



U.S. Department of Energy
Office of River Protection

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 Richland, Washington 99352

FEB 10 2006

06-WED-010

Mr. J. P. Betts, Project Manager
 Bechtel National, Inc.
 2435 Stevens Center
 Richland, Washington 99352

Dear Mr. Betts:

CONTRACT NO. DE-AC27-01RV14136 – TRANSMITTAL OF DESIGN OVERSIGHT REPORT ON REVIEW OF BECHTEL NATIONAL, INC. (BNI) DESIGN FOR THE TREATMENT OF RADIOACTIVE LIQUID WASTE (D-05-DESIGN-018)

The U.S. Department of Energy, Office of River Protection (ORP) conducted a design oversight review of the management of radioactive liquid waste at the Waste Treatment and Immobilization Plant (WTP). During WTP operations, secondary waste streams will be generated. These waste streams include radioactive liquid waste, which must be characterized, treated, and disposed per applicable state and Federal regulations. This waste will be transferred to the Liquid Effluent Retention Facility (LERF)/Effluent Treatment Facility (ETF) for treatment. This letter transmits the subject Oversight Report (Attachment).

Based on review of project information and discussion with BNI staff, the Design Oversight Team concluded that the design for radioactive liquid waste management, including treatment and disposal, is being appropriately implemented. There is significant documentation between BNI and the LERF/ETF contractor indicating that outstanding issues have been identified and are being effectively worked by both parties. No findings, open items, or recommendations were identified during this review.

This letter is not considered to constitute a change to the Contract. In the event the Contractor disagrees with this interpretation, it must immediately notify the Contracting Officer orally, and otherwise comply with the requirements of the Contract clause entitled 52.243-7 Notification of Changes.

If you have any questions, please contact me, or your staff may call Bill Hamel, Director, WTP Engineering Division, (509) 373-1569.

Sincerely,

John R. Eschenberg, Project Manager
 Waste Treatment and Immobilization Plant

WED:CAB

Attachment

cc: See page 2

FEB 10 2006

Mr. J. P. Betts
06-WED-010

-2-

cc w/attach:
J. P. Henschel, BNI
L. Lamm, BNI
R. Garrett, BNI

Attachment
06-WED-010

DESIGN OVERSIGHT REPORT

**REVIEW OF BNI DESIGN
FOR THE TREATMENT OF
RADIOACTIVE LIQUID WASTE**

January 2006

D-05-DESIGN-018

WED:CAB
January 26, 2006

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

DESIGN OVERSIGHT REPORT

REVIEW OF BNI DESIGN FOR THE TREATMENT OF RADIOACTIVE LIQUID WASTE

January 2006

Design Oversight: D-05-DESIGN-018

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EXECUTIVE SUMMARY

A primary mission of the U.S. Department of Energy (DOE), Office of River Protection (ORP) is the construction of the Waste Treatment and Immobilization Plant (WTP) in the 200 East Area of the Hanford Site. As part of its oversight responsibilities, WTP Engineering Division of ORP performed a design oversight review of the management of radioactive liquid waste in November, 2005. Two personnel from ORP performed the WED design oversight review. The purpose of the design review was to ensure applicable contract and design criteria were being met for the systems used to collect and transfer radioactive liquid waste.

The WTP complex consists of various facilities to analyze, treat, process, immobilize, and package waste from the Hanford Tank Farms. One of the key facilities of the WTP is the PT Facility. Within the PT Facility, process recycles and other radioactive liquid wastes generated in this and other facilities are collected. Any radioactive liquid waste that is not included in the vitrified waste matrices is transferred for treatment to Liquid Effluent Retention Facility (LERF)/Effluent Treatment Facility (ETF). Radioactive liquid waste effluent is derived from evaporation, treatment of melter offgas systems, and equipment decontamination. Because of this required capability, the PT Facility has been designed with waste storage tanks with sampling capability. During operations, the PT Facility will collect and sample the waste to ensure it meets the waste acceptance criteria of the treatment facilities. Prior to transfer, the waste must be sampled to ensure it meets the treatability envelope of LERF/ETF. Also, to ensure required modifications are made to LERF/ETF, an annual WTP forecast is developed for the volume and characteristics of waste to be treated at LERF/ETF.

The following are the specific objectives of this oversight:

1. Identify and understand the Contractor requirements for the storage and treatment of radioactive liquid waste.
2. Understand the technical bases for the forecasted liquid waste stream characteristics.
3. Verify a forecast for the generation of liquid radioactive waste has been developed and includes constituents, volumes, and duration. Verify LERF/ETF can adequately support the needs of the WTP.
4. Verify sufficient capacity exists in the transfer system to discharge the waste from the WTP to LERF/ETF.

This design oversight included a review of design documents for the radioactive liquid waste disposal system, forecast data, treatability envelopes, and other appropriate documents. Appropriate contractor personnel were interviewed and a field walkdown of installed equipment was performed. The oversight was conducted within the guidelines of ORP PD 220.1-12, February 12, 2003, "Conduct of Design Oversight".

Three general areas were identified for review. Review of these areas was determined to provide the information required to meet the design review objectives.

- Contract Requirements

- Waste forecasting
- Storage and transfer capacity

The methodology of review depended on the area although all relied heavily on document reviews. The contract requirements were verified through reviews of the contract and applicable interface control documents. The waste forecasting was verified through reviews of the process flowsheets and other applicable documents along with discussions with contractor staff [both BNI and Fluor Hanford (FH)]. The capacity was verified through reviews of the applicable system descriptions, calculations, and piping and instrument diagrams. Due to scope of the review, representative reviews were performed and in-depth reviews of every component were not performed. The following Lines of Inquiry (LOI) were developed.

- LOI-1: What are the contract requirements for delivery of radioactive liquid waste to the Effluent Treatment Facility and/or the Liquid Effluent Retention Facility?
- LOI-2: What is the forecast generation rate and characteristics of the radioactive liquid waste?
- LOI-3: What is the basis for the forecast?
- LOI-4: Will the waste meet the waste acceptance criteria of the Liquid Effluent Retention Facility and/or the Effluent Treatment Facility?
- LOI-5: Is there sufficient storage and transfer capacity (storage tanks, pumps, transfer lines) to manage the forecasted radioactive liquid waste?

It is the conclusion of the design oversight review team that the design process path being utilized by BNI for radioactive liquid waste management, including treatment and disposal is being appropriately implemented. There is significant documentation between BNI and the LERF/ETF contractor indicating that outstanding issues have been identified by both parties.

The review indicated that the required design elements at the WTP are being implemented and some of the equipment has been installed. The significant issues that remain unresolved are required changes to the ETF treatment capability, the need for more precision in the sampling of the waste, particularly for organics, and the associated environmental permits and approvals for both ETF and the final disposal facility. These issues were not listed as open items or recommendations in this report as they are currently being tracked in the Risk Management Database on risk assessment sheet WTP-IMT-020, "Effluent Characteristics Not Within LERF/ETF treatment envelope ICD-6", and there are no current indications that resolution will require design changes to the WTP. Future operations may be modified or in the worst case scenario a reverse osmosis system may need to be added to treat process condensate prior to transfer to LERF/ETF, but that is beyond the scope of this review. According to the Risk Management Database and captured within ICD-6, these issues are anticipated to be closed by March 2010. Thus, there were no findings, open items, or recommendations identified during this review.

**REVIEW OF BNI DESIGN FOR THE
TREATMENT OF RADIOACTIVE
LIQUID WASTE**

January 2006

D-05-DESIGN-018

Table of Contents

EXECUTIVE SUMMARY ii

INTRODUCTION5

BACKGROUND5

OBJECTIVES6

SCOPE6

APPROACH6

RESULTS7

CONCLUSIONS.....13

DOE ORDER 413.3.....13

APPENDIX A LINES OF INQUIRY DOCUMENTED REVIEW15

APPENDIX B DOCUMENTS REVIEWED REFERENCES34

APPENDIX C PERSONNEL INTERVIEWED39

APPENDIX D DESIGN OVERSIGHT REVIEW PLAN.....41

INTRODUCTION

A primary mission of the U.S. Department of Energy (DOE), Office of River Protection (ORP) is the construction of the Waste Treatment and Immobilization Plant (WTP) in the 200 East Area of the Hanford Site. The design and construction contractor for the WTP is Bechtel National, Inc (BNI). As part of its oversight responsibilities, ORP performs various assessments of BNI activities during the design and construction phase. One such oversight is the design review of various facility components and systems performed by the ORP WTP Engineering Division (WED). During WTP processing operations, secondary waste streams will be generated. These waste streams include radioactive liquid waste, which must be characterized, treated, and disposed per applicable state and Federal regulations. This waste will be transferred to and treated at the Liquid Effluents Retention Facility (LERF)/Effluent Treatment Facility (ETF). Due to the importance to the WTP mission, WED selected the radioactive liquid waste management and treatment systems for a design review.

Two personnel from ORP were designated to perform the WED design review of the evaporator systems. The formal design review occurred from November 9, 2005, to November 23, 2005, and consisted of discussions with appropriate BNI staff, document reviews, and fact finding. The purpose of the design review was to ensure applicable contract and design criteria were being met by the radioactive liquid waste disposal system designs and that the system would meet mission needs for the WTP. Because of the nature of the systems, the review consisted of primarily document reviews. Also, the waste will be received and treated at LERF and ETF, which are both operated by a different site contractor. Thus, the requirements for BNI consist mainly of forecasting, sampling, verification, and transfer of the waste. Based on the review, no open items or recommendations were identified.

BACKGROUND

The WTP complex consists of various facilities to analyze, treat, process, immobilize, and package waste from the Hanford Tank Farms. The four key facilities of the WTP are the Pretreatment (PT) Facility, the Low Activity Waste (LAW) Vitrification Facility, the High Level Waste Vitrification (HLW) Facility, and the Analytical Laboratory (LAB). The PT Facility is primarily designed to receive liquid waste slurry from the Tank Farms and to treat the waste using solid-liquid filtration, ion-exchange, and concentration and blending processes in order to prepare the waste for immobilization at the LAW and HLW Facilities. In addition, the PT Facility also receives process recycles and other radioactive liquid wastes generated in the other facilities. Any radioactive liquid waste that is not included in the vitrified waste matrices is collected and transferred for treatment to LERF/ETF. Because of this required capability, the PT Facility has been designed with waste storage tanks with sampling capability. During operations, the PT Facility will collect and sample the waste to ensure it meets the waste acceptance criteria of the treatment facilities. In addition, to ensure sufficient treatment capability exists, the WTP must provide annual forecasts of the volumes and characteristics of the waste to the treatment facility contractor.

OBJECTIVES

The following are the specific objectives of this oversight:

1. Identify and understand the Contractor requirements for the storage and treatment of radioactive liquid waste.
2. Understand the technical bases for the forecasted liquid waste stream characteristics.
3. Verify a forecast for the generation of liquid radioactive waste has been developed and includes constituents, volumes, and duration. Verify LERF/ETF can adequately support the needs of the WTP.
4. Verify sufficient capacity exists in the transfer system to discharge the waste from the WTP to LERF/ETF.

The design oversight was conducted as part of ORP's responsibility as owner of the WTP to ensure that the design and planned operations comply with the appropriate contractual requirements.

SCOPE

This oversight included a review of the plans and designs for the generation, transfer, and treatment of radioactive liquid waste that will be managed in LERF/ETF. The review specifically concentrated on the design elements that meet the requirements. Areas such as support for environmental compliance activities were not reviewed. The scope of the review did not specifically include capacities within the WTP used for the management of recycle liquids nor treated waste residue disposal. Also, liquid waste generation at the bulk vitrification facility was out of scope for this review.

A comprehensive review of the capacities and capabilities of the WTP, ETF, LERF, Bulk Vitrification Facility, and Integrated Disposal Facility is needed to verify cradle to grave disposal capability. However, due to uncertainties in current schedules, a review of this scope will be performed at a later date, thus limiting the scope of the review described in this report to the WTP.

