Chapter 4.0
Process Information

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CHAPTER 4.0
PROCESS INFORMATION

TABLE OF CONTENTS

Chapter 4.0 Process Information i
4.0 PROCESS INFORMATION 0
4.1 Process Description 0
4.1.1 Process Overview 0
4.1.2 Pretreatment Facility 2
4.1.3 LAW Vitrification Facility 31
4.1.4 High Level Waste Facility 53
4.1.5 Analytical Laboratory 73
4.1.6 Balance of Facilities (BOF) 86
4.2 WASTE MANAGEMENT UNITS 88
4.2.1 Containers [D-1] 88
4.2.2 Tank Systems [D-2] 98
4.2.3 LAW and HLW Miscellaneous Treatment Sub-Systems [WAC 173-303-680 and WAC 173-303-806(4)(i)] 112
4.2.4 Containment Buildings 118
4.3 OTHER WASTE MANAGEMENT UNITS 161
4.3.1 Waste Piles [D-3] 161
4.3.2 Surface Impoundments [D-4] 161
4.3.3 Incinerators [D-5] 161
4.3.4 Landfills [D-6] 161
4.3.5 Land Treatment [D-7] 161
4.3.6 Air Emissions Control [D-8] 161
4.3.7 Waste Minimization [D-9] 162
4.3.8 Groundwater Monitoring for Land-Based Units [D-10] 162
4.3.9 Functional Design Requirements 162
Tables 163

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4.0 PROCESS INFORMATION

4.1 Process Description

Mixed waste is managed by the Hanford Tank Waste Treatment and Immobilization Plant (WTP) using tanks, containment buildings, container storage areas, and miscellaneous unit systems. The floors and lower portions of the black cells and hot cell walls are lined with stainless steel for secondary containment. Black cells and hot cells will be equipped with an instrumented sump or sumps for leak detection. Liquids are removed from the black cell sumps by steam ejectors.

The pretreatment facility uses tank systems, miscellaneous unit systems (defined in Operating Unit Group 10, Section III.10.G of this Permit), and containment buildings to prepare waste feed from the Hanford Site double-shell tank (DST) system for vitrification. The low-activity waste (LAW) vitrification facility uses miscellaneous treatment unit sub-systems and equipment (defined in Operating Unit Group 10, Section III.10.H and III.10.I of this Permit), tank systems, and containment buildings to vitrify LAW feed. The high-level waste (HLW) vitrification facility uses miscellaneous treatment unit sub-systems and equipment (defined in Operating Unit Group 10, Section III.10.J and III.10.K of this Permit), tank systems, containment buildings, and container storage areas to vitrify HLW feed. A tank system and a container storage area are used at the analytical laboratory (Lab). Container storage is used in the balance of facilities (BOF) for waste management activities. These waste management activities are discussed in the following sections.

4.1.1 Process Overview

The WTP will store and treat waste feed from the Hanford Site double-shell tank (DST) system in the pretreatmentfacility. The pretreatment facility will separate the waste into two feed streams for the LAW and HLW melters. Feed from the DST system is expected to be of four major waste feed types, or waste feed envelopes. These waste feed envelopes are described as follows:

- Envelope A. This waste feed envelope will contain cesium at concentrations high enough to warrant removal of these radionuclides during pretreatment, to ensure that the immobilized low-activity waste (ILAW) glass will meet applicable requirements.
- Envelope B. This waste feed envelope will contain higher concentrations of cesium than envelope A. Cesium must be removed to comply with the ILAW specifications. This envelope may also contain concentrations of chlorine, chromium, fluorine, phosphates, and sulfates that are higher than those found in envelope A, which may limit the waste incorporation rate into the glass.
- Envelope C. This waste feed envelope will contain organic compounds containing complexed strontium and transuranics (TRU) that will require removal in a processing step unique to this waste envelope. As with envelopes A and B, cesium will also require removal in the pretreatment process to ensure that ILAW glass meets applicable requirements.
- Envelope D. HLW feed will be in the form of a slurry containing approximately 10 to 200 grams of unwashed solids per liter. The liquid fraction of the slurry will be separated from the solids and classified as envelope A, B, or C waste. The solid fraction will be envelope D waste.

The WTP treatment processes are designed to immobilize the waste constituents in a glass matrix by vitrification and to treat the offgas from the processes to a level that protects human health and the environment.

Two similarly designed vitrification systems will be used in the WTP. One system will immobilize the pretreated LAW feed and the second will immobilize the pretreated HLW feed. The dangerous waste constituents in the melter feed will be destroyed, removed, or immobilized in a glass matrix through the vitrification process.

The ILAW and immobilized high-level waste (IHLW) produced by the WTP will be in the form of glass packaged in stainless steel containers for ILAW and stainless steel canisters for IHLW and placed in permitted treatment, storage, and/or disposal (TSD) facilities.

