006; the only ongoing construction activity has been the application of special protective coatings for concrete slabs and walls at minus-21' elevation. (Installation of non-seismic fire water piping at minus-21' elevation by Patriot Fire Protection has recently started.) To support construction restart, punch lists have been created and efforts

are underway to ensure that the materials required for the near-term construction needs are available.

Secretarial certification will be obtained when the ground motion spectra evaluation, based on the soil characterization data collected from the deep boreholes drilled to approximately 1,400 feet below ground surface, confirm that the current design basis revised ground motion (RGM) is bounding. Preliminary evaluations performed by Pacific Northwest National Laboratory (PNNL) support that the RGM is conservative. PNNL's final report is forecasted to be issued in July 2007. Subsequently, the Secretarial certification of the seismic criteria will be received, thus allowing the restart of HLW construction.

BNI is in the midst of performing a construction readiness assessment to ensure safety and programmatic capability; the assessment is forecasted to be complete in July 2007. Engineering is behind schedule due to lack of resources and performance issues. Staffing increases have been aggressively pursued and the required level is anticipated to be met by August 2007.

Ongoing key design activities include the concrete walls, slabs, and supporting steel, embedded plates, joggle re-verification, and piping design for 0' to 14' elevations to support upcoming construction efforts. In addition, HLW staff are working towards expediting construction remobilization to FY 2007 from the planned restart in FY 2008, thus reducing the construction load in peak years. Re-design is complete for concrete slabs at 0' elevation and the walls and embedments for the walls between the 0' and 14' elevations. Design of rebar and embedments for slabs at 14' elevation is forecasted to be complete in July 2007. Calculations for the connections for the steel framing for the floor at the 37' elevation have been issued. Dynamic analysis for the HLW Facility was revised again in January 2007 after the stiffening of the roof structure to accommodate the larger seismic forces due to RGM. Impacts of the revised dynamic analysis on equipment are being evaluated. Spectra comparisons for shielded doors, shield windows, high integrity cranes, high-efficiency particulate air (HEPA) filters, crane-powered manipulators, electrical fixtures, melter and feed vessels, and melter feed slurry pumps have been completed.

151 joggle fabrication drawings have been prepared and a request for proposal for electrical joggles (critical for early construction) issued. All HLW piping and instrumentation diagrams (except the Autosampler System) have been issued as committed system design packages. Engineering review of the equipment layout drawing for the 58' elevation has been completed. Piping for the Non-Radioactive Liquid Disposal System and Concentrate Receipt System has been issued.

On March 28, 2007, Oregon Iron Works (OIW) successfully completed the factory acceptance test (FAT) of the melter crane maintenance shield door. Material procurement for all 17 HLW shield doors (part of the original contract with OIW) is complete. Fabrication of some of the shielded doors was delayed because the original vendor declared bankruptcy in 2006; OIW agreed to complete the partially completed shield doors. A purchase order worth approximately \$3 million for the HLW melter bus and power supply has been awarded to ABB. Significant efforts are being exerted to improve the Commercial Grade Dedication (CGD) process at BNI and at the vendor shops to ensure that Nuclear Quality Assurance (NQA)-1 requirements are met. QL systems, thermal catalytic oxidizer, and preheaters were awarded to a commercial

vendor EPCON. EPCON has awarded a purchase order for a QL vendor WEST METALS to establish a NQA-1 program at the EPCON facility to enable EPCON to perform "Q" fabrication. Canister lid welders and weld machine cameras have been received.

**Balance of Facilities:** Atlas Copco and Parsons Engineering have signed the contract to repair the Chiller Compressor Plant air dryers. BNI has been working with Atlas Copco for more than a year to come up with a technical requirement for the dryers and repair requirements. The Parson Engineering contract will result in all five dryers being delivered to the Marshalling Yard by the end of July 2007.

BNI has received a sufficient quantity of BOF Yard Rack steel to allow construction craft to start installation. This is a large scope of work that Construction has been working to open up. Paxton Vierling Steel (PVS), the supplier of the rack steel, was affected by flooding in the Mid-west this spring, and delivery of the remaining rack steel has been delayed. Any impact on rack installation completion because of the delivery delays is being assessed.

Construction forces continue to work on the installation of commodities in the Water Treatment Building, the Fuel Oil Storage tank, the Cooling Tower, Chilled Water Compressor Building, the Steam Plant, and the Non-Radioactive Liquid Disposal Facility. The Steam Plant is scheduled to be essentially complete this year and ready for component testing prior to operation. Craft personnel completed installation of the conduit for the melter assembly pad.

BNI has had a series of problems with the fabricator of the Glass Former Storage Facility's silos, putting in doubt the delivery and onsite installation of the silos this calendar year. Fabrication of the 17 silos is currently forecasted to be complete in August; however, this schedule is subject to delays as BNI finds further flaws in the silos as they are produced. BNI is evaluating different contractual approaches to mitigate the current series of problems.

Pretreatment-HLW feed lines repairs are progressing. These pipes have out-of-tolerance slope requiring that the connection at the PT Facility and piping installation welds be removed. The piping will be re-installed to obtain the required 0.5% slope. Construction forces were able to establish the required height for construction aid hangers that will be used to support the piping. The hangers will assure that the minimum slope, 0.5%, will be maintained. Realignment of the feed piping between HLW and PT was on hold for several months awaiting BNI Construction Management's implementation of a hexavalent chrome mitigation program.

Shrink wrap is being replaced on the exposed underground piping between the HLW and PT Facilities. This assures that the shrink wrap temperature specifications are within the worse case temperature calculations for operations. Since the driving factor for the shrink wrap is the ground resistance against movement of the piping, the buried piping will not need to have the existing wrap replaced. BNI is obtaining information data from the shrink wrap supplier that supports performance of engineering calculations showing that the shrink wrap on the buried underground piping does not need to be replaced.

Underground piping installations continue but covering the pipe remains on hold pending inspection by an independent corrosion engineer (ICE). The prior ICE informed BNI that they

were no longer available to support WTP work. BNI has issued a solicitation for another ICE but has not awarded a contract.

**Analytical Laboratory:** On June 6, 2007, the final steel beam was placed on the roof of the LAB. Structural steel installation continues, with iron workers erecting about 30 tons of steel each week. Approximately 52% of the main structural steel has been erected. Siding and roofing installation is scheduled to be completed this year.

BNI worked with Paxton Vierling Steel (PVS), the fabricator of the LAB steel, to resolve quality deficiency reports that were impacting the remaining shipment of LAB steel. The PVS facility suffered floods during the winter, and when the water receded, PVS determined that repairs and cleanup to the facility would take 8 to 18 weeks. BNI has hired a local firm to provide structural steel painting services allowing PVS to ship steel. Impacts to the LAB schedule have not been quantified.