APPROACH

The oversight was conducted within the guidelines of ORP PD 220.1-12, February 12, 2003, "Conduct of Design Oversight". Evaluated information was collected from various contractor and DOE documents and interviews with design staff. A full listing of the documents reviewed is provided in Appendix B. The title of personnel interviewed is provided in Appendix C. Note that due to the maturity of design and the scope of responsibility assigned to BNI, the majority of this review consisted of document reviews.

The design review was formally conducted from November 9, 2005, to November 23, 2005. To prepare, the review team collected applicable documentation in the week preceding the review. Due to the desire to minimize disruptions of the BNI design work, staff interactions were minimized in the weeks leading up to the formal review. During the review an interface meeting was held with the appropriate design staff in order to understand the BNI workscope and the documents provided. In order to help focus contractor response efforts, formal lines of inquiry were provided to BNI. The review team consisted of Carol Babel and Todd Shrader of ORP WED. The approved design oversight review plan is provided in Appendix D.

Three general areas were identified for review. Review of these areas was determined to provide the information required to meet the design review objectives.

- Contract Requirements
- Waste forecasting
- Storage and transfer capacity

The methodology of review depended on the area although all relied heavily on document reviews. The contract requirements were verified through reviews of the contract and applicable interface control documents. The waste forecasting was verified through reviews of the process flowsheets and other applicable documents along with discussions with contractor staff [both BNI and Fluor Hanford (FH)]. The capacity was verified through reviews of the applicable system descriptions, calculations, and piping and instrument diagrams. Due to scope of the review, representative reviews were performed and in-depth reviews of every component were not performed.

Finally, in order to maintain a project discipline for the design review, the principles of DOE Order 413.3, Project Management for the Acquisition of Capital Assets, were utilized to prepare for, conduct, and close-out the design review. This required the development of requirements and endpoints as well as the tracking of costs and schedule for the review. These principles were only applicable to the federal staff performing the review. BNI was not assessed against DOE Order 413.3.

RESULTS

The team reviewed various aspects of the design and planning for the management of radioactive liquid waste. Emphasis for the review was placed on application of contract and requirements documents to the design and planning. Vertical slices of design elements or requirements were reviewed in order to gage the overall effectiveness of the design process. Lines of Inquiry (LOI) were developed to adequately investigate all aspects of the system designs. The full discussion of each LOI is provided in Appendix A.

Contract Requirements – (LOI – 1)

What are the contract requirements for delivery of radioactive liquid waste to the Effluent Treatment Facility and/or the Liquid Effluent Retention Facility?

The two main documents that provide the design requirements that must be met by the WTP for radioactive liquid waste is the Contract and Interface Control Document 06 (ICD-6). A summary of the significant requirements is provided below.

- Provide an annual forecast with information on the operating range for volume, flow rate, activity, composition, and applicable waste codes for the radioactive dangerous liquid effluents. Complete and maintain a waste profile for the radioactive, dangerous liquid effluents per the LERF/ETF Dangerous Waste Permit.
- Submit all identified technical information and analyses required to modify or comply with any affected permits and implementing documents necessary to transfer the radioactive dangerous liquid effluents to LERF/ETF.
- Connect the WTP facility to the transfer lines provided for the radioactive dangerous liquid effluents at the WTP Site boundary. Provide the motive force for transferring the radioactive, dangerous liquid effluents to the LERF/ETF. Interlock the WTP transfer line, and the LERF leak detection and control system.
- Discharge the radioactive, dangerous liquid effluents within the current LERF/ETF treatability envelope. During operation document the volume and composition of the radioactive, dangerous liquid effluents. Do not commingle different waste types.
- Provide at least 1000 m³ (265,000 gal) of storage capacity, or 48 hours of storage capacity, whichever is greater, to store radioactive, dangerous liquid effluents without impacting WTP Contractor operations.
- Pretreat the radioactive, dangerous liquid effluents if required, to meet the negotiated LERF/ETF treatability envelope.

Based on a review of the design of the radioactive liquid waste disposal system, it appears that the system is designed and configured to meet these requirements. Note that some of these requirements are operational in nature and cannot be confirmed at this time. For example, the prohibition on commingling waste cannot be verified until the plant is operational.

Waste Forecasting (LOI – 2)

What is the forecast generation rate and characteristics of the radioactive liquid waste?

Per ICD-6, the WTP is required to generate an annual forecast of estimated effluent volumes and constituents. The requirement specifically states the following. "Provide an annual forecast with information on the operating range for volume, flow rate, activity, composition, and applicable waste codes for the radioactive dangerous liquid effluents. Complete and maintain a waste profile for the radioactive, dangerous liquid effluents per the LERF/ETF Dangerous Waste Permit."

The 2005 forecast is provided in “2005 WTP Material Balance and Process Flowsheet Assessment.” Although it was not clear from the documentation that the forecasts have been provided annually, the ICD provides clarification that the forecast be provided annually or as mutually agreed to reflect major process modifications. Based on the review and discussions with contractor personnel (BNI and FH) it appears forecast information is provided on a periodicity that meets the needs of all parties.

The forecast includes volume in gallon/month; mass flow in kg/month; concentration in mg/L for each constituent (cations, anions, radionuclides, and physical ions like pH, TDS etc) and concentration in lbs./day for organics) forecast to be present in the effluent that will be sent to LERF/ETF. The physical stream characteristics and isotopic compositions of the subsequent discharge stream to LERF/ETF have been provided with the forecast. All projected isotopic concentrations are within the LERF/ETF bounding limits.

The transfer rate from the Pretreatment Facility to ETF/LERF is forecasted to be 19.2 gpm. From Figure 2-3 (24590-WTP-RPT-PO-05-008, Rev. 0, “2005 WTP Tank Utilization Assessment”), 5.9 million gal/yr of the total effluent collected in the PT radioactive liquid waste disposal system (RLD) is discharged to LERF/ETF. The Tank Utilization Assessment assumes 100% availability and therefore the actual effluent volume transferred from WTP to LERF/ETF will most likely be less than the forecasted volume.

According to the Basis of Design section 6, Process Basis of Design, the maximum flowrate acceptable at the ETF is 26.4 million gal/yr, with an average flow of 50 gpm. Instrumentation located in the discharge line to LERF/ETF monitors the discharge instantaneous flow rate (170 gpm limit) and acceptability compliance parameters (pressure, process fluid temperature, radiation, pH, and conductivity). If the inventory is non-compliant with the LERF/ETF acceptance criteria, then it is routed to the LAW SBS Condensate Receipt Vessels TLP-VSL-00009A/B for reprocessing.

Waste Forecasting (LOI – 3)

What is the basis for the forecast?

The document “Flowsheet Bases, Assumptions, and Requirements” provides the basis for the effluent forecast. “The basis for operations of system RLD is to provide a collection point for radioactive liquid wastes to be transferred from the WTP to LERF/ETF. System RLD needs to provide enough space to be able to receive process condensate from the FEP and TLP evaporators and alkaline, radioactive effluents from the PT and LAW facility. There also needs to be enough liquid stored in the system RLD to be recycled back to the UFP system for use in dilution or solids washing”.

The 2005 Effluent Forecast is based on the 2005 blended AP-101/AY-102 Assessment Run. This represents the Envelope A/D material balances and is based on waste tanks AP-101 blended with AY-102. The steady-state flowsheet was utilized instead of the dynamic flowsheet as was done for previous forecasts. The 2005 Forecast represents a snapshot of the anticipated steady-state condition for the effluent discharge stream, while a blended AP-101/AY-102 waste feed is

processed at design production rates. Therefore, the 2005 Forecast represents the effluent that will be generated during commissioning of the WTP only. The WTP flowsheet is based on vitrification facility design capacities equal to 6 metric tons per day (MTD) of immobilized high level waste (IHLW), 30 MTD of immobilized low activity waste (ILAW) and PT facility design capacity of 80 MTD of ILAW equivalents. For Envelope A/D (AP-101/AY-102) the ILAW production is 30 MTG per day and 1320 sodium waste units per year. IHLW production is 5.9 MTG per day. Pretreatment production is 3210 waste sodium units per year.

The RLD system receives effluent wastes from LAW and HLW facility systems and various PT Facility processes. Within the PT Facility RLD-TK-00006B receives excess process condensate from RLD-TK-00006A and low activity effluents from RLD-VSL-00017A/B. The tanks fill until a full batch (265,000 gallons) has been received. The tank contents are held for sampling, as required, to verify compliance with the LERF/ETF treatability envelope. Waste that does not meet the LERF/ETF treatability envelope is transferred back to the LAW SBS condensate receipt vessel for reprocessing. The waste accumulated in RLD-TK-00006B is transferred to LERF/ETF if it meets the LERF/ETF treatability envelope, through a transfer pump at a rate of 170 gpm. Transfer is complete once the full batch volume has been transferred. Design basis and input assumptions for components such as the process condensate transfer pumps have been determined.

A key assumption of the System Plan includes the following. "The timing, capacities, and capability of the ETF, LERF, and TEDF will be driven by the needs of the waste treatment mission and assumed to be available when needed. If the treatment mission requires that changes be made to the ERF, LERF, or TEDF, or their operating plans, the ORP is assumed to successfully drive the changes". Also, "The LERF consists of three basins, each with an operating volume of 7.8 million gallons, which are used to provide lag storage of liquid effluent. Two of the basins will be allocated to supporting the waste treatment mission; the third basin will be reserved for CERCLA effluents".

Waste Forecasting (LOI – 4)

Will the waste meet the waste acceptance criteria of the Liquid Effluent Retention Facility and/or the Effluent Treatment Facility?

The LERF/ETF waste acceptance criteria has been developed and is contained in the treatability envelope. Once the WTP Contractor provides the WTP radioactive liquid effluent forecast (volume and composition), the LERF/ETF contractor performs a treatability evaluation. The treatability evaluation is conducted by comparing the WTP radioactive liquid effluent forecast to the LERF/ETF treatability envelope, which provides the requirements that determine if a liquid effluent is acceptable for receipt and treatment at the LERF/ETF. The maximum annual average concentrations over the range of the 27 year forecast is evaluated against the treatability envelope. The waste acceptance process involves three steps: (1) assemble waste information and screen for completeness; (2) compare waste to regulatory envelope; (3) compare waste to design envelope.

The last treatability evaluation was performed on the 2004 Forecast, which was based on the dynamic flowsheet and was for the life cycle of the WTP. This evaluation identified concerns and additional information requirements discussed below. In order to provide a complete treatability evaluation, the LERF/ETF contractor requested the following additional information: regulatory designation of the waste and units for organics. Additional assumptions and concerns have been noted including adequate National Environmental Policy Act (NEPA)/State Environmental Policy Act (SEPA) analyses and determinations for any required LERF/ETF changes, changes in the LERF/ETF delisting exclusions, possible modifications to the LERF/ETF State Waste Discharge Permit, and changes in the LERF/ETF Notice of Construction. Although each of these concerns will have to be addressed and may be considered open items at this time, they are tracked by alternate organizations and no WTP design changes are anticipated. Thus, no open items or recommendations are generated in this review for these items.

Also, it is recognized that design changes may be required at ETF and a new flowsheet will be required due to additional concerns. For example, the effectiveness of the ultraviolet/oxidation (UV/OX) unit may be affected by inorganic constituents in the waste. Also, to avoid scaling in the reverse osmosis unit, the pH of the waste will have to be adjusted from alkaline to acidic which in turn could cause off gassing of Iodine-129. Changes in the off gas treatment systems may be required. Finally, due to the expected radionuclide concentrations, the treatment residue will require additional stabilization prior to disposal. This stabilization capability may have to be added to the ETF. If these concerns are not adequately resolved WTP processing could be affected. These concerns are captured by the risk assessment sheet, WTP-IMT-020, "Effluent Characteristics not within LERF/ETF Treatment Envelope ICD-6-27, 6-33" (24590-WTP-RPT-PR-01-006, Revision 12). Again however, resolution may involve design changes at ETF or other facilities design changes may not be likely at the WTP. Thus, no open items or recommendations are identified in this review.