Secondary waste streams (e.g., dangerous and mixed solid waste, nonradioactive and nondangerous liquid effluents, mixed waste and dangerous liquid effluents) will be characterized and recycled into the treatment process, transported to permitted treatment, storage, and/or disposal (TSD) facilities located on the Hanford Site, or transported off-site, as appropriate. Nonradioactive dangerous waste will also be generated by laboratory and maintenance activities. This waste will be managed at the WTP until it can be transferred to an off-site TSD unit.

There are four primary components of the WTP: pretreatment, LAW vitrification, HLW vitrification, and the analytical laboratory. In addition, each of these waste treatment processes is supported by systems and utilities known as the balance of facilities. The following discussion presents an overview of these waste treatment processes and balance of facilities systems at the WTP. Figure 4A-1 presents a simplified process flow diagram of the WTP treatment processes.

Pretreatment

The waste feed will be stored and subsequently treated in the pretreatment facility prior to vitrification. The processes in the pretreatment facility will condition the waste feed and remove cesium, strontium, TRU compounds, and entrained solids. The waste feed will also be processed through ultrafiltration to separate the solids.

There will be three types of waste management units in the pretreatment facility, as follows:

- Tank systems
- Containment buildings
- Miscellaneous unit systems

The structure of the pretreatment facility is supported by a reinforced concrete foundation. The superstructure will be made of structural steelwork with a metal roof. Typically, the process cells within the pretreatment facility will be constructed of reinforced concrete. Secondary containment is provided as required for tank systems and miscellaneous unit systems managing dangerous or mixed waste. Secondary containment consists of either stainless steel liner or protective coating. Table C-6 provides information on secondary containment. Figure 4A-2 and 4A-02A present simplified process flow diagrams of the pretreatment processes.

LAW Vitrification

The LAW vitrification facility will house the vitrification systems for production of the ILAW. Three types of waste management units will be located in the LAW vitrification facility, as follows:

- Tank systems
- Containment buildings
- Miscellaneous treatment unit sub-systems and equipment

The LAW vitrification facility will be constructed of reinforced concrete and structural steelwork. The below-grade portion of the building structure is made of reinforced concrete, and the superstructure will be made of reinforced concrete and structural steelwork with a metal roof. The facility structure will be supported by a reinforced concrete mat foundation.

Secondary containment is provided as required for tank systems and miscellaneous unit sub-systems and equipment managing dangerous or mixed waste. Secondary containment consists of either stainless steel liner or protective coating. Table C-6 provides information on secondary containment. Figure 4A-3 presents a simplified process flow diagram of the LAW vitrification treatment processes.

HLW Vitrification

The HLW vitrification facility will house the vitrification systems for producing IHLW. Four types of waste management units will be located in the HLW vitrification facility, as follows:

- Container storage areas
- Tank systems
- Containment buildings
- Miscellaneous treatment sub-systems and equipment

The HLW vitrification facility will be constructed of reinforced concrete and structural steelwork. The lower elevations of the building structure are reinforced concrete construction, and the upper elevations made of structural steelwork with a metal roof. The facility structure will be supported by a reinforced concrete mat foundation. Secondary containment is provided as required for tank systems and miscellaneous unit sub-systems and equipment managing dangerous or mixed waste. Secondary containment consists of either stainless steel liner or protective coating. Table C-6 provides information on secondary containment. Figure 4A-4 presents a simplified process flow diagram of the HLW vitrification treatment processes.

Analytical Laboratory

The analytical laboratory will house the hot cells, laboratories, and systems for analyzing process samples and managing regulatory compliance samples. Two types of waste management units will be located in the analytical laboratory, as follows:

- Container storage areas
- Tank systems

The analytical laboratory will be constructed of reinforced concrete, structural steelwork, and a metal roof. The below-grade portions of the building structure will be constructed of reinforced concrete. The analytical laboratory structure will be supported by a reinforced concrete mat foundation. Secondary containment is provided as required for tank systems managing dangerous or mixed waste. Secondary containment consists of either stainless steel liner or protective coating. Table C-6 provides information on secondary containment.

Balance of Facilities

The balance of facilities includes support systems and utilities required for the waste treatment processes within the pretreatment, LAW vitrification, HLW vitrification, and the analytical laboratory. The balance of facilities support systems and utilities include, but are not limited to, heating and cooling, process steam, process water, chilled water, primary and secondary power supplies, and compressed air. The balance of facilities also includes the glass former reagent system (GFR) that supplies glass former reagents to the LAW and HLW vitrification facilities. Regulated waste management units within the balance of facilities include the HLW failed melter storage facility and the nonradioactive dangerous waste storage area.