Delivery of the hot cell manipulators has been delayed approximately 10 months from April 2007 to February 2008. This is not an issue for the Start LAW First planning because the manipulators are not required to support LAW operations; however, they are required to support HLW and PT operations. Delivery of the manipulators will require establishment of controlled atmosphere storage in the Marshalling Yard.

Stainless steel welding on the Process Vacuum Air System (PVA) has been started. PVA provides vacuum service to the radiological laboratory area fume hoods and room record air samples.

**Commodities Installations:** Based on the construction activities, the total WTP Project commodities placed or installed through May 2007 are summarized in Table 1.

**Table 1. Key Commodity Quantity Progress**

Quantity Progress	Current Planned at Completion Quantity	Installed To-Date Through May 2007	Percent Complete
Concrete	260,450 cy	168,210 cy	65%
Structural Steel	35,700 ton	9,440 ton	26%
Piping (in buildings)	889,000 ft	91,4700 ft	10%
Piping (underground)	124,900 ft	104,150 ft	83%
Conduit (in buildings)	781,660 ft	82,720 ft	11%
Conduit (underground)	187,810 ft	167,260 ft	89%
Cable Tray	96,180 ft	13,180 ft	14%
Cable and Wire	4,690,110 ft	176,700 ft	4%
Heating, Ventilation, and Air-Conditioning Ductwork	4,170,820 lb	559,990 lb	13%

### 2.1.3 Environmental Permits Required for Start of Construction

**Permitting and Licensing:** DOE and BNI continue to work closely with state and federal regulatory agencies to maintain permits, licenses, and authorizations needed to support WTP construction and commissioning. Permits required to support construction are in place. Permit modifications and revisions on evolving engineering designs are required and submitted on an ongoing basis. Non-radioactive and radioactive air permit applications containing updated design information have been approved: The Washington State Department of Health approved the radioactive air permit in June 2006, and the Washington State Department of Ecology (Ecology) approved the non-radioactive air permit in December 2006.

Ecology also approved seven Dangerous Waste Permit modifications during this reporting period. In October 2006, Ecology released a proposed permit modification to reflect the 2+2 melter design and other changes. The public comment period ended January 5, 2007, and ORP and BNI provided comments on the proposed permit modification. The 2+2 permit modification and related comment responsiveness summary are pending issuance by Ecology.

The Dangerous Waste Permit includes a compliance schedule (*Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Operating Unit 10, and Appendix 1, "Waste Treatment and Immobilization Plant"* [Ecology 2007]) that requires the submittal of engineering and operational information. Commodity growth, performance deterioration in engineering and construction, hydrogen buildup in piping and vessels in the PT Facility, difficulty in mixing heavy fluids in the PT Facility, revised seismic criteria affecting structural design of the PT and HLW Facilities, and a reduced FY 2006 funding level all contributed to increased project costs and schedule extension. In the December 2006 approved baseline, the estimated completion date for hot commissioning is May 2019. As a result, the remaining scheduled compliance schedule items listed in Table 2 will not be met.

**Table 2. Dangerous Waste Permit (RCRA)  
Compliance Schedule Items**

Item Number	Description	Due Date
1.	Submit documentation stating the WTP has been constructed in compliance with the Permit.	03/01/2008
32.	Final Compliance Date.	02/28/2009

The following compliance schedule items were not completed this reporting period:

- Item 3, Revise and Submit Waste Analysis Plan and associated Quality Assurance Project Plan to Ecology for review and approval, due 4/01/2007
- Item 4, Update and submit for approval "Procedures to Prevent Hazards," Chapter 6.0, Sections 6.3, 6.4, 6.5, and the Inspection Schedule, due 4/01/2007
- Item 5, Update and submit the Contingency Plan, due 4/01/2007

- Item 6, Update and resubmit for review and approval Training Program description in Chapter 8 of the Permit, due 4/01/2007
- Item 7, Submit under separate cover the actual WTP Dangerous Waste Training Plan for incorporation into Administrative Record, due 4/01/2007
- Item 8, Update and resubmit the Closure Plan for approval, due 4/01/2007
- Item 11, Submit descriptions of container management practices, due 4/01/2007
- Item 15, Submit descriptions of tank management practices, due 4/01/2007
- Item 17, Submit descriptions of containment building management practices, due 4/01/2007
- Item 21, Submit descriptions of management practices for the Pretreatment Miscellaneous Treatment System, due 4/01/2007
- Item 25, Submit descriptions of management practices for the LAW Vitrification Miscellaneous Treatment System, due 4/01/2007
- Item 30, Submit descriptions of management practices for the HLW Vitrification Miscellaneous Treatment System, due 4/01/2007

ORP is in the process of working with the regulators to resolve the HFFACO and *Resource Conservation and Recovery Act of 1976* (RCRA) permit compliance issues.

## **2.2 Near-Term Issues**

### **2.2.1 Regaining Confidence in Project Baseline**

Since late 2005, seven different internal and external reviews of WTP cost and schedule projections and cost management systems have been conducted. The Findings and Observations from these reviews are essentially complete. This provided the Secretarial Acquisition Executive with sufficient confidence in the WTP Project to approve rebaselining the project on December 22, 2006. The total project cost of the new performance baseline is \$12.263 billion and the contract completion date (turnover to operations contractor) is November 2019. The revised baseline assumed consistent Congressional appropriations of \$690 million from FY 2007 through construction and commissioning completion. Recent information from Congress on FY 2008 appropriation language shows a \$100 million reduction in funding, which in turn could lead to another significant update to the WTP cost and schedule if funding is not fully restored in FY 2009.

Discussions continue with the regulators concerning the impact of the rebaseline. Contract negotiations with BNI are scheduled to commence in 2007.

### **2.2.2 Earned Value Management System Certification**

In December 2004, DOE requested BNI become certified to the American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA)-748, *Earned Value Management Systems*, criteria and that a DCMA readiness review be conducted. The initial June 2005 DCMA EVMS

certification review concluded that the BNI EVMS description and implementing procedures were non-compliant with ANSI/EIA-748. DCMA completed a follow-on certification review in late November 2006. Though DCMA noted significant improvement, the review identified eight Corrective Action Requests (CAR) and three Continuous Improvement Opportunities (CIO). In response, BNI developed a Corrective Action Closure Plan and made significant improvements to qualify for EVMS certification. Subsequently, the DOE Office of Engineering and Construction Management (OECM) selected Tecolote Research, Inc. to replace DCMA in the EVMS certification process. OECM and Tecolote Research, Inc. have completed and approved the associated closure plans for BNI's CAR, with all closure plans forecast for closure in June 2007. OECM is working with Congressional staffers to change language to accept Tecolote approval in lieu of DCMA.