Storage and Transfer Capacity (LOI – 5)

Is there sufficient storage and transfer capacity (storage tanks, pumps, transfer lines) to manage the forecasted radioactive liquid waste?

Storage Tanks:

Requirement: Provide at least 1000 m³ (265,000 gal) of storage capacity, or 48 hours of storage capacity, whichever is greater, to store radioactive, dangerous liquid effluents without impacting WTP Contractor operations.

Tank RLD-TK-00006B receives excess process condensate (condensate left after recycle demands are met) from tank RLD-TK-00006A (15,500 gallons over 2 days) and low active effluents from vessels RLD-VSL-000 17A/B (20,000 gallons over 2 days). Tank RLD-TK-00006B with a maximum operating volume of 312,900 gallons fills until a full batch (265,000 gallons) has been received. A hold up of about 13 days is available in this tank to allow for delays in the laboratory or LERF/ETF. Tank RLD-TK-00006A will be an alternate route in case of failure of RLD-TK-00006B (maximum operating volume 312,900 gallons).

Pumps:

Requirement: Provide the motive force for transferring the radioactive, dangerous liquid effluents to the LERF/ETF.

The waste accumulated in RLD-TK-00006B is transferred to LERF/ETF (transfer sequence SEQ-RLD-00422) if it meets the LERF/ETF treatability envelope, through pump RLD-PMP-00011A/B at a rate of 170 gpm through the 4-in. diameter main transfer line and 90 gpm through the 3-in diameter backup transfer line. If the acceptance criteria are not met, the non-compliant effluent is pumped to the LAW SBS Condensate Receipt Vessels TLP-VSL-00009A/B. Pumps RLD-PMP-00012A/B will be used to re-circulate the contents of the process condensate tanks before sampling and or transferring between the two process condensate tanks. Pumps RLD-PMP-00014A/B will be used to provide process condensate from the process condensate tanks (RLD-TK-00006A/B) to process distribution header. There are no emptying ejectors required in these tanks. The installed pumps will be sufficient to recover heels left in the tanks.

Transfer Lines:

Requirements:

- The 4-inch containment pipeline is constructed from fiber-reinforced epoxy. (ICD-6)
- The minimum instantaneous discharge rate to LERF is 90 gpm (ICD-6)
- The maximum allowable fluid temperature is 120° F (49° C) (ICD-6)
- The delivery pressure to LERF shall be atmospheric pressure. (LERF/ETF Treatability Envelope)
- The design pressure is 100 psig (ICD-6).
- Connect the WTP facility to the transfer lines provided for the radioactive dangerous liquid effluents at the WTP Site boundary. (ICD-6)
- Interlock the WTP transfer line and the LERF leak detection and control system. (ICD-6)

Two pipelines (a main and backup) will be used to transfer the radioactive, dangerous waste effluent from WTP to LERF/ETF. The physical interface points for these pipelines are shown as nodes 8A and 8B on the Interface Control Drawing 24590-WTP-B2-C12T-00001. The main pipeline will be used to transfer the effluent. If the main pipeline is unavailable, effluent will be transferred via the backup pipeline. The main pipeline is a 4-in. diameter primary pipe encased in 8-in. diameter outer pipe. The backup pipeline is a 3-in. diameter primary pipe encased in 6-in diameter outer pipe. The design pressure for both pipelines is 100 pounds per square inch gage at 49° C (120° F). The WTP portion of the transfer pipelines will be constructed of a material which is chemically compatible with the effluent. Where the WTP pipelines join with the PHMC pipelines at the interface point, the design will be physically compatible with and maintain the physical integrity of each pipeline. The design of the WTP transfer system will not allow the design pressure of the RLD pipelines to be exceeded and will be capable of throttling the system flow rate so that the design pressure of the backup transfer line is not exceeded. The WTP transfer system will provide a vacuum relief capability. A leak detection system (tape or leak pot) will be installed.

The LERF consists of three basins, each with an operating volume of 7.8 million gallons, which are used to provide lag-storage of liquid effluent. Two of the basins will be allocated to supporting the waste treatment mission; the third basin will be reserved for CERCLA effluents.

The WTP Contractor will monitor the effluent for flow rate/total flow on a real-time and historical basis, and the process upset indicating parameters such as pH, conductivity, and radioactivity. Flow and process upset indicating parameters will be transmitted to the PHMC monitoring and control system on a real-time basis. The real-time data and permissive signals will be transmitted over a dedicated line. The monitoring system will initiate automated corrective measures, as appropriate, to protect the integrity of both the disposal and discharged effluent.

Based on review of ICD-6, referenced P&ID's, and calculation notes, LERF/ETF Treatability Envelope analysis, and FFS performance specifications it appears the currently designed storage and transfer capacity is adequate to manage the forecasted radioactive liquid waste.

CONCLUSIONS

It is the conclusion of the design oversight review team that the design process path being utilized by BNI for radioactive liquid waste management, including treatment and disposal is being appropriately implemented. There is significant documentation between BNI and the LERF/ETF contractor indicating that outstanding issues have been identified by both parties.

The review indicated that the required design elements at the WTP are being implemented and some of the equipment has been installed. The significant issues that remain unresolved are required changes to the ETF treatment capability, the need for more precision in the sampling of the waste, particularly for organics, and the associated environmental permits and approvals for both ETF and the final disposal facility. These issues were not listed as open items or recommendations in this report as they are currently being tracked in the Risk Management Database on risk assessment sheet WTP-IMT-020, "Effluent Characteristics Not Within LERF/ETF treatment envelope ICD-6", and there are no current indications that resolution will require design changes to the WTP. Future operations may be modified or in the worst case scenario a reverse osmosis system may need to be added to treat process condensate prior to transfer to LERF/ETF, but that is beyond the scope of this review. According to the Risk Management Database and captured within ICD-6, these issues are anticipated to be closed by March 2010. Thus, there were no findings, open items, or recommendations identified during this review.

DOE ORDER 413.3

In order to provide a structured format for the review, DOE Order 413.3 was utilized as a guide. In particular, requirements were identified and schedules developed. Also costs were tracked in order to determine the resources applied to the review. This report constitutes the CD-4 deliverable for this review.

The requirements for the performance of this review were as follows.

- Verification that a plan has been developed for the management of radioactive liquid waste including forecasting.
- The WTP contains the required design elements to meet contractual requirements for the disposal of radioactive liquid waste.
- The design was performed per ORP PD 220.1-12, February 12, 2003, "Conduct of Design Oversight".
- The design review schedule was maintained as described in Table 2.

The first three requirements were met by the review. However, the last requirement was not met as the final report was not issued per the schedule. Issuance of the final report was delayed due to competing priorities for the review team.

The endpoint of the design review was the issuance of this report. Verification or implementation of recommendations will be tracked under the ORP Consolidated Action Reporting System where applicable.

Finally, although formal time tracking was not performed for this review, an estimate was developed by the participants. To support this review, BNI expended approximately 10 man-hours for a cost of \$700. To perform the review, ORP expended approximately 60 man-hours for a cost of approximately \$4,200. Thus, the cost to perform this review is estimated to be approximately \$4,900.

APPENDIX A

**LINES OF INQUIRY
DOCUMENTED REVIEW**

Lines of Inquiry

1. *What are the contract requirements for delivery of radioactive liquid waste to the Effluent Treatment Facility and/or the Liquid Effluent Retention Facility?*

Contract Requirements: WTP Contract No. DE-AC27-01RV14136

To summarize the contract requirements include:

- Provide an annual forecast with information on the operating range for volume, flow rate, activity, composition, and applicable waste codes for the radioactive dangerous liquid effluents. Complete and maintain a waste profile for the radioactive, dangerous liquid effluents per the LERF/ETF Dangerous Waste Permit.
- Submit all identified technical information and analyses required to modify or comply with any affected permits and implementing documents necessary to transfer the radioactive dangerous liquid effluents to LERF/ETF.
- Connect the WTP facility to the transfer lines provided for the radioactive dangerous liquid effluents at the WTP Site boundary. Provide the motive force for transferring the radioactive, dangerous liquid effluents to the LERF/ETF. Interlock the WTP transfer line, and the LERF leak detection and control system.
- Discharge the radioactive, dangerous liquid effluents within the current LERF/ETF treatability envelope. During operation document the volume and composition of the radioactive, dangerous liquid effluents. Do not commingle different waste types.
- Provide at least 1000 m³ (265,000 gal) of storage capacity, or 48 hours of storage capacity, whichever is greater, to store radioactive, dangerous liquid effluents without impacting WTP Contractor operations.
- Pretreat the radioactive, dangerous liquid effluents if required, to meet the negotiated LERF/ETF treatability envelope.

The specific requirements and location of each within the contract are listed below:

Page C-6

Section C.4 Environment, Safety, Quality, and Health (c) (4)

- (D) Ecology, WDOH, and/or local agencies will regulate liquid effluent and solid waste. The Contractor shall provide technical and regulatory support for all required permitting and compliance activities associated with WTP liquid effluent and solid waste.
- (E) Certain vitrification secondary waste stream disposal activities (e.g., waste water discharges to the Effluent Treatment Facility) may be subject to existing PCB discharge limitations.

Page C-35

Standard 3: Design (b) Establish and Maintain Facility Design Requirements: The Contractor shall comply with the Contract design process and the following:

- (1) Functional Specification: The Contractor shall prepare for DOE information (Table C5.1.1, Deliverable 3.2) a Functional Specification that defines the technical operational

requirements of the WTP based on the WTP Conceptual Design and supporting documentation. This document shall define the waste treatment requirements, environmental compliance requirements, and authorization basis requirements of the facility as currently known and understood. The Functional Specification shall describe the process/functional requirements of the WTP, including:

Reference: Contract deliverable 3.2, 24590-WTP-PL-G-01-011, Revision 7, "Functional Specification", dated June 24, 2005.

(iv) Estimates of effluents

Reference: The most recent forecast is included in 24590-WTP-RPT-PO-05-009, "2005 WTP Material Balance and Process Flowsheet Assessment".

Earlier forecasts are contained in HNF-8306, treatability evaluations HNF-8306 Revision 0, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated June 2001.

HNF-8306 Revision 1, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated September 2004.

Page C-57

Standard 6: Product Qualification, Characterization, and Certification

The purpose of the Standard is to describe the requirements for documentation that describes the strategies for qualifying the immobilized waste products (IHLW and ILAW) and secondary wastes (solid waste, non-radioactive non-dangerous liquid effluents, radioactive dangerous liquid effluents, and air emissions).

Product qualification, characterization, and certification activities and deliverables shall be integrated with all technical, regulatory, and operability aspects of the WTP.

(a) The Contractor shall:

- (1) Identify, quantify, and describe each immobilized waste product, and secondary waste to be produced or generated by the WTP.
- (2) Conduct activities necessary to qualify each immobilized waste product and to provide confidence, prior to commissioning operations that the products will conform to the specifications and requirements in the Contract.
- (3) Conduct activities necessary during commissioning to characterize and provide a basis for certifying that the immobilized waste products and secondary wastes conform to the specifications and requirements in this Contract.