4.1.2 Pretreatment Facility

The pretreatment facility is designed to receive mixed waste from the DST system and separate and prepare the LAW and HLW feed streams for vitrification. The main functions performed at the pretreatment facility are as follows:

- Receive waste feeds from the Hanford Site DST system.
- Separate cesium, strontium, and TRU radionuclides from the waste feeds.
- Segregate solids into the HLW feed stream.

- Concentrate the separated radionuclides for incorporation into the HLW feed stream.
- Adjust the concentration of the waste for vitrification.
- Collect and monitor liquid effluents.
- Blend waste fractions to optimize treatment steps.

The purpose of this section is to describe the major systems associated with the pretreatment facility. Descriptions of process systems, ventilation systems, and mechanical support systems associated with the pretreatment facility are provided in the following sections.

The following figures found in Appendix 4A and drawings, found in the *Hanford Facility Dangerous Waste Permit* (DWP), Operating Unit Group 10, Appendix 8, provide additional detail for the pretreatment facility:

- Simplified process flow diagrams for the WTP.
- Process flow figures for pretreatment process information.
- Typical system figures depicting main features for each regulated system.
- General arrangement figures and drawings showing locations of regulated equipment.
- Waste management area figures showing facility locations to be permitted.

Vessels in black cells are designed for a 40-year life, and are of welded stainless steel construction. The black cells in the pretreatment facility are located adjacent to the hot cell. Hydraulic connections connect the black cells to each other and connect selected black cells to the hot cell. These hydraulic connections are used to cascade fluid flow between cells in the event that the black cell secondary containment hold-up volume is exceeded by the contents of a single leaking vessel in the black cell. As the liquid cascades from cell to cell it will reach the hot cell. The floors and lower portions of the black cells and hot cell walls are partially lined with stainless steel for secondary containment. This secondary containment will have a gradient designed to channel liquid to a low-point sump within each black cell and three sumps in the hot cell. Black cells and hot cells will be equipped with an instrumented sump or sumps for detecting loss of vessel or piping integrity. Liquids are removed from the black cell sumps by steam ejectors.

The radiation monitor and valves with potential exposure to elevated radiation are contained within a shielded bulge attached to the outside wall of the black cell. The bulge provides secondary containment for ancillary equipment and is equipped with decontamination sprays, liquid level instrumentation for leak detection, and a drain to the Ultimate Overflow Vessel (PWD-VSL-00033).

Liquid level in the vessels will be monitored and maintained within low and high operating limits. Regulated WTP plant tank systems processes and leak detection systems instruments and parameters will be provided in Table III.10.E.E. Regulated miscellaneous treatment systems process and leak detection systems instruments and parameters will be provided in Table III.10.G.C.

At times, internal decontamination of vessels may be required. The primary permanent process vessels are fitted with wash rings for decontamination by flushing. Wash systems will be able to introduce water, caustic solution, or acid. The stainless steel lined floor provides secondary containment.

Instrumentation, alarms, controls, and interlocks will be provided for the tank systems and miscellaneous treatment systems to indicate or prevent the following conditions, as appropriate:

- Overfilling: Plant items are protected against overfilling by liquid level indication, high level instrumentation interlocks to shut off feed sources, and process control system control functions backed up by hard wired trips as required.

- Loss of containment: Plant items are protected against containment loss by liquid level indication, and by process control, system control and alarm functions as required, including shut off of feed sources. Tanks or miscellaneous units (MUs) that manage liquid mixed or dangerous waste is provided with secondary containment, and some tanks and MUs utilize daily visual inspection for leak detection. Tank and MU ancillary equipment is provided with secondary containment or visually inspected for leaks on a daily basis in accordance with WAC-173-303-640(4)(f). Sumps associated with the management of liquid mixed or dangerous waste are provided with liquid level instrumentation and an ejector or pump to empty the sump as needed.
- Inadvertent transfers of fluids: System sequential operations are properly interlocked to prevent inadvertent transfers at the wrong time or to the wrong location.
- Loss of mixing function: Tank systems are instrumented (air pressure/flow indication) to prevent hydrogen accumulation and solids settling. A forced air in-bleed is provided to dilute hydrogen generated through radiolysis.
- Loss of process function: System vessels using reverse flow diverters incorporated dual reverse flow diverter system redundancy into the design to prevent loss of process function and to maintain appropriate liquid levels in vessels if one of the reverse flow diverters should fail.
- Overheating: Temperature regulation with chilled water is provided for those plant items where heat may be generated due to radiolysis. Chilled water lines will be monitored for contamination.
- Overpressurization: Relief is provided by use of rupture disks.
- Vacuum in vessels: Relief is provided through the PVP system during transfer of waste out of vessels.
- Loss of air flow: The plant ventilation system creates a pressure gradient which causes air to flow through engineered routes from an area of lower contamination potential to an area of higher contamination potential.