### **2.2.3 Revised Ground Motion**

During June through October 2006, four deep boreholes were drilled on the WTP site approximately 1,400 feet below ground surface to provide information on ground motion attenuation in the basalt and interbedded sediments underlying the WTP site. In February 2007, PNNL issued the *Geology of the Waste Treatment Plant Seismic Boreholes* (PNNL-16407), which described the results of the geologic studies from the boreholes. The site response report was issued on June 29, 2007. As a result of a much-improved determination of the shear wave velocity contrast in the interbeds that underlie the WTP, the report shows that the predicted site response is considerably reduced (at least 30%) below the RGM of 2005 design basis at the most significant frequencies. The final seismic design criteria will conservatively remain the RGM of 2005. ORP updated their report, *Basis for the Secretarial Certification of the Final Seismic Criteria*, incorporating the updated seismic responses from PNNL's evaluation, for review by Headquarters and others. The final report will be issued July 20, 2007, for Secretarial certification. Following the Secretarial certification, the project will resume construction in the HLW and PT Facilities.

### **2.2.4 Pulse Jet Mixers Design Closure**

Three areas of PJM design are undergoing additional design review and testing: (1) to firm up data regarding system performance; (2) to close out unverified assumptions regarding system design; and (3) to resolve issues identified by the EFRT.

- Previous PJM testing was focused on ensuring that hydrogen gas does not accumulate in individual pulse jet tubes in excess of the lower flammability limit. The current PJM air usage strategy assumes that the antifoam that is added to sparge the non-Newtonian tanks will not increase the gas retention of these vessels. The initial testing at Savannah River National Laboratory demonstrated that in most cases this assumption was not bounding and that additional testing was required. Prototypical testing is being planned to quantitatively evaluate this effect. Also, alternative antifoam agents will be reviewed. The purpose for this second phase of antifoam activities is to minimize the impact of antifoam behavior on plant systems.
- Testing to demonstrate that full-stroke PJM mixing fully exchanges the slurry within the PJMs (ensuring flammable gases do not accumulate in individual pulse jet tubes) was

completed. An extension of this test program to determine the minimum PJM strokes was successfully accomplished and the test report was issued for review.

- Using the pressure measurement instruments, testing was completed to demonstrate PJM overblow and show when the PJMs are full. Methods developed for overblow detection are being incorporated into the plant design. The tests indicate that the current method for determining that the PJMs have been filled with slurry prior to “driving” will be successful. Follow-up testing to determine design loadings for multiple PJM overblows and to firm up instrument and control performance for full-size PJMs was initiated in February 2007 and is expected to be completed in September 2007 with the final report issued in early 2008.
- New PJM testing is currently being planned to address mixing concerns identified in the EFRT review of WTP. The work is defined in the EFRT IRP for issue M3, Inadequate Mixing. PJM testing activities will be performed in scaled mixing platforms to:  
(1) demonstrate re-suspension of settled waste solids of Newtonian slurries; (2) determine mixing times for various vessel mixing functions; (3) determine if a hydraulic “short circuit” could occur in non-Newtonian slurries, which would cause insufficient mixing; (4) confirm post-design basis event mixing of vessels; and (5) demonstrate that normal process mixing successfully meets the flowsheet mixing requirements. The schedule for the various related activities is detailed in the M3 IRP.

### **2.2.5 Hydrogen Generation**

On March 14, 2006, BNI sent letter CCN 106655, "Hydrogen Generation Rate Calculation Open Items," to DOE, which addressed and responded to each of 13 open items. The letter also addressed the subject of issuing a revised hydrogen generation rate (HGR) and times to lower flammability limit (TLFL) calculation in a confirmed status. The letter stated the calculation was expected to be issued on May 10, 2006.

On May 18, 2006, BNI issued 24590-WTP-M4C-V11T-00004, *Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*, Rev. C, as a committed calculation. The calculation was not confirmed because Authorization Basis Amendment Request (ABAR) 04-197, "Implementation of Revised Time Basis for Single Failure Criteria for Hydrogen Mitigation," referenced by the HGR calculation, was not yet approved. DOE completed its review of ABAR 04-197 on May 18, 2007. In addition, several design modifications are being reviewed by DOE and BNI to improve the capacity of the WTP. These potential modifications may impact the HGR calculation and may be included in the calculation prior to its release as confirmed.

### **2.2.6 Issues with Use of Antifoaming Agent in WTP Pretreatment Vessels**

During design of the WTP PT Facility, seven tanks were projected to contain non-Newtonian slurries. Mixing of these complex fluids is required for processing and to prevent hazardous volumes of flammable gases generated by radioactivity and chemical reactions. PJMs are planned for mixing most vessels in the WTP because they contain no moving parts; however, testing indicated their effectiveness for non-Newtonian fluids was low. Air spargers were therefore added to promote better mixing.

Antifoam agents (AFA) are planned for use in the WTP evaporators and the tanks with non-Newtonian fluids. AFA works to eliminate foaming by reducing surface tension. This was successfully demonstrated in the evaporator testing. Past tests have indicated that the AFA also works to decrease the size of gas bubbles in liquids. More recent tests have further demonstrated that adding low concentrations of AFA to water generates small bubbles, and that there was no measurable gas holdup after the concentration of AFA was increased by a factor of 35. The tentative schedule calls for testing to be completed by August 2007 and the draft report to be issued by September 2007.

### **2.2.7 Hydrogen in Piping and Ancillary Vessels**

BNI has been investigating the buildup of HPAV and developing methods for preventing hydrogen from accumulating in quantities sufficient to cause damage to affected systems. Engineering found that similar conditions existed in a number of locations throughout the HLW and PT Facilities. A combination of active and passive control strategies were developed to address each affected ancillary vessel and piping flowpath. These strategies are described in ABARs 05-0040 and 05-0041. The active strategies used venting, flushing, or draining of vessels and piping to remove hydrogen before it reached damaging explosive quantities. In other locations, BNI relied on passive controls including, in some small bore piping, letting the detonation occur if the system could withstand the explosion loads without any circumferential deformation. In cases where the hydrogen hazard developed sufficiently slowly, administrative controls will be relied on to ensure operators remove hydrogen from affected piping and ancillary vessels before an explosion can occur; otherwise, automatic removal systems or passive strategies will be used.