- (4) Issue a certification document for each filled and sealed canister that the canister meets product specifications and the basis for the certification.
 - (5) Perform all product qualification, characterization, and certification activities in accordance with the requirements of Section C.4.
- (b) The Contractor shall update the Secondary Wastes Compliance Plan (Table C 5.1.1, Deliverable 6.1) describing the plan for qualification, characterization, and certification of each immobilized waste product, and secondary wastes included under this Contract. These plans shall provide the following information:
- (1) Identification, quantification, and description of each immobilized waste product, and secondary waste. The description shall include chemical and radiochemical composition, physical properties, and a comparison to Contract requirements.
 - (2) Planned methods and documentation to qualify each immobilized waste product and secondary waste.
 - (3) Planned methods and documentation to characterize and provide a basis for certifying that each immobilized waste product and secondary waste meets Contract requirements.
 - (4) Planned methods and documentation to comply with dangerous and hazardous waste regulations as required under law and in the Contract.
 - (5) Identification and description of documentation to be provided with each product package submitted for acceptance, and secondary waste submitted for transfer that describes the product, documents characterization activities, and provides a basis for certifying that the product or waste conforms to the Contract requirements.

Reference: Contract deliverable 6.1, 24590-WTP-PL-RT-03-003, Revision 1, "Secondary Wastes Compliance Plan", dated September 30, 2004.

Page C-71, C-72

Standard 7: Environment, Safety, Quality and Health (4) Environmental Protection (Table C 5.1.1, Deliverable 7.3)

- (v) The Contractor shall work with the appropriate Hanford Site contractor in providing legally and regulatory required air and liquid effluent and near facility environmental monitoring. The Contractor shall collect, compile, and integrate air and liquid effluent monitoring data from operations and activities under their control. The Contractor shall compare the monitoring data with regulatory and/or permit standards applicable to their activities and/or operations and

provide the data and analyses to the appropriate Hanford Site contractor for use in preparing the mandatory State and Federal environmental reports for the Hanford Site in a timely environmental data for the WTO to support Hanford Site assessments and preparation for the Hanford Site Environmental Report.

Reference: Contract deliverable 7.3, 24590-WTP-PL-ENV-01-004, Revision 4, "Hanford Tank Waste Treatment and Immobilization Plant Environmental Plan", dated October 3, 2003.

Page C-78

C.7 Facility Specification

(a) Functional Design Requirements:

(15) Include process and facility design features that will efficiently minimize the use of services and utilities, generation of secondary waste and waste products consistent with the constraints specified in the contract. Achievement of this requirement is demonstrated through design reviews and DOE's design oversight:

(ii) Generation of secondary wastes, including: Radiological Solid Wastes, Dangerous Wastes, Non-Radioactive, Non-Dangerous Liquid Effluents, Radioactive, Dangerous Liquid Effluents; and

Reference: HNF-8306, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated September 2004.

(d) Waste Treatment and Immobilization Plant Unit Operation:

(1) Pretreatment Unit Operations: Pretreatment shall include the following major process functions:

(vi) Liquid Effluent Treatment: This operation concentrates and recycles waste processing streams resulting from the treatment of HLW and LAW Vitrification system off-gas condensates. Treated condensates will be transferred to the Effluent Treatment Facility on the Hanford site.

References: 24590-PTF-3YD-PWD-00001, Revision 1, "System Description for Plant Wash and Disposal System PWD and Radioactive Liquid Waste Disposal System RLD", dated September 22, 2003.

24590-HLW-3YD-RLD-00001 Revision 1, "System Description of HLW Radioactive Liquid Waste Disposal (RLD)", dated May 18, 2005.

24590-LAB-2YD-RLD-00001 Revision 2, "System Description of Radioactive Liquid Waste Disposal System for the Analytical Laboratory", dated February 15, 2005.

24590-LAW-3YD-20-00001 Revision 0, "System Description for LAW Vitrification Liquid Effluent System (RLD and NLD)", dated October 14, 2004.

24590-PTF-3PS-RLD-T0001, Revision A, "Software Functional Specification for PTF Radioactive Liquid Waste Disposal (RLD) System", dated May 19, 2004.

24590-HLW-3PS-RLD-T0001, Revision A, "Software Functional Specification for HLW Radioactive Liquid Waste Disposal (RLD) System", dated May 18, 2005.

24590-LAW-3PS-RLD-T0002, Revision 0, "Software Functional Specification for LAW Radioactive Liquid Waste Disposal (RLD) System", dated January 27, 2005.

24590-LAB-3PS-RLD-T0001, Revision 0, "Software Functional Specification for LAB Radioactive Liquid Waste Disposal (RLD) System", dated July 12, 2005.

Page C-118

C.9 Interface Control Documents

This Section provides the requirements for ICDs that describe the physical and administrative interfaces between DOE, ORP, Tank Farm Contractor, and other Hanford Site Contractors.

The approach to managing the interfaces is based upon development of ICDs that identify the requirements, roles, and responsibilities for all parties to the interface.

- (a) An initial set of ICDs was prepared as part of the WTP Conceptual Design:

ICD 6: Radioactive, Dangerous Liquid Effluents

- (b) ICDs shall reflect all interfaces and services needed in the construction and performance testing phases, and projected interface and services needed for the future commissioning and operating phases. The ICDs shall be an element of the design basis.

Reference: 24590-WTP-ICD-MG-01-006, Revision 3, "ICD 06 – Interface Control Document for Radioactive, Dangerous Liquid Effluents", dated August 15, 2003.

1. Provide an annual forecast with information on the operating range for volume, flow rate, activity, composition, and applicable waste codes for the radioactive dangerous liquid effluents. Complete and maintain a waste profile for the radioactive, dangerous liquid effluents per the LERF/ETF Dangerous Waste Permit.
2. Submit all identified technical information and analyses required to modify or comply with any affected permits and implementing documents necessary to transfer the radioactive dangerous liquid effluents to LERF/ETF.
3. Connect the WTP facility to the transfer lines provided for the radioactive dangerous liquid effluents at the WTP Site boundary. Provide the motive force for transferring the radioactive, dangerous liquid effluents to the LERF/ETF. Interlock the WTP transfer line, and the LERF leak detection and control system.
4. Discharge the radioactive, dangerous liquid effluents within the current LERF/ETF treatability envelope. During operation document the volume and composition of the radioactive, dangerous liquid effluents. Do not commingle different waste types.
5. Provide at least 1000 m³ (265,000 gal) of storage capacity, or 48 hours of storage capacity, whichever is greater, to store radioactive, dangerous liquid effluents without impacting WTP Contractor operations.
6. Pretreat the radioactive, dangerous liquid effluents if required, to meet the negotiated LERF/ETF treatability envelope.

2. *What is the forecast generation rate and characteristics of the radioactive liquid waste?*

ICD-6 requires WTP to generate an annual forecast of estimated effluent volumes and constituents.

Reference: 24590-WTP-ICD-MG-01-006, Revision 3, "ICD 06 -- Interface Control Document for Radioactive, Dangerous Liquid Effluents", dated August 15, 2003.

"Provide an annual forecast with information on the operating range for volume, flow rate, activity, composition, and applicable waste codes for the radioactive dangerous liquid effluents. Complete and maintain a waste profile for the radioactive, dangerous liquid effluents per the LERF/ETF Dangerous Waste Permit."

Reference: The most recent effluent forecast provided by BNI was included in 24590-WTP-RPT-PO-05-009, "2005 WTP Material Balance and Process Flowsheet Assessment".

The forecast is provided annually or as mutually agreed to reflect major process modifications. The forecast includes volume in gallons/month; mass flow in kg/month; concentration in mg/L for each constituent (cations, anions, radionuclides, and physical ions like pH, TDS etc) and concentration in lbs/day for organics) forecast to be present in the effluent that will be sent to LERF/ETF. The forecast will be provided until the start of hot operations, when the forecast will be replaced with actual operations results. The forecast is used to evaluate the treatability of the WTP liquid effluents in the LERF/ETF and disposal requirements for the remaining secondary solid wastes. The treatability evaluation for the most recent BNI effluent forecast (24590-WTP-RPT-PO-05-009) has not been completed yet. The most recent treatability evaluation is, HNF-8306 Revision 1, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated September 2004. The 2005 Effluent Forecast is based on the 2005 blended AP-101/AY-102 Assessment Run. The physical stream characteristics and isotopic compositions of the subsequent discharge stream to LERF/ETF are provided in Table 3-11 of the document. All projected isotopic concentrations are within the LERF/ETF bounding limits. The transfer rate from PT to LERF/ETF is forecasted to be 19.2 gpm. From Figure 2-3 (24590-WTP-RPT-PO-05-008, Revision 0, "2005 WTP Tank Utilization Assessment"), 5.9 million gal/yr of the total effluent collected in the PT radioactive liquid waste disposal system (RLD) is discharged to LERF/ETF and from figure 3-9, 36.4 million gallons of the total effluents collected in the PT RLD is discharged to LERF/ETF and 27.7 million gallons is recycled to the WTP.

According to, 24590-WTP-DB-ENG-01-001, Revision 1c, "Basis of Design" section 6, Process Basis of Design, the maximum flowrate acceptable at the ETF is 26.4 million gal/yr, with an average flow of 50 gpm. Instrumentation located in the discharge line to LERF/ETF monitors the discharge instantaneous flow rate (170 gpm limit) and acceptability compliance parameters (pressure, process fluid temperature, radiation, pH, and conductivity). If the inventory is non-

compliant with the LERF/ETF acceptance criteria, then it is routed to the LAW SBS Condensate Receipt Vessels TLP-VSL-00009A/B for reprocessing.

A table of organic constituents included in the effluent forecast is provided in CCN 086197, "Meeting minutes, ICD-6 Radioactive Liquid Effluent Forecast", dated April 2, 2004.

Earlier forecasts are contained in HNF-8306, treatability evaluations HNF-8306 Revision 0, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated June 2001.

HNF-8306 Revision 1, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated September 2004.

3. *What is the basis for the forecast?*

Reference: 24590-WTP-DB-ENG-01-001, Revision 1C, "Basis of Design", section 6 – Process Basis of Design.

WMH-9758688, Letter E. S. Aromi, WMO to T. K. Teynor, RL, "Liquid Effluent Retention Facility/Effluent Treatment Facility Treatability Envelope", dated September 29, 1997.

24590-WTP-RPT-PO-04-0025, Revision 2, "2005 Deliverables Concept Paper", dated May 26, 2005.

RPP-RPT-23412, Revision 0, Appendix E "System Plan 3 Success Criteria and Key Enabling Assumptions".

24590-WTP-RPT-PO-05-009, Revision 0, "2005 WTP Material Balance and Process Flowsheet Assessment", dated November 10, 2005.

24590-WTP-RPT-PR-02-005, Revision 1, Assumptions, Design Bases, Design Criteria, and Engineering Inputs to Underpin the WTP Process Design", dated February 7, 2005.

24590-WTP-RPT-PO-05-001, Revision 0, "2005 WTP Operations Research Assessment", dated August 29, 2005.

24590-WTP-RPT-PO-05-008, Revision 0, "2005 WTP Tank Utilization Assessment", dated August 8, 2005.

Calculation sheets: 24590-PTF-MVC-RLD-00003, 00004, 00005 and 24590-PTF-MPC-RLD-00001, 00006, 00007, 00008, 00009, 000014.

From 24590-WTP-RPT-PT-02-005, Revision 3, Flowsheet Bases, Assumptions, and Requirements", section 2.17.3, Basis: "The basis for operations of system RLD is to provide a collection point for radioactive liquid wastes to be transferred from the WTP to LERF/ETF. System RLD needs to provide enough space to be able to receive process condensate from the FEP and TLP evaporators and alkaline, radioactive effluents from the PT and LAW facility. There also needs to be enough liquid stored in the system RLD to be recycled back to the UFP system for use in dilution or solids washing.

From 24590-WTP-RPT-PO-05-001, Revision 0, 2005 WTP Operations Research Assessment, Introduction, "The WTP flowsheet is based on vitrification facility design capacities equal to 6 metric tons per day (MTD) of immobilized high level waste (IHLW), 30 MTD of immobilized low activity waste (ILAW) and PT facility design capacity of 80 MTD of ILAW equivalent.