In addition to level control, temperature and pressure may be monitored for tank systems and miscellaneous treatment systems in some cases. Additional information may be found in the system logic descriptions located in DWP Operating Unit Group 10, Appendix 8.13.

4.1.2.1 Waste Feed Receipt Process (FRP) System

Process flow diagram of the Waste Feed Receipt Process system (FRP) is provided in DWP Operating Unit Group 10, Appendix 8.1. The primary function of the FRP is to receive batch transfers of waste feed from the DST system, and to store the waste pending processing through pretreatment.

The main components of the FRP system are:

- Waste transfer lines.
- Waste Feed Receipt Vessels (FRP-VSL-00002A/B/C/D).
- Vessel inlet and outlet valve headers.
- Pumps, piping, and instrumentation for waste transfers.
- Waste sampling equipment.

Waste feed will normally be transferred from the DST system in batches up to 1 million gallons into three of the four Waste Feed Receipt Vessels. The fourth vessel containing waste feed from the preceding transfer is used to sustain production while the current batch transfer is being mixed and sampled to verify waste characteristics.

The Waste Feed Receipt Vessels (FRP-VSL-00002A/B/C/D) can also receive concentrate from the Waste Feed Evaporation Process (FEP) System and off-specification treated LAW from the treated LAW Concentrate Storage Process (TCP) System. The waste feed stored in the Waste Feed Receipt Vessels is batch-transferred forward for processing to either the FEP system or to the Ultrafiltration Process (UFP) System. The FRP system also has the capability to return stored waste to the DST system.

Waste feed is received from the DST system through the inner pipe of any one of three co-axial transfer lines. The inlet valve header routes the waste to the Waste Feed Receipt Vessels. The inlet and outlet valve headers and pumps are used in combination to facilitate the transfer of waste from one Waste Feed Receipt Vessel to another, forward transfer of waste to the pretreatment process, or the return of waste to the DST system using the transfer lines.

FRP system design features include:

- Capability to pressure-test both the inner and outer transfer lines for integrity.
- Transfer line leak detection system for integrity indication during transfer.
- Transfer line flushing and draining capability.
- Instrumentation for monitoring vessel liquid level.
- Vessel vent to the Pretreatment Vessel Vent Process (PVP) System.
- Forced air purge and passive air purge of the vessel vapor space for mitigation of hydrogen gas buildup.
- Internal pulse jet mixers (PJMs) for solids suspension and slurry mixing.
- Remote sampling capability off the discharge of the transfer pump via autosampler ASX-SMPLR-00025.

4.1.2.2 Waste Feed Evaporation Process (FEP) System

Process flow diagrams of the Waste Feed Evaporation Process (FEP) System are provided in DWP Operating Unit Group 10, Appendix 8.1. The primary process function of the FEP tanks and miscellaneous unit system is to concentrate waste streams from:

- The FRP system.
- The HLW Lag Storage and Feed Blending Process (HLP) System.
- The Plant Wash and Disposal Process (PWD) System.
- The Spent Resin Collection and Dewatering Process (RDP) System.

The main components of the FEP tank and miscellaneous unit system are as follows:

Tank system

- Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B)
- Waste Feed Evaporator Condensate Vessel (FEP-VSL-00005)
- Vessel outlet valve headers
- Pumps, piping, and instrumentation for waste transfers

Miscellaneous Unit systems

- Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B)
- Waste Feed Evaporator Primary Condensers (FEP-COND-00001A/B)
- Waste Feed Evaporator Intercondensers (FEP-COND-00002A/B)
- Waste Feed Evaporator Aftercondensers (FEP-COND-00003A/B)

- Waste Feed Evaporator Reboilers (FEP-RBLR-00001A/B)
- Pumps

The Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) will deliver concentrate to the Ultrafiltration Process (UFP) System. Overhead vapors and noncondensables from the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) are routed to the Waste Feed Evaporator Primary Condensers (FEP-COND-00001A/B). Process condensate from the Waste Feed Evaporator Primary Condensers and steam condensate from the vacuum system are collected in the Waste Feed Evaporator Condensate Vessel (FEP-VSL-00005) and discharged to the Radioactive Liquid Waste Disposal Process (RLD) System. The noncondensables from the vacuum system are discharged to the PVP system.

During off-normal conditions, excess dilute recycles to the FEP Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B), or excess concentrate from the FEP Waste Feed Evaporator Separator Vessels can be routed to the FRP system for interim storage. Fluids generated from solids washing in the UFP system that are collected in the HLP system and are too dilute for feed to HLW vitrification can also be concentrated in the FEP system.

The FEP system includes two Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B) for managing feed makeup from multiple sources. One Waste Feed Evaporator Feed Vessel will be in a makeup mode while the alternate vessel is feeding the evaporator trains.