A consultant, Dominion Engineering, Inc., calculated the explosion effects that would be large enough to cause piping deformation. These calculations were based on new experimental data provided by DOE from research done for this problem at the California Institute of Technology in 2006. This research focused on the most vigorous type of explosion in hydrogen mixtures, a detonation-to-deflagration transition near an obstacle in the piping (such as a bend, closed valve, etc.). BNI also chartered an external Hydrogen Review Committee to review the HPAV generic solutions. The Committee completed their review and concurred with BNI's design solutions. DOE is reviewing the ABARs and has not identified any significant issues to date; the review is planned for completion in August 2007. DOE and BNI are still discussing how to model pipe whip loads and design pipe supports for explosion and liquid slug loads. The focus of this is to optimize the number, size, and location of supports while providing adequate safety from this hazard. This work is planned for completion in late 2007.

### **2.2.8 Ultrafiltration System Design Review**

The EFRT raised two major issues that are consistent with ORP's 2004 design oversight conclusions for the ultrafiltration system. EFRT issue M13, Inadequate Filter Surface Area and Flux, concluded the ultrafiltration system, as originally designed, was the limiting factor in providing waste feed to the HLW and LAW melters for waste, requiring caustic leaching. EFRT issue M12, Undemonstrated Leaching Process, concluded the ultrafiltration system and leaching process have not been demonstrated beyond small scale laboratory tests.

In response to issue M13, BNI performed an engineering study to identify the maximum increase in ultrafiltration filter surface area that can be included in the WTP hot cell. BNI identified design changes that can double the surface area by utilizing five horizontal filter bundles in series for each of the two ultrafilter trains. Subsequently, BNI performed an assessment of vertical filter design concepts. Concepts under evaluation could increase filter surface area by a factor of about 2.5. Decisions on the selected configuration are planned for late summer 2007.

In response to issue M12, BNI is performing modeling to develop optimum ultrafiltration system operating approaches, testing tank waste samples using the optimized flowsheet, developing simulants, and testing the ultrafiltration flowsheet with an integrated engineering scale system. Phase I integrated engineering scale system test results are scheduled to be available by June 2008. In addition, a Pretreatment Engineering Platform (PEP) is being designed, built, and tested to demonstrate the ultrafiltration system processes and predict system capacity. The Pretreatment Engineering Platform is being designed and fabricated by Washington Group International's Engineered Product Department and Tessengerlo Kerley Services in Carlsbad, New Mexico. The PEP will be shipped in modular platforms to Richland, Washington, and installed in PNNL's Process Demonstration Laboratory West facility. Design of the PEP is beyond 60%; procurement and fabrication of vessels, piping, valves, pumps, and structural steel is underway. The modules are scheduled for shipment to Richland in late 2007, assembled, and testing is targeted for the first quarter of 2008. Successful testing of the ultrafiltration system in the PEP will support resumption of PT Facility construction in the hot cell and black cells for this system.

### **2.2.9 Increased Projection of Sodium Added with Hydroxide used to Leach HLW Solids**

ORP design assessments performed in 2004 identified issues with the effectiveness of the WTP flowsheet for leaching aluminum from HLW solids. In 2006, the WTP Project identified potential flowsheet revisions to achieve effective caustic leaching to solubilize aluminum. These flowsheet revisions are based on more credible predictions of process chemistry, including reagent additions required to keep aluminum in solution following cooling from approximately 100°C to 25°C. The net result of the flowsheet revisions is an increase in the overall sodium quantity that is utilized in the caustic leaching process and associated increases in sodium disposed as low-level waste. Total sodium requiring disposal as low-level waste may increase from 60,000 to 90,000 metric tons (MT).

In order to address this issue, DOE is performing tests with tank waste and simulants to confirm flowsheet performance and aluminum solubility correlations. Other work is underway to identify potential options to minimize the impact of sodium requirements in leaching. Potential solutions include sodium hydroxide recycle, maintaining the process from ultrafiltration through low-level waste immobilization at elevated temperature, and treating/separating the aluminum within the tank waste prior to sending it to the WTP.

If the total sodium value becomes as high as 90,000 MT, the WTP treatment time could increase or the facility throughput for LAW immobilization could be increased.

### 2.2.10 Safety Culture

ORP and BNI continue to work together to reinforce and improve the workforce-wide safety culture. Several workshops and forums have been held to enhance onsite safety. BNI Construction personnel held the WTP 2007 Safety Summit on February 23, 2007, at the Richland Red Lion Hotel for the stakeholders of the WTP construction site to view the progress being made toward developing a stronger nuclear safety and quality culture. Stakeholders included representatives from the Hanford Advisory Board and the Central Washington Building Trades, as well as all the parties more directly associated with the project. The WTP Construction Site Safety Council, WTP Construction Site Voluntary Protection Program (VPP) Steering Committee, WTP Construction Site Electrical Safety Committee, WTP Construction Site "Safety Education Through Observations" Committee, and the WTP Building Trades Union Stewards Committee made presentations explaining how their committees were organized, how they evaluated safety, and what they were doing to further safety at the site. Each committee also made recommendations for further improvement in their respective areas. BNI Construction conducted a follow-up workshop on March 9 at the Pasco Red Lion Hotel for the foremen, general foremen, supervisors, and management of the WTP construction site to discuss communication and to build trust with the craft for developing a stronger nuclear safety and quality culture. Also, on May 23, the construction site had almost 100% participation in the Safety Expo at the TRAC facility. To encourage attendance, management gave site personnel time off to attend this important event.

The third WTP Safety Culture Employee Survey was conducted the week of April 23, 2007. Last year, the survey resulted in nearly 80% overall participation, with 75% non-manual and 99% manual employees participating. The target this year is 100% participation by all employees. This anonymous survey provides BNI management feedback on how the organization is functioning and allows employees to inform management how they feel about a variety of issues related to working at WTP. Since the implementation of the WTP Employee Opinion Survey in 2005, some areas requiring improvement were brought to light. The following actions took place in the past year in response to 2006 survey results:

- Revision of WTP Work Rules/Employee Handbook in response to suggestions
- Increased communications with employees, specifically on obtaining employee feedback and comments
- Implementation of a Differing Professional Opinion program
- Implementation of a discipline review board
- Development of a Managing Performance class

BNI will present the results from the 2007 Safety Culture Employee survey to DOE management on June 27, 2007, with roll out to the craft anticipated at the July Construction All-Hands Meeting.