From 24590-WTP-RPT-PO-05-009, Revision 0, 2005 WTP Material Balance and Process Flowsheet Assessment, "For this assessment, the Envelope A/D material balances are based on waste tanks AP-101 blended with AY-102. The Envelope B/D material balance is based on waste tank AZ-101". For Envelope B/D (AZ-101) the Immobilized low activity waste (ILAW) production is 30 metric tons of glass (MTG) per day and 1490 sodium waste units per year. Immobilized high level waste (IHLW) production is 2.5 MTG per day. PT production is 3680 waste sodium units per year of treated low activity waste. For Envelope A/D (AP-101/AY-102) the ILAW production is 30 MTG per day and 1320 sodium waste units per year. IHLW production is 5.9 MTG per day. PT production is 3210 waste sodium units per year.

System RLD receives effluent wastes from the following LAW facility functional areas: Melter Primary Offgas Treatment System (LOP); LAW Vitrification Secondary Offgas/Vessel Vent Treatment System (LVP); process wastes, vessel washes, C3/C5 floor drain and sump wastes, and vessel vent header drainage, all of which are expected to have low levels of radioactive contamination. System RLD also receives wastes from the following HLW functional areas: primary and secondary offgas treatment and HDH system (HOP), vessel washes, offgas drains, and C3/C5 floor drains and sumps system. In addition, System RLD receives waste from the following PT sources: RLD system vessels and tanks primarily concerned with the collection of solutions that may be discharged to LERF/ETF, such as process condensates from evaporators, caustic waste from the LAW caustic scrubber, and spent reagents from the resin addition process. RLD-TK-00006B receives excess process condensate (condensate left after recycle demands are met) from RLD-TK-00006A and low active effluents from RLD-VSL-000 17A/B. The tank fills until a full batch (264,500 gallons) has been received. The tank contents are held for sampling (when necessary) for 7.2 hours (1SARD) in accordance with ICD-06. ICD-06 requires that the first 5 to 10 batches of waste sent to LERF/ETF be sampled. If the waste complies with the treatability envelope then the frequency of sampling may be reduced to once every 10th batch. In addition the lines to LERF/ETF are equipped with monitors for pressure, radioactivity, conductivity, temperature, and pH to assure LERF/ETF compliance. Waste that does not meet the LERF/ETF treatability envelope is transferred back to the LAW SBS condensate receipt vessel (TLP-VSL-00009A/B) for reprocessing. The waste accumulated in RLD-TK-00006B is transferred to LERF/ETF (transfer sequence SEQ-RLD-00422) if it meets the LERF/ETF treatability envelope, through pump RLD-PMP-000 11 A/B at a rate of 170 gpm. Transfer is complete once the full batch volume has been transferred.

Design basis and input assumptions of the process condensate transfer pumps are included in calculation 24590-PTF-MPC-RLD-00006, "Process Data for Process Condensate Transfer Pumps 24590-PTF-MP-RLD-00011A/B", dated July 16, 2003. Included are as follows:

- Pumps RLD-PMP-00011A/B will be used to transfer process condensate from the Process Condensate Vessel (RLD-VSL-00006A/B) to LERF and TLP-VSL-00009A/B, if the effluent does not meet LERF Acceptance Criteria.
- The 4-inch containment pipeline is constructed from fiber-reinforced epoxy.
- The maximum instantaneous discharge rate to LERF is 170 gpm.
- The delivery pressure to LERF shall be atmospheric pressure.
- The maximum allowable fluid temperature is 120°F (49°C).

- The delivery pressure to the LAW SBS purge receipt vessels TLP-VSL-00009A/B shall be - 0.9 psig.
- The maximum allowable pressure is 100 psig.
- The process condensate has properties of water.
- There are 0.00 wt.% suspended solids in the condensate.

ICD-6 (24590-WTP-ICD-MG-01-006, Revision 3) includes the following requirements to:

- Provide an annual forecast with information on the operating range for volume, flow rate, activity, composition, and applicable waste codes for the radioactive dangerous liquid effluents.
- Complete and maintain a waste profile for the radioactive, dangerous liquid effluents per the LERF/ETF Dangerous Waste Permit.
- Submit all identified technical information and analyses required to modify or comply with any affected permits and implementing documents necessary to transfer the radioactive dangerous liquid effluents to LERF/ETF.
- Connect the WTP facility to the transfer lines provided for the radioactive dangerous liquid effluents at the WTP Site boundary.
- Provide the motive force for transferring the radioactive, dangerous liquid effluents to the LERF/ETF.
- Interlock the WTP transfer line, and the LERF leak detection and control system.
- Do not commingle different waste types.
- Provide at least 1000 m³ (265,000 gal) of storage capacity, or 48 hours of storage capacity, whichever is greater, to store radioactive, dangerous liquid effluents without impacting WTP Contractor operations.
- Pretreat the radioactive, dangerous liquid effluents if required, to meet the negotiated LERF/ETF treatability envelope.

System Plan 3 (RPP-RPT-23412, Revision 0), key assumptions include: E3.4.1.1 - The timing, capacities, and capability of the ETF, LERF, and TEDF will be driven by the needs of the waste treatment mission and assumed to be available when needed. If the treatment mission requires that changes be made to the ERF, LERF, or TEDF, or their operating plans, the ORP is assumed to successfully drive the changes. E3.4.1.2 - The LERF consists of three basins, each with an operating volume of 7.8 Mgal, which are used to provide lag-storage of liquid effluent. Two of the basins will be allocated to supporting the waste treatment mission; the third basin will be reserved for CERCLA effluents.

1. Will the waste meet the waste acceptance criteria of the Effluent Treatment Facility and/or the Liquid Effluent Retention Facility?

The LERF/ETF waste acceptance criteria is contained in:

Reference: WMH-9758688, Letter E. S. Aromi, WMO to T. K. Teynor, RL, "Liquid Effluent Retention Facility/Effluent Treatment Facility Treatability Envelope", dated September 29, 1997.

Once the WTP Contractor provides the WTP radioactive liquid effluent forecast (volume and composition), the PHMC evaluates the forecast to ensure that the WTP radioactive liquid effluents can be treated in the LERF/ETF.

Reference: FH-0005350, Letter E. S. Aromi, FH to H. E. Bilson, RL, "Treatability Evaluation of River Protection Project – Waste Treatment Plant Liquid Effluent Forecasts", dated October 3, 2000.

HNF-8306 Revision 0, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated June 2001.

HNF-8306 Revision 1, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated September 2004.

24590-WTP-RPT-PR-01-066, Revision 12, "Risk Assessment Report", dated December 23, 2005.

The treatability evaluation is conducted by comparing the WTP radioactive liquid effluent forecast to the LERF/ETF treatability envelope, which provides the requirements that determine if a liquid effluent is acceptable for receipt and treatment at the LERF/ETF. The maximum annual average concentrations over the range of the 27 year forecast is evaluated against the treatability envelope. The waste acceptance process involves three steps: (1) assemble waste information and screen for completeness; (2) compare waste to regulatory envelope; (3) compare waste to design envelope.

The last treatability evaluation performed identified concerns and/or additional information requirements discussed below. In order to provide a complete treatability evaluation, the PHMC needs the following additional information:

- Regulatory designation of waste – this is required to complete the regulatory evaluation for permit compliance.
- Units for Organics – to complete this evaluation, the organics need to be reported in units of mg/L instead of pounds per day.

Pertaining to LERF and ETF environmental regulations/permits and safety documentation the following assumptions, concerns and acknowledgments are noted:

- NEPA/SEPA – It is the assumption that the environmental document to be prepared by the WTP Project will address all changes to the LERF and ETF associated with WTP aqueous effluent discharges and will be in place prior to discharging any effluents to LERF or ETF.
- Dangerous Waste Permit – The LWPF has submitted a delisting modification to the current LEERF/ETF delisting exclusion that should include any additional constituents under F039 that WTP would require.
- State Waste Discharge Permit – The permit allows the LERF/ETF to accept generator effluents containing approved constituents at approved concentrations. Of the organics identified in the current forecast, 14 are above the concentration in the Discharge Permit application. At a minimum a characterization study for these constituents identifying them as new constituents of concern will need to be submitted to Ecology for approval along with identifying 54 new constituents of concern for Ecology approval. Ecology may require that ST4500 be modified if the changes considered significant.
- LERF Radiological Inventory Management – The LERF is classified as below Category 3 nuclear facility. Based on the maximum influent concentration, the WTP forecast is within the LERF safety basis.
- ETF Radiological Inventory Management – The ETF is classified as below Category 3 nuclear facility. Radioactive inventory control at ETF is accomplished by characterizing feed streams for radionuclide inventory and calculating a maximum allowable feed batch volume that can be present at ETF. Based on the maximum average, the allowable batch volume for WTP radiological liquid effluent is 4.5 million gallons. This is considered a reasonable allowable batch volume for the operation of ETF.
- Radioactive Air Emissions – The WTP forecasted effluent contains organics that are outside the current NOC and/or exceed the current small quantity emission rates. A modification of the existing NOC is required prior to the receipt of the WTP effluent.

Pertaining to LERF and ETF design envelope the following assumptions, concerns and acknowledgments are noted:

- Suspended Solids – All feeds are required to be filtered through a 5-micron (nominal) filter before receipt in the LERF or at ETF. Current BNI design of the WTP includes a filter skid prior to the discharge to LERF.
- Organics – The destruction efficiency of organics through the UV/OX is dependent on several factors including: 1) type and concentration of organic contaminants, 2) concentration of total organic carbon, and 3) type and concentration of dissolved inorganic constituents (e.g., carbonates, iron, nitrate, etc.). The WTP forecast concentration and overall matrix exhibits many of the factors that interfere with the destruction efficiency of the UV/OX unit. Because of this it is doubtful that the ETF can treat the WTP forecasted organics to acceptable levels under the current ETF flowsheet. A new flowsheet will need to be developed that will evaluate reconfiguration and recycling to accommodate the higher organic levels and interferences that reduce the overall efficiency of the UV/OX in destroying organics.
- Dissolved Solids – The primary areas of concern include scaling of unit operations, compatibility with materials of construction, and ability to produce a dry powder waste. To avoid scaling of the RO membrane the upper feed limit for TDS is 0.5 wt.%, the WTP feed

after pH adjustment is forecast to range from 0.108 to 0.45 wt. %. The WTP feed pH is considerably alkaline and will need to be lowered to the acidic region of 4 – 5 in the pH adjust tank. As the pH is lowered carbonate will be converted to CO₂ and off gassed through the degas column. The primary concern is then the off gassing of Iodine-129, loading/capacity of the vessel vent off-gas system. During the development of a new ETF flowsheet to accommodate the elevated organic levels, this off-gassing of undesirable vapors will need to be resolved. Finally, the maximum averaged quantity of powder generated from the WTP feed is 855 pounds per day, and falls within the ETF nominal dryer capability of 2,000 pounds per day

- Disposal of Secondary Waste – Based on the estimated radionuclide concentrations in the powder that would be produced from WTP feed, carbon-14, iodine-129, uranium, and technetium-99 all exceed the mobile radionuclide reporting limits for disposal at the burial grounds. In addition, the projected mercury concentration in the powder exceeds the Land Disposal Restriction levels for disposal. The powder produced would be considered Category 3, and would require stabilization/encapsulation per Hanford Site Solid Waste Acceptance Criteria before it can be disposed. This additional treatment capability would need to be added to the LERF/ETF or done elsewhere before disposal.