The design features of the FEP evaporator feed system include:

- Internal pulse jet mixers for solids suspension.
- Instrumentation for monitoring vessel liquid level.
- Vessel vent to the PVP system.
- Forced air purge and passive air purge of the vessel vapor space for mitigation of hydrogen gas buildup.
- Pump and line flushing capability.
- Transfer flow rate indication and transfer volume totalizer.
- Remote sampling capability off the discharge of the transfer pumps via autosampler ASX-SMPLR-00025.
- Vessel spray rings for vessel decontamination.

The FEP waste feed evaporator trains can be operated independently or at the same time depending on the evaporation needs. The Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) are forced-circulation units operating under vacuum to reduce the operating temperature. Recirculation pumps maintain a high flow rate from the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) to the Waste Feed Evaporator Reboilers (FEP-RBLR-00001A/B). Pumps maintain a high flow rate around the evaporation system. The pumps transfer the waste through the Waste Feed Evaporator Reboilersand back into the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B). The recirculating waste stream is prevented from boiling in the reboiler tubes by maintaining sufficient hydrostatic head (submergence) to increase the boiling point above the temperature of the liquor in the Reboiler tubes.

As the liquid travels out of the Reboilers (FEP-RBLR-00001A/B), the hydrostatic head diminishes and flash evaporation occurs as the flow enters the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B). The liquid continues to flash and the vapor and liquid streams are separated (liquid-vapor disengagement). The liquid stream circulates in this loop and becomes more concentrated, while the vapor stream passes through a demisting section to the evaporator condensers.

A portion of the concentrate is also pumped from the bottom of the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) at the controlled liquid density and is discharged to Ultrafiltration Feed Preparation Vessels (UFP-VSL-00001A/B) in the UFP system, or is recycled to the FRP system.

The vapor stream exiting the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) is condensed in a three-stage condenser system consisting of Waste Feed Evaporator Primary Condensers (FEP-COND-00001A/B), Waste Feed Evaporator Intercondensers (FEP-COND-00002A/B), and Waste Feed Evaporator Aftercondensers (FEP-COND-00003A/B). The noncondensables exiting the After-Condenser are routed to the PVP system for treatment.

Design features of the evaporator trains include:

- Operating pressure indication and control.
- Differential pressure indication across the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) demister section.
- Water sprays to the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) demister section.
- Process condensate radiation monitoring and recycle capability.
- Low-pressure steam supply for heating the Waste Feed Evaporator Reboilers (FEP-RBLR-00001A/B).
- Waste Feed Evaporator Reboilers (FEP-RBLR-00001A/B) tube leak detection and diversion capability.
- Waste Feed Evaporator Reboilers (FEP-RBLR-00001A/B) steam condensate collection.
- Instrumentation for monitoring and control of vessel liquid level.
- Forced air purge of the vessel vapor space for mitigation of hydrogen gas buildup (passive venting of purge air via the downstream vessels connected to the vent header).
- Capability to drain, flush, and chemically clean the system.

The condensed vapor from the FEP condensers is collected in the Waste Feed Evaporator Condensate Vessel (FEP-VSL-00005). One condensate vessel is used to collect condensate from both evaporator trains. A small fraction of the total condensate is recycled to the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) demister water sprays. The balance of the condensate is transferred to the RLD system. Off-specification condensate is recycled to the Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B).

Design features include:

- Instrumentation for monitoring and control of vessel liquid level.
- Vessel vent to the PVP system.
- Outlet valve header.
- Remote sampling capability off the discharge of the transfer pumps.
- Dip legs in the vessel that maintain a liquid seal (pressure boundary) between the vessel and the condensers.
- Makeup recycle water as required for startup.

4.1.2.3 Ultrafiltration Process (UFP) System

Process flow diagrams of the Ultrafiltration Process (UFP) System are provided in DWP Operating Unit Group 10, Appendix 8.1.

The UFP tank system separates the waste feed from the HLW Lag Storage and Blending Process and the Waste Feed Receipt Process Systems and/or the Waste Feed Evaporation Process System into a high solids stream, referred to as the HLW feed stream, and a relatively solids-free stream, referred to as the LAW feed stream. In the UFP system, the separated solids may undergo additional treatment (washing and/or leaching operations) to reduce the quantity of IHLW produced. In addition, the LAW feed stream may require Sr/TRU precipitation (Envelope C only). This operation will be performed in the UFP system prior to solids separation.

The main components of the UFP tank system are:

- Ultrafiltration Feed Preparation Vessels (UFP-VSL-00001A/B).
- Ultrafiltration Feed Vessels (UFP-VSL-00002A/B).
- Two ultrafilter trains, each containing five individual ultrafilters (UFP-FILT-00001A/2A/3A/4A/5A and -00001B/2B/3B/4B/5B).
- Associated ultrafilter backpulsing equipment.
- Ultrafilter Permeate Collection Vessels (UFP-VSL-00062A/B/C).
- Pumps, piping, and instrumentation for waste transfers and control of unit operations.
- Heat exchangers (UFP-HX-00041A/B and -00001A/B) for cooling waste slurry.