After a nearly three-month suspension, stainless steel welding resumed the week of March 12, 2007. In December 2006, BNI Construction management stopped welding activities when a label air sample taken on an employee (welder) at the LAW Facility exceeded the

hexavalent chromium OSHA permissible exposure limit. However, the air sample was considered invalid because the welder had removed his sampling equipment during a break and did not put it back on. The event was reported as a safety occurrence. In response, BNI issued safety evaluation documents linking OSHA requirement to the WTP Safety Program; conducted General Awareness training of all employees, contractors, and customer representatives, and Affected Worker training for all employees who could potentially be exposed during normal work assignments (welders, helpers, and inspectors); and held a prejob briefing to all affected workers on the new Job Hazard Analysis (JHA) and work control processes. BNI also revised the JHA for Mig and Tig welding of chromium-bearing stainless steels and implemented a work planning/control/authorization process for Tig and Mig welding operations on stainless steel. Stainless steel welding has resumed; thermal cutting and stick welding of chromium-bearing metals remains under suspension. (Note: Gas metal arc welding [GMAW] is frequently referred to as Mig welding; gas tungsten arc welding [GTAW] is frequently referred to as Tig welding.)

The WTP construction site workforce continues to work toward the achievement of the DOE-VPP Star Status. Considerable strides have been made toward the improvement of the current programs and processes as well as the development of the application. The WTP-VPP Steering Committee was instrumental in exposing the workforce to the five tenets of DOE-VPP and associated sub-elements. The draft WTP Construction Site VPP Application that was submitted to ORP on May 31, 2007, was returned with comments on June 27, 2007. Comments and revisions will be incorporated into the final document and reviewed with the ORP VPP coordinator. Upon receiving concurrence from the ORP VPP coordinator, the application will then be presented to WTP management and ORP WTP project management for endorsement. Their endorsement will prompt the submittal of the application to DOE Headquarters. In future months, the WTP construction site workforce will continue improving its programs, processes, and culture in preparation for DOE review of the application.

### 2.2.11 Quality Issues

**Structural Steel Fabricator Sub-tier Supplier Qualification Issue:** Delivery of annex structural steel from Hirschfeld Steel was held in abeyance during March 2007 awaiting resolution of quality assurance (QA) issues that arose because BNI had exempted a subcontractor from performing source inspections of steel vendors. On April 19, 2007, ORP personnel, along with two QA subject matter experts (SME), visited Hirschfeld's facility to review their procurement records to verify the fabricator had adequately evaluated sub-tier structural steel suppliers. On April 10, ORP and SMEs had previously reviewed a representative sample of these records and agreed the records met applicable minimum Nuclear Quality Assurance (NQA)-1 requirements. BNI and the fabricator are working to improve the fabricator's overall quality program including improving procedures and recordkeeping to address this and other quality issues. Hirschfeld Steel procurement and quality issues indicate continuing quality and welding attention is required. BNI has made substantial changes in its Supplier Oversight Program to improve performance but continued DOE inspection is warranted.

**Preservation Maintenance Program:** Although ORP had previously identified issues with BNI's program for maintaining procured and installed equipment and BNI had committed to take actions to address these issues, a recent preservation maintenance program review again identified a number of significant issues with BNI Property Preservation Program, indicating that

corrective actions were inadequate. For example, BNI had issued at least 100 deficiency reports for maintenance activities not performed. Many of these deficiencies were avoidable. As a result, ORP identified a "Concern" in this area and requested BNI to take appropriate corrective actions. ORP will closely monitor BNI's actions to address these issues and implement an effective property preservation program.

**Pending DOE Enforcement Action for Quality Deficiencies at the WTP:** In July 2007, the DOE Office of Enforcement (OE) will conduct an enforcement conference with BNI to discuss facts and circumstances concerning several quality deficiencies at the WTP. During the conference, BNI is to provide a summary of the corrective actions taken to prevent recurrence and the results achieved to date. The quality deficiencies were investigated by OE in late 2006 and an investigation report was issued in May 2007 summarizing potential non-compliances with the following quality assurance requirements: (1) multiple examples of BNI not following written procedures; (2) inadequate training/indoctrination to adequately perform quality-affecting work; and (3) failure to implement effective corrective actions for known discrepancies. The OE investigation focused on the following four issues:

1. Deficiencies associated with joggled penetrations
2. Deficiencies associated with review of supplier submittals
3. Deficiencies associated with the Commercial Grade Dedication process
4. Deficiencies associated in the Integrated Control Network (ICN) procurement

The final outcome of the conference will be published by DOE in late summer. ORP will closely monitor the completion and effectiveness of BNI's corrective actions to address the above issues.

### 3.0 ACTIONS TAKEN OR INITIATED TO RECOVER ANY AGREEMENT SCHEDULE SLIPPAGE

#### 3.1 After Action Report Findings and Recommendations – Report Dated June 2007

In 2005, the DOE Office of Engineering and Construction Management (OECM) requested an external organization, LMI Government Consulting (LMI) (a non-profit firm), to perform an after-action fact finding review of the WTP Project. OECM directed LMI to examine the period from implementation of contract modification A029 in April 2003 until late 2005. LMI documented the results of their evaluation in a January 2006 report that focused on: the causes of growth in project cost estimates and extension of schedule and weaknesses in the functional areas of staffing/organization structure; project management policies; reporting effectiveness between ORP and the DOE Headquarters; and contract management.

All LMI issues have been summarized and addressed as shown below. This is the final report for the after-action review.

- **Acquisition Management:** The accelerated award of a contract in 2000 resulted in three weaknesses: (1) an incomplete government cost analysis and basis upon which to award the contract; (2) commercial-like contract arrangements; and (3) exacerbation of vulnerabilities in a design-build approach.

**Actions and Status:** These questions were closed through the following actions: (1) DOE tasked and USACE completed an independent validation of the most recent contractor project EAC by summer 2006; (2) ORP modified the contract on November 15, 2005, to include DOE O 413.3, *Program and Project Management for the Acquisition of Capital Assets*, as a project requirement; and (3) DOE provided direction to the contractor to maintain a lag of 12 months between completion of design of structures, systems, or components and the beginning of construction in order to mitigate issues with design-build contracts.

- **Accounting for Project Risk:** The contractor did not have a sound basis for a complex project involving first-of-a-kind technologies leading to an underestimation of project risk. Contributors to risk included not accounting for design of novel technologies, inadequate expectations of availability of construction materials and qualified labor, underestimating design requirements, and lack of strong technical and cost expertise in risk management.