The program and technological risk for the effluent characteristics not being within LERF/ETF treatment envelope are captured in the “Risk Assessment Report”, 25590-WTP-RPT-PR-01-006, Revision 12, Risk Assessment Sheet WTP-IMT-020. The risk states, “It is likely that transfers of WTP effluents will not be possible if the WTP effluent characteristics do not meet the LER/ETF acceptance criteria”. Additional processing may be required to remove constituents such as Hg, iodine, dissolved solids, or organics in the evaporator or scrubber effluent. It is most likely that reagent addition using existing WTP systems can adjust effluent properties to meet requirements. However, if this is not possible and evaporator condensate contains volatile organic compounds which exceed LERF/ETF treatability requirements, a reverse osmosis (RO) system would need to be added to treat process condensate prior to transfer to LERF/ETF. To handle this risk WTP will update the material balance flowsheet to include speciated organics, and in FY 2006 provide an effluent forecast based on an assumed non-bounding organics inventory.

2. Is there sufficient storage and transfer capacity (storage tanks, pumps, transfer lines) to manage the forecasted radioactive liquid waste?

References: 24590-WTP-DB-ENG-01-001, Revision 1C, "Basis of Design", section 6 – Process Basis of Design, dated January 7, 2005.

WMH-9758688, Letter E. S. Aromi, WMO to T. K. Teynor, RL, "Liquid Effluent Retention Facility/Effluent Treatment Facility Treatability Envelope", dated September 29, 1997.

24590-PTF-3YD-PWD-00001, Revision 1, "System Description for Plant Wash and Disposal System PWD and Radioactive Liquid Waste Disposal System RLD", dated September 22, 2003.

24590-WTP-RPT-PO-04-0025, Revision 2, "2005 Deliverables Concept Paper", dated May 26, 2005

24590-WTP-RPT-PR-02-005, Revision 1, Assumptions, Design Bases, Design Criteria, and Engineering Inputs to Underpin the WTP Process Design", dated February 7, 2005.

24590-WTP-ICD-MG-01-006, Revision 3, "ICD 06 – Interface Control Document for Radioactive, Dangerous Liquid Effluents", dated August 15, 2003.

24590-PTF-M6-RLD-00001, Revision 1, "P&ID – PTF Radioactive Liquid Waste Disposal System Process Condensate RLD-TK-00006A/B", dated August 16, 2004.

24590-PTF-M6-RLD-00002, Revision 2, "P&ID – PTF Radioactive Liquid Waste Disposal System Process Condensate RLD-PMP-00011A/B, 12A/B & 14A/B", dated November 8, 2004.

24590-PTF-M6-RLD-00004, Revision 1, "P&ID – PTF Radioactive Liquid Waste Disposal System Process Condensate Distribution" dated May 25, 2004.

24590-PTF-M6-PWD-00001, Revision 1, "P&ID – PTF Plant Wash & Disposal System Effluent Collection Tree", dated May 28, 2004.

24590-PTF-M6-PWD-00050, Revision 1, "P&ID – PTF Plant Wash & Disposal System Secondary Containment Leak Detection System", dated February 16, 2005.

24590-PTF-M6-PWD-00051, Revision 1, "P&ID – PTF Plant Wash & Disposal System Secondary Containment Leak Detection System", dated February 16, 2005.

24590-PTF-M6-PWD-00057, Revision 3, "P&ID – PTF Plant Wash & Disposal System Underground Transfer Lines", dated March 8, 2005.

24590-PTF-MPC-RLD-00001, Revision C, "Pump Sizing Calculation, System RLD – RLD Pumps 11A/B, 12A/B, 14A/B", dated February 25, 2003.

24590-PTF-MPC-RLD-00006, Revision 0, "Process Data for Process Condensate Transfer Pumps 24590-PTF-MP-RLD-00011A/B", dated August 7, 2002.

24590-PTF-MPC-RLD-00007, Revision 0, "Process Data for Process Condensate Recirculation Pumps 24590-PTF-MP-RLD-00012A/B", dated August 7, 2002.

24590-PTF-MPC-RLD-00008, Revision 0, "Process Data for Process Condensate Distribution Pumps 24590-PTF-MP-RLD-00014A/B", dated August 7, 2002.

24590-PTF-M6C-RLD-00003, Revision A, "Pipe line sizing calculations Referencing Drawings 24590-PTF-M5-V17T-00022004 & 24590-PTF-M6-RLD-00004", dated August 14, 2002.

24590-PTF-MVC-RLD-00003, Revision 0, "Process Data for Process Condensate Vessels 24590-PTF-MV-RLD-0006A/B", dated September 3, 2002.

24590-PTF-M6C-PWD-00043, Revision C, "WTP Underground Transfer Lines Minimum Detectable Leak Rate", dated August 24, 2004.

24590-PTF-M6-PWD-00058, Revision 3, "P&ID – PTF Plant Wash & Disposal System Underground Transfer Lines", dated March 8, 2005.

24590-PTF-MX-PWD-00004, Revision 2, "Equipment Assembly – PTF Plant Wash & Disposal System Secondary Containment Leak Detection Box", dated August 28, 2005.

24590-PTF-MX-PWD-00005, Revision 0, "Equipment Assembly – PTF Plant Wash & Disposal System Secondary Containment LERF Leak Detection Box RLD-LDB-00012 & RLD-LDB-00013", dated August 3, 2005.

24590-WTP-B2-C12T-00001, Revision 0, "Interface Control Drawing", dated November 15, 2002.

Fluor Federal Services 2001, "Performance Specification, Liquid Effluent Transfer System, W-519-P1, Revision 1", dated June 24, 2002.

Storage Tanks:

Requirement: Provide at least 1000 m³ (265,000 gal) of storage capacity, or 48 hours of storage capacity, whichever is greater, to store radioactive, dangerous liquid effluents without impacting WTP Contractor operations.

Tank RLD-TK-00006B receives excess process condensate (condensate left after recycle demands are met) from tank RLD-TK-00006A (15,500 gallons over 2 days) and low active effluents from tanks RLD-VSL-000 17A/B (25,000 gallons over 2 days). Tank RLD-TK-00006B with a maximum operating volume of 312,900 gallons fills until a full batch (264,500 gallons) has been received. The tank contents are held for sampling (when necessary) for 7.2 hours (1SARD) in accordance with ICD-06. A hold up of about 13 days is available in this tank to allow for delays in the laboratory or LERF/ETF. Tank RLD-TK-00006A will be an alternate route in case of failure of RLD-TK-00006B (maximum operating volume 312,900 gallons). The Alkaline Effluent Vessels will be holding radioactive materials. Therefore, the tanks will require wash rings to decontaminate them.

The above components and capacities were verified from referenced P&ID's.

Pumps:

Requirement: Provide the motive force for transferring the radioactive, dangerous liquid effluents to the LERF/ETF.

The waste accumulated in RLD-TK-00006B is transferred to LERF/ETF (transfer sequence SEQ-RLD-00422) if it meets the LERF/ETF treatability envelope, through pump RLD-PMP-00011A/B at a rate of 170 gpm through the 4-in. diameter main transfer line and 90 gpm through the 3-in diameter backup transfer line. If the acceptance criteria are not met, the non-compliant effluent is pumped to the LAW SBS Purge Receipt Tank Vessels TLP-VSL-00009A/B. Pumps RLD-PMP-00012A/B will be used to re-circulate the contents of the process condensate tanks before sampling and or transferring effluent. These pumps may also be used to transfer condensate between the two process condensate tanks. Pumps RLD-PMP-00014A/B will be used to provide process condensate from the process condensate tanks (RLD-TK-00006A/B) to process distribution header. There are no emptying ejectors required in these tanks. The installed pumps will be sufficient to recover heels left in the tanks. Verified from referenced P&ID's.

Transfer Lines:

Requirements:

- The 4-inch containment pipeline is constructed from fiber-reinforced epoxy. (ICD-6)
- The minimum instantaneous discharge rate to LERF is 170 gpm (ICD-6)
- The maximum allowable fluid temperature is 120 degrees F (49 degrees C) (ICD-6)
- The delivery pressure to LERF shall be atmospheric pressure. (LERF/ETF Treatability Envelope)
- The delivery pressure to LAW SBS purge receipt vessels shall be -0.0 psig.
- The maximum allowable pressure is 100 psig (ICD-6).
- Connect the WTP facility to the transfer lines provided for the radioactive dangerous liquid effluents at the WTP Site boundary. (ICD-6)
- Interlock the WTP transfer line and the LERF leak detection and control system. (ICD-6)

Two pipelines (a main and backup) will be used to transfer the radioactive, dangerous waste effluent from WTP to LERF/ETF. The physical interface points for these pipelines are shown as nodes 8A and 8B on the Interface Control Drawing 24590-WTP-B2-C12T-00001. The main pipeline will be used to transfer the effluent. If the main pipeline is unavailable, effluent will be transferred via the backup pipeline. The main pipeline is a 4-in. diameter primary pipe encased in 3-in. diameter outer pipe. The backup pipeline is a 3-in. diameter primary pipe encased in 6-in. diameter outer pipe. A tape leak detection system is installed. The design pressure for both pipelines is 100 pounds per square inch gage at 49 degrees centigrade (120 degrees F). The WTP portion of the transfer pipelines will be constructed of a material which is chemically compatible with the effluent. Where the WTP pipelines join with the PHMC pipelines at the interface point, the design will be physically compatible with and maintain the physical integrity of each pipeline. The design of the WTP transfer system will not allow the design pressure of the FRP pipeline to be exceeded and will be capable of throttling the system flow rate so that the design pressure of the backup transfer line is not exceeded. The WTP transfer system will provide a vacuum relief capability. A leak detection system (tape or leak pot) will be installed.

The LERF consists of three basins, each with an operating volume of 7.8 million gallons, which are used to provide lag-storage of liquid effluent. Two of the basins will be allocated to supporting the waste treatment mission; the third basin will be reserved for CERCLA effluents. The WTP Contractor will monitor the effluent for flow rate/total flow on a real-time and historical basis, and the process upset indicating parameters such as pH, conductivity, and radioactivity. Flow and process upset indicating parameters will be transmitted to the PHMC monitoring and control system on a real-time basis. The real-time data and permissive signals will be transmitted over a dedicated line. The monitoring system will initiate automated corrective measures, as appropriate, to protect the integrity of both the disposal and discharged effluent.

Verified from ICD-6, referenced P&ID's LERF/ETF Treatability Envelope analysis, and FFS performance specifications.

APPENDIX B
DOCUMENTS REVIEWED
REFERENCES

REFERENCES

1. CCN 086197, "Meeting minutes, ICD-6 Radioactive Liquid Effluent Forecast", dated April 2, 2004.
2. CCN 082012, "Meeting minutes, ICD-6 Forecast and Treatability Evaluation", dated February, 2004.
3. CCN 071789, "Meeting minutes, ICD-6 Treatability Evaluation of WTP Radioactive Liquid Effluent Forecast", dated September 30, 2003.
4. CCN 053960, "Meeting minutes, ICD 5 and 6 Issue Status, Effluent Forecast, Tc-99 and Effluent Filter", dated March 10, 2003.
5. CH2MHILL 019978, "Meeting minutes, ICD-6 Treatability of WTP Radioactive Dangerous Liquid Effluents", dated April 30, 2001.
6. HNF-8306 Revision 1, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated September 2004.
7. Fluor Federal Services 2001, "Performance Specification, Liquid Effluent Transfer System, W-519-P1, Revision 1", dated June 24, 2002.
8. HNF-8306 Revision 0, "Waste Treatment Plant Liquid Effluent Treatability Evaluation", dated June 2001.
9. FH-0005350, Letter E. S. Aromi, FH to H. E. Bilson, RL, "Treatability Evaluation of River Protection Project – Waste Treatment Plant Liquid Effluent Forecasts", dated October 3, 2000.
10. RPP-RPT-23412, Revision 0, Appendix E "System Plan 3 Success Criteria and Key Enabling Assumptions".
11. WMH-9758688, Letter E. S. Aromi, WMO to T. K. Teynor, RL, "Liquid Effluent Retention Facility/Effluent Treatment Facility Treatability Envelope", dated September 29, 1997.
12. WTP Contract No. DE-AC27-01RL14136, "Waste Treatment and Immobilization Plant Contract", dated December 2005.
13. 24590-WTP-PL-G-01-011, Revision 7, "Functional Specification", dated June 24, 2005.