Ultrafiltration is a filtration process in which the waste stream is processed axially through the Ultrafilters (UFP-FILT-00001A/2A/3A/4A/5A and -00001B/2B/3B/4B/5B), which are long bundles of permeable tubes. Solids-free liquids pass radially through the permeable ultrafilter tubes surface while the concentration of the solids in the recirculating stream continuously increases within the associated feed vessel. The resulting solids slurry may need treatment such as caustic leaching, oxidative leaching, and/or water washing to reduce the quantity of IHLW produced.

Waste is received from the HLP, FRP, and/or the FEP systems into the Ultrafiltration Feed Preparation Vessels (UFP-VSL-00001A/B) of the UFP system. The waste may be sampled here to determine the ultrafiltration parameters. The waste may undergo caustic leaching here for some envelope A/D feeds. Heat and agitation are applied for caustic leaching. For envelope C feeds, the capability exists for the addition of chemicals to the Ultrafiltration Feed Preparation Vessels (UFP-VSL-00001A/B) to precipitate strontium and TRU elements contained in the incoming waste stream prior to solids concentration by ultrafiltration. Heat (if required) and agitation can be applied to ensure that the precipitation process is completed.

The Ultrafiltration Feed Preparation Vessels (UFP-VSL-00001A/B) feed the Ultrafiltration Feed Vessels (UFP-VSL-00002A/B), which feed the ultrafilters themselves. During the initial solids concentration, the solids-free stream generated by ultrafiltration is designated as the LAW feed stream, which is then routed to one of the three Ultrafilter Permeate Collection Vessels (UFP-VSL-00062A/B/C). Here, the permeate is sampled for solids breakthrough (turbidity) and criticality (plutonium) prior to further processing, which includes cesium removal and additional evaporation prior to LAW vitrification.

The resulting concentrated slurry may then be caustic leached and/or oxidative leached to remove glass-limiting compounds, and washed in the Ultrafiltration Feed Vessels (UFP-VSL-00002A/B) with process water to remove interstitial liquid and soluble salts, while being further processed through the Ultrafilters (UFP-FILT-00001A/2A/3A/4A/5A and -00001B/2B/3B/4B/5B). The final concentrated HLW feed stream is transferred to the HLW Lag Storage Vessels currently planned to be HLP-VSL-00027B and HLP-VSL-00028 and then on to the HLW vitrification process. Permeate from solids washing is also collected in one of the Ultrafilter Permeate Collection Vessels (UFP-VSL-00062A/B/C), but a substantial fraction of this stream is normally routed to the facility wash and disposal process system (PWD) for recycle.

During waste processing, the permeability of the Ultrafilters (UFP-FILT-00001A/2A/3A/4A/5A and 00001B/2B/3B/4B/5B) is reduced over time. Re-establishing the ultrafilters' permeability can be accomplished using one of three different methods: 1) backpulsing one filter at any time with filter permeate or 2) backpulsing one filter at any time with nitric acid or caustic or 3) cleaning an entire filter train utilizing nitric acid or caustic. Backpulsing with permeate may be utilized while the filter train is in normal operation, but cleaning with nitric acid or caustic requires the filters to be out of operation. Filter performance will be monitored to determine when cleaning is required.

The primary design features of the UFP system are:

- Pulse jet mixers in the Ultrafiltration Feed Preparation Vessels, the Ultrafiltration Feed Vessels, and in the Ultrafilter Permeate Collection Vessels, and mixing air spargers in the Ultrafiltration Feed Vessels.
- Cooling jackets on the Ultrafiltration Feed Preparation Vessels and on the Ultrafiltration Feed Vessels and external heat exchangers in recirculation loops associated with these vessels for cooling their contents.
- Passive vessel overflow routes for the Ultrafiltration Feed Preparation Vessels, the Ultrafiltration Feed Vessels, and in the Ultrafilter Permeate Collection Vessels to the Ultimate Overflow Vessel (PWD-VSL-00033).
- Steam spargers in the Ultrafiltration Feed Preparation Vessels and the Ultrafiltration Feed Vessels for heating waste slurry for certain treatment processes.
- UFP-PMP-00044A/B for emptying Ultrafiltration Feed Vessels
- Sampling capabilities from recirculation loops associated with the Ultrafiltration Feed Preparation Vessels and Ultrafiltration Feed Vessels, and in the Ultrafilter Permeate Collection Vessels via autosamplers ASX-SMPLR-00019 and ASX-SMPLR-00020.
- Vessel wash rings for the Ultrafiltration Feed Preparation Vessels, the Ultrafiltration Feed Vessels, and in the Ultrafilter Permeate Collection Vessels Ventilation (both passive and forced) for the Ultrafiltration Feed Preparation Vessels, the Ultrafiltration Feed Vessels, and in the Ultrafilter Permeate Collection Vessels.