**Actions and Status:** These questions were closed through the following actions: (1) DOE conducted several comprehensive reviews and analysis of WTP's technical approach and innovative systems; cost and schedule baselines; and risk projections. After resolution of comments from these reviews, designs are being revised and a revised cost and schedule baseline was established; (2) ORP hired a risk assessment manager to advise the ORP WTP and Tank Farms manager in the area of incorporating risk in project and organizational activities; and (3) ORP approved a revised risk management procedure.

- **Project Management Issues:** There were several weaknesses in project management. These included: (1) premature establishment of baselines and negotiation of project

milestones with regulators, given the reliance on novel technologies; (2) failure to require the contractor to comply with DOE's project management requirements; (3) reporting deficiencies in the area of EVMS and inappropriate use of the contractor's project control system data; (4) inadequate change control process; and (5) inappropriate deletion of project scope to provide additional project contingency.

**Actions and Status:** These questions were closed through the following actions:

(1) DOE O 413.3 and its corresponding manual, DOE M 413.3, *Project Management for the Acquisition of Capital Assets*, were added to the contract; (2) The DOE Office of Environmental Management is incorporating lessons learned for critical decisions in other projects and the establishment of regulatory milestones; (3) Several audits of the project's EVMS have been conducted including a certification audit in November 2006; (4) ORP issued a revised change control procedure to address deficiencies related to using contractor real-time management of project baseline; and (5) ORP has re-established project contingencies.

- **Organizational/Staffing Issues:** The report identified weaknesses in organizations and staffing: (1) ORP staff requires a larger contract administration staff with additional contracting officers, supported by additional contracting specialists, as well as a dedicated legal advisor to address contract issues; and (2) the two major projects comprising the RPP mission scope (WTP and Tank Farm Project) warrant a dedicated and certified Federal Project Director.

**Actions and Status:** These questions were closed through the following actions:

(1) The following new positions have been filled: a Director of Procurement (with warrant authority), a procurement attorney, two senior experienced contracting officers (one for the WTP contract and one for the Tank Farm Project contract), two senior contract specialists, and two other contract specialists for the WTP; and (2) The Assistant Manager for Tank Farms and the Assistant Manager for WTP have been certified as Federal Project Directors by DOE Headquarters.

- **Contract Management Issues:** ORP contract management processes did not follow strict interpretation of DOE contract management policy, including sending direction letters to the contractor exceeding change order authorities.

**Actions and Status:** Revised correspondence procedures have been issued to prevent improper issuance of change orders.

- **Oversight Issues:** The evaluation found that there was inadequate oversight of the project on the part of Headquarters' Office of Environmental Management (EM) and Office Engineering and Construction Management (OECM) staff, and only limited oversight of the contractor by ORP based on the commercial nature of the contract. Further, there were limited ORP and EM manager-to-staff interactions, which failed to allow either EM or OECM staff to perform functions of oversight or notify senior management of problems.

**Actions and Status:** These questions were closed through the following: (1) ORP has established and filled six Facility Representative positions who are in the field on an almost daily basis overseeing delivery of materials and equipment and construction

activities; (2) ORP has designated technical subject matter experts in key areas related to the WTP design, engineering, and construction, such as electrical, piping, and concrete; (3) ORP has an integrated assessment schedule for monitoring contractor activities for safety and quality that it updates on a periodic basis; (4) The Assistant Secretary for Environmental Management (EM-1) has established the Office of Project Recovery, which reports to the Assistant Secretary and the Principal Deputy Assistant Secretary; and (5) DOE Headquarters' Environmental Management, Office of Performance Assessment, and OECM, as part of Quarterly Project Reviews, now provide independent assessment of the WTP Project.

- **Annual Funding Constraints:** Constrained funding pushes costs to the future and extends project schedules resulting in an additional cost premium for work to be performed.

**Actions and Status:** The Department continues to request \$690 million per year to maintain the cost and schedule approved by the Secretarial Acquisition Executive for the December 2006 baseline.

### **3.2 Actions and Status: External Review of Process Flowsheet – Report Dated March 17, 2006**

In March 2006, the EFRT completed a critical review of the WTP process flowsheet for BNI. The team identified 17 major issues and 11 potential issues that would prevent the WTP from meeting contract requirements. In response, BNI developed a project response plan describing the proposed actions to address the issues; IRPs were developed for each issue; and all IRPs have been issued and approved. The IRPs include the actions required for issue resolution, a schedule for completion, integration with other issues, and integration with the overall project schedule. Examples of some of the identified issues include: inadequate ultrafiltration area and flux, undemonstrated leaching process, plugging of process piping, mixing vessels erosion, inadequate mixing systems, instability of baseline ion exchange resin, PT Facility availability, lack of comprehensive feed testing in commissioning, and limited remotability demonstration. Issue resolution has focused on near-term project impacts. Resolution of all issues with additional analysis and testing is planned to be completed by the fall of 2008.

### **3.3 Congressional Interactions**

DOE prepares quarterly reports to House and Senate Committees on Authorization and Appropriations on the activities and financial status of each of the five subprojects within the WTP Project.

#### 4.0 BUDGET AND COST STATUS

**Status:** In the June 2006 cost and schedule performance reports and earned value reporting data, BNI implemented the May 2006 EAC as an over-target baseline; on December 22, 2006, the baseline was approved by the DOE Undersecretary as the new performance baseline.

In October 2006, BNI incorporated a resequencing effort to continue construction of the LAW, BOF, and LAB (LBL) while delaying construction restart of PT and HLW until October 2007. ORP subsequently directed BNI to further accelerate completion of the LBL facilities by one year, and to incorporate the impacts of the recommendations from the EFRT review regarding the processing and capacity of the PT Facility. The sum of these impacts has transferred over \$500 million of management reserve and project contingency to the performance measurement baseline (PMB). However, these impacts were anticipated in the May 2006 EAC. Through May 2007, the WTP Project has a cumulative negative schedule variance of \$20.8 million and a positive cost variance of \$42.6 million on \$3,500 million of completed work. Some of the positive cost variance is attributed primarily to the amount of work done by construction field craft in the PT and HLW Facilities prior to the work curtailment in FY 2005. Some of the cost and schedule variance is also related to recent corrections by BNI associated with the method used to measure earned value performance for plant equipment procurements and purchases of bulk plant material. The new method ties earnings and costs to specific subcontractor progress milestones, which should significantly lessen the variability of earned value reporting relating to this area.