14. 24590-WTP-DB-ENG-01-001, Revision 1C, "Basis of Design", section 6 – Process Basis of Design, dated January 7, 2005.
15. 24590-WTP-PL-RT-03-003, Revision 1, "Secondary Wastes Compliance Plan", dated September 30, 2004.
16. 24590-WTP-ICD-MG-01-006, Revision 3, "ICD 06 – Interface Control Document for Radioactive, Dangerous Liquid Effluents", dated August 15, 2003.
17. 24590-LAW-3YD-20-00001 Revision 0, "System Description for LAW Vitrification Liquid Effluent System (RLD and NLD)", dated October 14, 2004.
18. 24590-PTF-3YD-PWD-00001, Revision 1, "System Description for Plant Wash and Disposal System PWD and Radioactive Liquid Waste Disposal System RLD", dated September 22, 2003.
19. 24590-HLW-3YD-RLD-00001 Revision 1, "System Description of HLW Radioactive Liquid Waste Disposal (RLD)", dated May 18, 2005.
20. 24590-LAB-3YD-RLD-00001 Revision 2, "System Description of Radioactive Liquid Waste Disposal System for the Analytical Laboratory", dated February 15, 2005.
21. 24590-LAB-3PS-RLD-T0001, Revision 0, "Software Functional Specification for LAB Radioactive Liquid Waste Disposal (RLD) System", dated July 12, 2005.
22. 24590-PTF-3PS-RLD-T0001, Revision A, "Software Functional Specification for PTF Radioactive Liquid Waste Disposal (RLD) System", dated May 19, 2004.
23. 24590-HLW-3PS-RLD-T0001, Revision A, "Software Functional Specification for HLW Radioactive Liquid Waste Disposal (RLD) System", dated May 18, 2005.
24. 24590-LAW-3PS-RLD-T0002, Revision 0, "Software Functional Specification for LAW Radioactive Liquid Waste Disposal (RLD) System", dated January 27, 2005.
25. 24590-WTP-RPT-PR-01-066, Revision 12, "Risk Assessment Report", dated December 23, 2005.
26. 24590-WTP-RPT-PO-05-009, Revision 0, "2005 WTP Material Balance and Process Flowsheet Assessment", dated November 10, 2005.
27. 24590-WTP-RPT-PO-04-0025, Revision 2, "2005 Deliverables Concept Paper", dated May 26, 2005.
28. 24590-WTP-RPT-PR-02-005, Revision 1, "Assumptions, Design Bases, Design Criteria, and Engineering Inputs to Underpin the WTP Process Design", dated February 7, 2005.

29. 24590-WTP-RPT=PT-02-005, Revision 2, "Flowsheet Bases, Assumptions, and Requirements", dated August 25, 2003.
30. 24590-WTP-RPT-PO-05-001, Revision 0, "2005 WTP Operations Research Assessment", dated August 29, 2005.
31. 24590-WTP-RPT-PO-05-008, Revision 0, "2005 WTP Tank Utilization Assessment", dated August 8, 2005.
32. 24590-PTF-MX-PWD-00004, Revision 2, "Equipment Assembly – PTF Plant Wash & Disposal System Secondary Containment Leak Detection Box", dated August 28, 2005.
33. 24590-PTF-MX-PWD-00005, Revision 0, "Equipment Assembly – PTF Plant Wash & Disposal System Secondary Containment LERF Leak Detection Box RLD-LDB-00012 & RLD-LDB-00013", dated August 3, 2005.
34. 24590-PTF-M6-PWD-00057, Revision 3, "P&ID – PTF Plant Wash & Disposal System Underground Transfer Lines", dated March 8, 2005.
35. 24590-PTF-M6-PWD-00058, Revision 3, "P&ID – PTF Plant Wash & Disposal System Underground Transfer Lines", dated March 8, 2005.
36. 24590-PTF-M6-PWD-00050, Revision 1, "P&ID – PTF Plant Wash & Disposal System Secondary Containment Leak Detection System", dated February 16, 2005.
37. 24590-PTF-M6-PWD-00051, Revision 1, "P&ID – PTF Plant Wash & Disposal System Secondary Containment Leak Detection System", dated February 16, 2005.
38. 24590-PTF-M6C-PWD-00043, Revision C, "WTP Underground Transfer Lines Minimum Detectable Leak Rate", dated August 24, 2004.
39. 24590-PTF-M6-RLD-00001, Revision 1, "P&ID – PTF Radioactive Liquid Waste Disposal System Process Condensate RLD-TK-00006A/B", dated August 16, 2004.
40. 24590-PTF-M6-RLD-00002, Revision 2, "P&ID – PTF Radioactive Liquid Waste Disposal System Process Condensate RLD-PMP-00011A/B, 12A/B & 14A/B", dated November 8, 2004.
41. 24590-PTF-M6-PWD-00001, Revision 1, "P&ID – PTF Plant Wash & Disposal System Effluent Collection Tree", dated May 28, 2004.
42. 24590-PTF-M6-RLD-00004, Revision 1, "P&ID – PTF Radioactive Liquid Waste Disposal System Process Condensate Distribution" dated May 25, 2004.
43. 24590-PTF-MPC-RLD-00001, Revision C, "Pump Sizing Calculation, System RLD – RLD Pumps 11A/B, 12A/B, 14A/B", dated February 25, 2003.

44. 24590-WTP-B2-C12T-00001, Revision 0, "Interface Control Drawing", dated November 15, 2002.
45. 24590-PTF-MVC-RLD-00003, Revision 0, "Process Data for Process Condensate Vessels 24590-PTF-MV-RLD-0006A/B", dated September 3, 2002.
46. 24590-PTF-M6C-RLD-00003, Revision A, "Pipe line sizing calculations Referencing Drawings 24590-PTF-M5-V17T-00022004 & 24590-PTF-M6-RLD-00004", dated August 14, 2002.
47. 24590-PTF-MPC-RLD-00006, Revision 0, "Process Data for Process Condensate Transfer Pumps 24590-PTF-MP-RLD-00011A/B", dated August 7, 2002.
48. 24590-PTF-MPC-RLD-00007, Revision 0, "Process Data for Process Condensate Recirculation Pumps 24590-PTF-MP-RLD-00012A/B", dated August 7, 2002.
49. 24590-PTF-MPC-RLD-00008, Revision 0, "Process Data for Process Condensate Distribution Pumps 24590-PTF-MP-RLD-00014A/B", dated August 7, 2002.

APPENDIX C
PERSONNEL INTERVIEWED

Title of personnel interviewed:

- 1 Deputy Manager, Mechanical Production Engineering (Point of Contact)
- 1 Supervisor Mechanical Engineer
- 1 Technical and Process Operations Engineer
- 2 Process Engineers
- 1 Field Engineer

APPENDIX D
DESIGN OVERSIGHT REVIEW PLAN

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

DESIGN OVERSIGHT PLAN
REVIEW OF BNI DESIGN OF
THE TREATMENT OF RADIOACTIVE
LIQUID WASTE

November 9, 2005

Design Oversight: D-05-DESIGN-018

Team Lead: Todd Shrader

Reviewer(s): Carol Babel

Submitted by:

Team Lead:

Todd Shrader Date 11/9/05
Todd Shrader

Approved by:

WTP Engineering
Division Director:

William Hamel Date 11/9/2005
William Hamel

Project Manager
Waste Treatment Plant:

John Eschenberg Date 11/10/05
John Eschenberg

1.0 Background, Purpose, and Objectives

1.1 Background

The mission of the Waste Treatment and Immobilization Plant is to vitrify Hanford Tank Waste for disposal at either the National Geological Repository (High Level Waste) or the on the Hanford Site (Low Activity Waste). During the completion of the mission, other waste streams will be generated as part of the processing operations. These waste streams include liquid and solid radioactive waste. All of these waste streams must be characterized, processed or treated, packaged, and disposed per applicable state and Federal regulations. Potentially large volumes of radioactive (and hazardous) liquid waste will be generated during the processing operations. This waste will be transferred to and treated at the Effluent Treatment Facility/Liquid Effluents Retention Facility.

1.2 Purpose

The purpose of this review is to confirm that the liquid waste constituents and volume that will be generated at the Waste Treatment Plant and treated at the Effluent Treatment Facility/Liquid Effluent Retention Facility have been identified and that the facility has sufficient capability to store and/or treat the waste. The review will confirm the following:

- The radioactive liquid waste being generated at the Waste Treatment Plant meets contract requirements for delivery to the Effluent Treatment Facility/Liquid Effluent Retention Facility.
- The Waste Treatment Plant radioactive liquid waste streams are sufficiently characterized to meet the waste acceptance criteria of the Effluent Treatment Facility/Liquid Effluent Retention Facility.

1.3 Specific Objectives

The following are the specific objectives of this oversight:

1. Identify and understand the Contractor requirements (Contractual and source document) for the storage and treatment of radioactive liquid waste.
2. Understand the technical bases for the forecasted liquid waste stream characteristics.
3. Verify a forecast for the generation of liquid radioactive waste has been developed and includes constituents, volumes, and duration. Verify the Effluent Treatment Facility/Liquid Effluent Retention Facility can adequately support the needs of the Waste Treatment Plant.

4. Verify sufficient capacity exists in the transfer system to discharge the waste from the Waste Treatment Plant to the Effluent Treatment Facility/Liquid Effluent Retention Facility.

2.0 Process

This oversight shall be conducted within the guidelines of ORP PD 220.1-12, 2/12/03, "Conduct of Design Oversight". In addition, in order to maintain a project discipline for the design review, the principles of DOE Order 413.3, Project Management for the Acquisition of Capital Assets, will be utilized to prepare for, conduct, and close-out the design review. These principles are applicable to the federal staff performing the review. The Contractor will not be assessed against DOE Order 413.3.

2.1 Scope

This oversight shall include a review of the plans and designs for the generation, transfer, and treatment of radioactive liquid waste that will be managed in the Effluent Treatment Facility and/or the Liquid Effluent Retention Facility. The scope of the review will not include capacities within the Waste Treatment Plant used for the management of recycle liquids nor treated waste residue disposal. Also, liquid waste generation at the bulk vitrification facility is out of scope for this review.

A comprehensive review of the capacities and capabilities of the Waste Treatment Plant, Effluent Treatment Facility, Liquid Effluent Retention Facility, Bulk Vitrification Facility, and Integrated Disposal Facility is needed to verify cradle to grave disposal capability. However, due to uncertainties in current schedules, a review of this scope will be performed at a later date, thus limiting the scope of the review described in this plan to the Waste Treatment Plant.

2.2 Preparation

1. Identify the Contractor Point of Contact for the Review
2. Establish the scope and elements of the design oversight review of radioactive liquid waste treatment.
3. Identify and review applicable Contract and source document requirements.
4. Review background information as provided by Contractor and identified through review of available databases.
5. Review other applicable documentation.
6. Review previously performed applicable Contractor design review reports and documentation.

7. Review current Contractor open issues and the plans for and status of resolution.

In this regard, Table 1 lists information requested to be supplied by the Contractor to initiate this oversight.

2.3 Review and Identify, Resolve, or Document Issues

Evaluate the selected attributes and requirements and develop lines of inquiry and specific questions that are explored with cognizant Contractor personnel to meet the oversight objectives. This phase will be documented in summary tables as shown in Attachment 1, Appendix A, as required. This effort will include participating in any applicable internal Contractor reviews and discussions. The output from this phase of the oversight will be a completed summary table with Contractor responses to the questions and lines of inquiry and a list of remaining open issues that need further evaluation by the Contractor for resolution.