4.1.2.4 HLW Lag Storage and Feed Blending Process (HLP) System

Process flow diagrams of the HLW Lag Storage and Feed Blending Process (HLP) System are provided in DWP Operating Unit Group 10, Appendix 8.1. The primary functions of the HLP system are to receive, blend, store, and transfer HLW feed. The HLP system receives for staging and blending the following waste streams: HLW feed from the Hanford Tank Farms, the HLW pretreated slurry from the UFP system, cesium concentrate from the CNP system, and transfers from the FEP.

The main components of the HLP tank system are:

- HLW Feed Receipt Vessel (HLP-VSL-00022).
- HLW Lag Storage Vessels (HLP-VSL-00027A/B).
- HLW Feed Blend Vessel (HLP-VSL-00028).
- Pumps, breakpots, piping, and instrumentation for waste transfers.

All feeds within the HLP system contain solids; as a result mixing with PJMs is required in all HLP vessels. In addition to PJMs, the HLW Lag Storage Vessels (HLP-VSL-00027A/B) and the HLW Feed Blend Vessel (HLP-VSL-00028) will be provided with air sparging capabilities.

<u>HLW Feed Receipt Vessel (HLP-VSL-00022)</u>

HLW feed is received into the HLW Feed Receipt Vessel (HLP-VSL-00022).

The waste received in this vessel is sampled (via ASX-SMPLR-00020) and transferred to either the UFP vessels (UFP-VSL-00001A/B), the Waste Feed Evaporation Process (FEP) vessels (FEP-VSL-00017A/B) or the Waste Feed Receipt Process (FRP) System.

HLW Lag Storage Vessels (HLP-VSL-00027A/B)

Treated high solids waste (HLW feed stream) received from the UFP system is stored, segregated, and blended in the HLW Lag Storage Vessels (HLP-VSL-00027A/B). As needed, the waste stored in these vessels is sampled (via ASX-SMPLR-00020) to determine blending and to comply with vitrification parameters of IHLW. HLW Feed Blend Vessel (HLP-VSL-00028)

The HLW feed stream is routed from the HLW Lag Storage Vessels (HLP-VSL-00027A/B) to the HLW Feed Blend Vessel (HLP-VSL-00028). For operational flexibility, there is an option to blend the HLW feed in the HLW Lag Storage Vessel HLP-VSL-00027B prior to transfer to the HLW vitrification facility. The HLW feed blending will occur primarily in the HLW Feed Blend Vessel HLP-VSL-00028).

The HLW treated solids may be blended with contents of:

- Strontium/TRU precipitate slurry from HLW Lag Storage Vessels (HLP-VSL-00027A/B).
- Un-neutralized cesium concentrate from the Cesium Evaporator Separator Vessel. (CNP-EVAP-00001) via the Cesium Evaporator Concentrate Lute Pot (CNP-VSL-00002).
- Neutralized cesium concentrate from the Eluate Contingency Storage Vessel (CNP-VSL-00003).

The amount of each of these waste streams will be coordinated. Sodium Hydroxide will be added as needed. The blended HLW feed stream is then transferred to the HLW vitrification facility for final treatment and immobilization. Before the blended HLW feed is transferred to the HLW vitrification facility, it is sampled (via autosampler ASX-SMPLR-00020). The HLP system includes an option to return the blended HLW feed stream to the Hanford Tank Farms.

The primary design features of the HLP vessels are:

- Internal PJMs for solids suspension.
- External cooling jackets.
- Passive vessel overflow routes to the Ultimate Overflow Vessel (PWD-VSL-00033).
- Sampling capabilities via autosampler ASX-SMPLR-00020.
- Vessel wash rings.
- Vessel ventilation (both passive and forced) through the PVP/PVV systems.
- PJM ventilation through the PJV system.

4.1.2.5 Cesium Ion Exchange Process (CXP) System

Process flow diagrams of the Cesium Ion Exchange Process (CXP) System are provided in DWP Operating Unit Group 10, Appendix 8.1. The primary function of the CXP system is to remove cesium-137 from the LAW feed stream. This is accomplished using a series of ion exchange columns containing a resin that preferentially extracts cesium-137. After caustic displacement of LAW feed in the ion exchange columns and a water rinse, elution of the cesium-loaded resin is accomplished using dilute nitric acid supplied by the Cesium Nitric Acid Recovery Process (CNP) System. The cesium-loaded nitric acid is then routed to the CNP system with the cesium ultimately processed in the HLW melter.