**Budget:** The WTP Project has received \$690 million of FY 2007 funding divided into separate control accounts for each of the five main facilities. With the carryover funds of \$250.3 million from FY 2006, the WTP Project has \$940 million of available funding. The FY 2006 carryover funds have either been committed by BNI to a subcontract or reserved for BNI termination liability. Per Congressional language, ORP is currently holding back \$69 million of funding from BNI pending certification of BNI's EVMS (anticipated by August 2007). For FY 2008, ORP again requested \$690 million in the Congressional Budget for the WTP Project.

**Costs:** Anticipated total WTP Project spending for FY 2007 is about \$520 million, based on BNI's May 2007 cost and schedule performance reports. However, with restart of full construction in the PT and HLW Facilities in early FY 2008, BNI anticipates spending significantly more in the next few years; consequently, the planned carryover amounts will be mostly spent.

## 5.0 DOE/DOE CONTRACTOR COMPLIANCE

The new performance baseline was approved on December 22, 2006, and included a cost of \$12.263 billion and completion date of November 2019 for the WTP Project. The cost to complete the project is \$8.62 billion and the project has already been appropriated \$3.64 billion for design and construction. This December 2006 baseline assumes consistent Congressional appropriations of \$690 million from FY 2007 through construction and commissioning completion.

Now that the revised WTP cost and schedule has been approved by DOE's Secretarial Acquisition Executive, discussions are proceeding with the regulators to try to resolve the HFFACO and RCRA permit schedule issues (refer to Table 3 for a listing of affected milestones). Section 7.0 provides more detailed descriptions of the impacted milestones.

**Table 3. Impacted HFFACO Milestones**

Milestone	HFFACO Date	Description
M-062-00	12/31/2028	Complete Pretreatment Processing and Vitrification of Hanford High Level (HLW) and Low Activity (LAW) Tank Wastes.  Compliance with the work schedules set forth in this M-62 series is defined as the performance of sufficient work to assure with reasonable certainty that DOE will accomplish series M-62 major and interim milestone requirements.
M-062-00A	02/28/2018	Complete WTP Pretreatment Processing and Vitrification of Hanford HLW and LAW Tank Waste.  Tank Waste processing shall complete the WTP pretreatment and vitrification of no less than 10% of Hanford's Tank waste by mass and 25% by activity.
M-062-07B	12/31/2007	Complete Assembly Of Low Activity Waste Vitrification Facility Melter #1 So That It Is Ready For Transport And Installation In The LAW Vitrification Building (BNI Baseline Schedule Activity 4DL321A200 As Part Of DOE Contract No. DE-AC27-01RV14136).
M-062-08	06/30/2006	Submittal Of Hanford Tank Waste Supplemental Treatment Technologies Report, Draft Hanford Tank Waste Treatment Baseline, And Draft Negotiations Agreement In Principle (AIP).  DOE will submit a supplemental Treatment Technologies Report that describes the technical, financial, and contractual alternatives which, in combination with the WTP and any required additional LAW vitrification facilities, are needed to treat all of Hanford's Tank Wastes.
M-062-09	02/28/2009	Start Cold Commissioning - Waste Treatment Plant.  DOE Will Start Cold Commissioning Of Its Tank Waste Treatment Plant. Start Of Cold Commissioning Is Defined As Introduction Of First Feed Simulant Into A Process Building.

**Table 3. Impacted HFFACO Milestones**

<b>Milestone</b>	<b>HFFACO Date</b>	<b>Description</b>
M-062-10	01/31/2011	Complete Hot Commissioning - Waste Treatment Plant.  DOE Will Achieve Sustained Throughput Of Pretreatment, Low-Activity Waste Vitrification And High-Level Waste Vitrification Processes, And Demonstrate WTP Treatment Complex Availability To Complete Treatment of no less than 10% of the tank waste by mass and 25% of the tank waste by activity by December 2018.
M-062-11	06/30/2007	Submit A Final Hanford Tank Waste Treatment Baseline.  Following The Completion Of Negotiations Required In M-62-08, DOE Will Modify Its Draft Baseline As Required And Submit Its Revised Agreed-To Baseline For Treating All Hanford Tank Waste (HLW, LAW, and TRU) by 12/31/2028.

## **6.0 AREAS OF NON-COMPLIANCE**

The WTP portion of the Hanford Facility RCRA permit (Ecology 2007) includes a compliance schedule for the submittal of permit design packages and other information. Twelve compliance schedule items were not completed as scheduled in Appendix 1 of the WTP portion of the Hanford Facility RCRA permit. The missed compliance schedule items are identified in Section 2.1.3 .

## 7.0 STATUS OF HFFACO MILESTONES

The status of the HFFACO M-62-00 milestone series for the WTP is as follows:

### 7.1 M-62-00 – COMPLETE PT PROCESSING AND VITRIFICATION OF HANFORD HIGH LEVEL AND LOW ACTIVITY TANK WASTES

**Milestone Date:** December 31, 2028

**Description:** Compliance with the work schedules set forth in this M-62 series is defined as the performance of sufficient work to assure with reasonable certainty that DOE will accomplish series M-62 major and interim milestone requirements.

DOE internal work schedules (e.g., DOE approved schedule baselines) and associated work directives and authorizations shall be consistent with the requirements of this agreement. Modification of DOE contractor baseline(s) and issuance of associated DOE work directives and/or authorizations that are not consistent with agreement requirements shall not be finalized prior to approval of an agreement change request submitted pursuant to agreement action plan, Section 12.0.

**Status:** Unrecoverable.

### 7.2 M-62-00A – COMPLETE WTP PT, PROCESSING AND VITRIFICATION OF HANFORD HLW AND LAW TANK WASTES

**Milestone Date:** February 28, 2018

**Description:** Tank waste processing shall complete the WTP pretreatment and vitrification of no less than 10% of Hanford's tank waste by mass\* and 25% by activity.

\*[In meeting this requirement DOE will pretreat and vitrify no less than 6,000 metric tons of sodium (in the instance of LAW feed) and 800 metric tons of waste oxides (in the instance of HLW feed)].

**Status:** Unrecoverable.

### 7.3 M-62-07B – COMPLETE ASSEMBLY OF LAW MELTER #1 SO THAT IT IS READY FOR TRANSPORT AND INSTALLATION IN THE LAW VITRIFICATION BUILDING (BNI BASELINE SCHEDULE ACTIVITY 4DL321A3200 AS PART OF DOE CONTRACT NO. DE-AC27-01RV14136), AND COMPLETE SCHEDULE ACTIVITY ID 4DH46102A2 – MOVE #1 MELTER INTO THE HLW VITRIFICATION FACILITY.