2.4 Reporting

Brief DOE and Contractor management periodically as required and prepare a draft report that summarizes the activities, the results, conclusions, and recommendations of the review. The draft report will be issued for review and comment by DOE management and cognizant Contractor personnel. The final report will resolve comments received on the draft report.

2.5 Application of DOE Order 413.3

This review plan serves as the CD-1/2/3 document as it provides the final design for the review. Approval of this plan constitutes approval to proceed to project execution, the performance of the design review.

2.5.1 Design Review Requirements

The review team requirements for the performance of this review are as follows.

- Verification that a plan has been developed for the management of secondary low level waste including forecasting and disposal.
- Verification that the proposed disposal facility has sufficient capacity on the schedule required for the disposal of low level waste from the Waste Treatment Plant.
- The design will be performed per ORP PD 220.1-12, 2/12/03, "Conduct of Design Oversight".
- The design review schedule will be maintained as described in Table 2.

2.5.2 Endpoint

The design review endpoint is defined as the issuance of the final review report by the Office of River Protection.

3.0 Schedule and Cost

Table 2 summarizes the schedule for completion of this design oversight review. The schedule variance will be tracked throughout the review and updates provided to management as required. Final costs will be estimated for both the review team and the Contractor staff that support the review. A total cost for the review will be estimated.

4.0 Documentation

The final report of this review shall contain the applicable sections and content as summarized in Attachment 1.

The open issues identified in this review shall be listed in the final report. Each open issue shall be assigned an item number and shall be tracked to resolution through CARS. These shall also be tracked to resolution by the Contractor through the CCN that will be assigned to the transmittal of the report from DOE to the Contractor.

5.0 Closure

The Team Leader with concurrence of the Division Director shall confirm that the open items from this review are adequately resolved.

Table 1
Initial Information Requirements

1.	Any plans or documents describing the generation, storage, transfer, treatment and disposal of radioactive liquid waste.
2.	Any interfacing documents between BNI and other Contractors describing the transfer, treatment and disposal of radioactive liquid waste.
3.	A list of applicable source documents (Contract, ICD's, etc.) that contain requirements applicable to the management of radioactive liquid waste.
4.	Forecast data for the generation rate and predicted constituents of radioactive liquid waste.
5.	Documentation indicating the Effluent Treatment Facility/Liquid Effluent Retention Facility will have sufficient capacity and be operated on a schedule that supports the Waste Treatment Plant.
6.	Any Contractor review reports assessing the management of radioactive liquid waste.
7.	Design documents (system descriptions, P&ID's, specifications) that show sufficient storage and transfer capability exists at the Waste Treatment Plant to manage radioactive liquid waste.

The above list may be clarified or modified as required to complete the review. The Contractor Point of Contact and Team Leader are expected to communicate on a regular basis to focus the document requests.

Design Oversight Plan: D-04-DESIGN-010
Review of the Treatment of Liquid Radioactive Waste
Page 7 of 13

Table 2
Schedule

Activity Description	Responsibility	Complete By
Develop Oversight Plan	Shrader	11/9/05
Identify Team members	Shrader/Hamel	11/9/05
Advise the Contractor of planned oversight review and provide oversight plan to identify needed Contractor support (Draft plan will be provided for comment as developed)	Shrader	11/9/05
Provide team with an overview of the management plan for radioactive liquid waste. Overview will provide general information for the team to use during document reviews.	Contractor	11/10/05
Obtain requested documents from the Contractor	Team	11/10/05
Meet with cognizant Contractor personnel to outline objectives and to provide initial questions/concerns. (Formal Design Oversight Review Entrance Brief). This can be combined with the overview described above.	Team/Contractor	11/10/05
Review Contractor documents	Team	11/23/05
Meet with appropriate Contractor personnel to complete document review and to resolve outstanding questions/concerns.	Team/Contractor	11/23/05
Prepare draft Design Oversight Report	Team	11/28/05
Provide exit briefing for Contractor and DOE management	Team	As Scheduled
Contractor review and comment on draft Design Oversight Report	Contractor	12/2/05
Resolve comments and prepare final report for DOE management review	Shrader/Gibbs	12/6/05
Resolve DOE management comments and issue final Design Oversight Report	Shrader	12/9/05

Design Oversight Report Outline

The design oversight report should have the following sections, as appropriate:

Cover Page – The cover page includes dates of the design oversight, the report number, the names of the participating oversight reviewer(s) and the name of the DOE design oversight leader who reviewed and approved the report.

Executive Summary – The executive summary of this design oversight should describe the design products reviewed, review meetings attended and present the significant strengths and weaknesses. The summary should provide a conclusion on the adequacy of the design products/processes reviewed and identify significant open issues and the mechanism for tracking resolution of these issues by the Contractor.

Report Outline

1. INTRODUCTION

Summarizes the activity, schedule, purpose, scope and methods of review

2. BACKGROUND

Similar to the Background Section of the Design Oversight Plan

3. OBJECTIVES, SCOPE AND APPROACH

3.1 Objectives

Lists the objectives from the Design Oversight Plan

3.2 Scope

Summarizes the areas, systems, components, etc, reviewed in the oversight. This is similar to the Scope section of the Design Oversight Plan

3.3 Approach

In the same format as the Design Oversight Plan, summarizes the actual work performed as part of this oversight, e.g., documents reviewed, actual meetings held with the Contractor, preparation of preliminary draft for Contractor review and comment, etc.

4. RESULTS

This section contains the significant results of the review including detailed description of the bases and recommendations for resolution of Open Issues identified in this review. The Open Issues should be sequentially numbered in this discussion in the order listed in Table 1, see below.

This section should be subdivided such that there is a subsection for each objective:

4.1 Objective 1

...

4.2 Objective 2

....

5. RECOMMENDATIONS

Summary of recommendations for action by the Contractor and DOE to ensure that open issues are resolved and plans for future oversight reviews.

6. REFERENCES

Principal references used in the oversight. Note that the majority of references will be contained in the reviewer summaries.

APPENDIX A

(Note: This appendix contains the detailed results of the review. In addition to the responses to the questions and lines of inquiry explored during the oversight this appendix may also contain relevant minutes of meetings between the Contractor and DOE conducted as part of this review. This is typically a substantial document and is transmitted and handled as a separate document. The following is the format of this appendix.)

RESPONSES TO DOE QUESTIONS AND LINES OF INQUIRY DESIGN OVERSIGHT {System or area of review}

{Date}

The following questions (lines of inquiry) were developed by DOE as part of the design oversight of the process for selection of materials of construction (and the referenced documents). They are grouped into the following categories:

- A. ...
- B. ...

{Note: Categories of questions may include or pertain to, for example; Design Status Design Status, Design Requirements, System Descriptions, Calculations, System Descriptions, Modeling, Research and Technology Program, Technical Performance, Additional Questions after the initial discussions with the Contractor, Contractor Resolution of Action Items developed in Multi-Discipline Design Reviews or other meetings. Categories may also include minutes of meetings.}

The questions are arranged into tables and organized into five columns, which are:

Question - The question or line of inquiry raised by DOE.

Comment - Additional information supplied by DOE to clarify the question.

Response - The Contractor response to the question.

Cognizant Discipline - The Contractor discipline that has the primary information on the response.

Group - Questions are categorized into three groups:

- A. Questions that have complete responses.
- B. Questions related to design information not yet available because of current status of the design. Dates for completion will be provided by {Date to be provided by the Contractor}.
- C. Questions related to alternate system designs, off-design conditions, or actions outside the current scope of work. Partial responses have been provided. No additional work to resolve these questions is planned. Significant effort is expected to resolve these questions and may have significant project cost/schedule impacts.

Task# ORP-WTP-2006-0018

E-STARS™ Report
 Task Detail Report
 02/10/2006 0919

TASK INFORMATION

Task#	ORP-WTP-2006-0018	Status	CLOSED
Subject	CONCUR: (06-WED-010) TRANSMITTAL OF DESIGN OVERSIGHT REPORT ON REVIEW OF BECHTEL NATIONAL, INC. (BNI) DESIGN FOR THE TREATMENT OF RADIOACTIVE LIQUID WASTE (D-05-DESIGN-018)		
Parent Task#		Due	
Reference	06-WED-010	Priority	High
Originator	Almaraz, Angela	Category	None
Originator Phone	(509) 376-9025	Generic1	
Origination Date	01/26/2006 1315	Generic2	
Remote Task#		Generic3	
Deliverable	None	View Permissions	Normal
Class	None		
Instructions	Hard copy of the correspondence is being routed for concurrence. Once you have reviewed the correspondence, please approve or disapprove via E-STARS and route to the next person on the list. Thank you.		
	bcc: MGR RDG File WTP OFF File J. J. Short, OPA C. A. Babel, WED W. F. Hamel, WED T. A. Shrader, WED J. R. Eschenberg, WTP		

ROUTING LISTS

1	Route List	Inactive
	<ul style="list-style-type: none"> ● Babel, Carol A - Review - Concur - 01/30/2006 0908 <i>Instructions:</i> ● Hamel, William F - Review - Concur with comments - 02/09/2006 1004 <i>Instructions:</i> ● Short, Jeff J - Review - Concur with comments - 02/09/2006 1005 <i>Instructions:</i> ● Eschenberg, John R - Review - Concur - 02/10/2006 0919 <i>Instructions:</i> ● Schepens, Roy J - Approve - Approved with comments - 02/09/2006 0759 <i>Instructions:</i> 	

ATTACHMENTS

No Attachments

COLLABORATION

RECEIVED

FEB 10 2006

DOE-ORP/ORPCC

Task# ORP-WTP-2006-0018**COMMENTS**

Poster Schepens, Roy J (Deutsch, V Genie) - 02/09/2006 0702

Approve

Shirley Olinger concurred for Schepens in his absence.

Poster Hamel, William F (Almaraz, Angela) - 02/09/2006 1002

Concur

Rob Gilbert signed for Bill Hamel on 2/3/06.

Poster Short, Jeff J (Almaraz, Angela) - 02/09/2006 1002

Concur

Mike Barrett signed for Jeff Short on 2/3/06.

TASK DUE DATE HISTORY

No Due Date History

SUB TASK HISTORY

No Subtasks

-- end of report --

Task# ORP-WTP-2006-0018

E-STARS™ Report
 Task Detail Report
 01/26/2006 0117

TASK INFORMATION

Task# ORP-WTP-2006-0018
Subject CONCUR: (06-WED-010) TRANSMITTAL OF DESIGN OVERSIGHT REPORT ON REVIEW OF BECHTEL NATIONAL, INC. (BNI) DESIGN FOR THE TREATMENT OF RADIOACTIVE LIQUID WASTE (D-05-DESIGN-018)
Parent Task# **Status** Open
Reference 06-WED-010 **Due**
Originator Almaraz, Angela **Priority** High
Originator Phone (509) 376-9025 **Category** None
Origination Date 01/26/2006 1315 **Generic1**
Remote Task# **Generic2**
Deliverable None **Generic3**
Class None **View Permissions** Normal
Instructions Hard copy of the correspondence is being routed for concurrence. Once you have reviewed the correspondence, please approve or disapprove via E-STARS and route to the next person on the list. Thank you.

bcc:
 MGR RDG File
 WTP OFF File
 J. J. Short, OPA
 C. A. Babel, WED
 W. F. Hamel, WED
 T. A. Shrader, WED
 J. R. Eschenberg, WTP

ROUTING LISTS

1 Route List Active

- Babel, Carol A - Review - Awaiting Response
Instructions:
- Hamel, William F - Review - Awaiting Response
Instructions:
- Short, Jeff J - Review - Awaiting Response
Instructions:
- Eschenberg, John R - Review - Awaiting Response
Instructions:
- Schepens, Roy J - Approve - Awaiting Response
Instructions:

Handwritten notes:
 CAD 1/30/06
 RAD 2/3/06
 MB for JS 2/3/06
 2/8
 094
 [Signatures]

ATTACHMENTS

No Attachments

COLLABORATION