**Milestone Date:** December 31, 2007

**Description:** This milestone represents (1) the assembly of LAW Melter #1 to the point it is ready for refractory as part of BNI baseline activities 3EL3212A00 "Specifications and Analysis," 4DL321A000 "LAW - Procure Material & Equipment for Melters," and 4DL321A200 "LAW- Assemble Melter #1," (Contract No. DE-AC27-01RV14136). In addition, activities 4DL121U100 "LAW - Elev +3 South Melter FREP," and 4DL131D000

“LAW - Elev +28 Columns, Beams & Q-Decking at +48,” shall be substantially completed; and (2) moving the first HLW melter into the HLW Facility as defined in BNI baseline activities ID 4DH46102A2.

Completion of this milestone will be met when (1) LAW melter #1 will have been fully fabricated, assembled, and ready for refractory material to be installed. Assembly of the melter is scheduled to occur near the end of LAW construction when the facility is most ready to have the assembled melter moved into the LAW cell where the refractory material will be installed. Meeting this milestone therefore represents significant accomplishment of the engineering, design, and construction of the LAW Facility; and (2) HLW melter #1 has been fully fabricated and moved into the HLW Vitrification Facility.

**Status:** Unrecoverable.

**7.4 M-62-08 – SUBMITTAL OF HANFORD TANK WASTE SUPPLEMENTAL TREATMENT TECHNOLOGIES REPORT, DRAFT HANFORD TANK WASTE TREATMENT BASELINE, AND DRAFT NEGOTIATIONS AGREEMENT IN PRINCIPLE (AIP).**

**Milestone Date:** June 30, 2006

**Description:** DOE will submit a supplemental treatment technologies report that describes the technical, financial, and contractual alternatives, which in combination with the WTP and any required additional LAW vitrification facilities, are needed to treat all of Hanford’s tank wastes. The report will identify and describe viable path(s) forward to complete treatment of all tank wastes by December 31, 2028. The report shall apply the same selection criteria to all options and include the second LAW vitrification facility as an option. The report will include the results of all waste form performance data (compared against the performance of borosilicate glass) for all the treatment technologies being considered; performance data will be adequate to make decisions as to the acceptability of any proposed waste form for the waste being considered; and description of the considered treatment technologies (including size, throughput, technical viability, and life cycle cost estimates).

This report will also include a discussion of waste treatment plant throughput commitments and the realistic potential for enhancing the throughput of currently planned melters, proposed additional melters and potential second generation melters installed at first melter change out.

The draft baseline will contain DOE’s proposed approach for treating all Hanford Site tank wastes (high-level, low-activity, and transuranic) by December 31, 2028, including life-cycle cost estimates that indicate projected funding requirements through completion of the RPP mission; a schedule for construction and operation of proposed new facilities and/or enhancements to the WTP; and projected throughput for each facility.

The report and baseline will be accompanied by a draft negotiations agreement in principle (AIP) and draft agreement change request containing milestones and associated agreement requirements sufficient to effectively drive all required work. These, include but are not limited to: (1) the establishment of requirements regarding any necessary WTP modification(s); (2) the establishment of requirements scheduling the acquisition and operation of any approved

treatment technology systems; (3) the establishment of production metrics for treatment complex (WTP plus any supplemental treatment system or second LAW vitrification facility) consistent with completion of treatment by December 31, 2028; and (4) the establishment of requirements scheduling acquisition and operation of feed delivery systems for any approved supplemental technology (M-47 milestones). The AIP will be finalized within 30 days of submittal and provide for negotiations to be completed within 180 days of AIP finalization, and will provide that, in the event the parties do not reach agreement within this timeframe, the negotiations will be resolved as a resolution of a dispute via final determination of the Director of Ecology pursuant to HFFACO Article VIII. Unless otherwise agreed by the parties, this final determination will be issued within seven months of AIP finalization.

**Status:** Missed.

#### **7.5 M-62-09 - START COLD COMMISSIONING - WASTE TREATMENT PLANT**

**Milestone Date:** February 28, 2009

**Description:** DOE will start cold commissioning of its tank waste treatment plant. Start of cold commissioning is defined as introduction of first feed simulant into a process building.

**Status:** Unrecoverable.

#### **7.6 M-62-10 - COMPLETE HOT COMMISSIONING - WASTE TREATMENT PLANT**

**Milestone Date:** January 31, 2011

**Description:** DOE will achieve sustained throughput of PT, LAW vitrification, and HLW vitrification processes and demonstrate WTP treatment complex availability to complete treatment of no less than 10% of the tank waste by mass and 25% of the tank waste by activity by December 2018.

**Status:** Unrecoverable.

#### **7.7 M-62-11 - SUBMIT A FINAL HANFORD TANK WASTE TREATMENT BASELINE**

**Milestone Date:** June 30, 2007 (See M-62-10)

**Description:** Following the completion of negotiations required in M-62-08, DOE will modify its draft baseline as required and submit its revised, agreed-to, baseline for treating all Hanford tank waste (high-level, low-activity, and transuranic) by December 31, 2028.

**Status:** Missed.

## 8.0 REFERENCES

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- 62 FR 8693, 1997, "Record of Decision for the Tank Waste Remediation System, Hanford Site, Richland, WA," *Federal Register*, Vol. 62, pp. 8693-8704, February 26.
- Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP, 24590-WTP-M4C-V11T-00004*, Rev. C, dated May 18, 2006.
- CCN 106655, "Hydrogen Generation Rate Calculation Open Items," letter to U.S. Department of Energy, Office of River Protection, Bechtel National, Inc., Richland, Washington, dated March 14, 2006.
- CCN 132846, "Report of External Flowsheet Review Team for the Hanford Waste Treatment and Immobilization Plant-Final Report Titled: "Comprehensive Review of the Hanford Waste Treatment Plant Flowsheet and Throughput," letter to U.S. Department of Energy, Office of River Protection, Bechtel National, Inc., Richland, Washington, dated March 17, 2006.
- DoD 2005, *Technology Readiness Assessment (TRA) Deskbook*, prepared by the Deputy Undersecretary of Defense for Science and Technology, May 2005.
- DOE Contract No. DE-AC27-01RV14136 between the U.S. Department of Energy and Bechtel National, Inc., dated December 11, 2000.
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- DOE O 413.3A, 2006, *Program and Project Management for the Acquisition of Capital Assets*, Change No. 1, U.S. Department of Energy, Office of Management, Budget and Evaluation, Washington, D.C.
- Ecology et al. 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
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*Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq., as amended.*

SRS 2006, *Ultrafiltration Process (UFP) Caustic Leaching Antifoam Performance*, WSRC-TR-2005-00564, Rev. 0, Savannah River National Laboratory, Aiken, South Carolina.