The main components of the CXP system are:

- Cesium Ion Exchange Feed Vessel (CXP-VSL-00004).
- Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4).
- Cesium Ion Exchange Treated LAW Collection Vessels (CXP-VSL-00026A/B/C).

- Pumps, heat exchanger, filter, piping, and instrumentation for waste transfers.

The Cesium Ion Exchange Feed Vessel (CXP-VSL-00004) receives LAW feed from the UFP system and allows for continuous operation of the ion exchange system. The CXP system-contains four Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4). At any given time, three of the columns are used in series to remove cesium-137 from the LAW feed stream. The three columns are termed lead, lag, and polishing columns, depending on their position in the train. The fourth column is eluted and regenerated, and is then placed in a standby mode until the lead column reaches the desired cesium loading. At this point, the lead column is rotated out for elution and regeneration, the lag column becomes the lead, the polishing column becomes the lag, and the standby column is rotated into the polishing position.

The concentration of cesium-137 in the feed stream is monitored by sampling in the Ultrafilter Permeate Collection Vessels (UFP-VSL-00062A/B/C) prior to transfer to the lead Cesium Ion Exchange Column and by radiation monitors on the line between each Cesium Ion Exchange Column (CXP-IXC-00001/2/3/4). When cesium-137 is detected above an established set point following an ion exchange column, the lead column is taken out of the loading cycle, eluted, and the resin bed regenerated while the other columns are placed into the loading cycle.

Elution is part of a resin bed regeneration cycle that typically includes the following steps:

- Displacement of residual LAW feed stream in the column by displacement with dilute caustic solution to prevent the potential of precipitating aluminum hydroxide from the LAW feed stream at low pH values. This caustic rinse is provided from the Cesium Ion Exchange Reagent Vessel (CXP-VSL-00005).
- Displacement of residual dilute caustic solution from the column with demineralized water to prevent an acid-base reaction during elution.
- Elution of cesium-137 ions with dilute nitric acid from the CNP system.
- Displacement of residual acid from the column with demineralized water to prevent an acid-base reaction with the caustic solution.
- Regeneration of the resin bed with caustic solution from the Cesium Resin Addition Process (CRP) System.
- Displacement of residual caustic solution with treated LAW feed solution to prevent churning of the resin bed upon introduction of untreated LAW feed. This treated LAW feed is provided directly from the Cesium Ion Exchange Column functioning as the polishing column.

After a number of loading and regeneration cycles, the resin performance is expected to decrease to a set point, which is termed “spent”. The number of cycles depends on LAW feed constituents, operating temperatures, properties of the resin, radiation exposure, and LAW feed throughput rates. The spent resin is slurried with recycled Ion Exchange resin flush solution and flushed out of the column into the Spent Resin Collection and Dewatering Process (RDP) System for resin disposal. A slurry of fresh resin is prepared in the Cesium Resin Addition Process (CRP) System and then added to the column as an ion exchange column bed replacement.

An elution system is provided by three vessels; one containing nitric acid, another containing demineralized water, and a third vessel containing sodium hydroxide. Each vessel has a volume sufficient to fully elute one fully loaded column, and one partially loaded column. The vessels are located at an elevation sufficiently high above the Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4) to provide enough hydrostatic head to induce flow through the Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4) and associated piping to the destination vessel.

Following cesium ion exchange, the treated LAW feed is transferred to the Cesium Ion Exchange Treated LAW Collection Vessels (CXP-VSL-00026A/B/C) where the LAW feed is sampled then transferred for further treatment in the Treated LAW Evaporation Process (TLP) System and the Treated LAW Concentrate Storage Process (TCP) System.

The primary design features of the CXP system are:

- Instrumentation for monitoring and control of vessel liquid level.
- Pulse jet mixers in the Cs Ion Exchange Feed Vessel (CXP-VSL-00004) and the Cesium Ion Exchange Treated LAW Collection Vessels (CXP-VSL-00026A/B).
- Passive vessel overflow routes from the Cs Ion Exchange Feed Vessel (CXP-VSL-00004), the Cs Ion Exchange Reagent Vessel (CXP-VSL-00005) and the Cesium Ion Exchange Treated LAW Collection Vessels (CXP-VSL-00026A/B).
- Remote sampling capabilities on the discharge of transfer pumps via autosampler ASX-SMPLR-00017.
- Connection of the vessel vapor space to the Pretreatment Vessel Vent Process (PVP) System.

4.1.2.6 Cesium Nitric Acid Recovery Process (CNP) System

Process flow diagram of the Cesium Nitric Acid Recovery Process (CNP) System is provided in DWP Operating Unit Group 10, Appendix 8.1. The Cesium Nitric Acid Recovery Process System (CNP) supports the Cesium Ion Exchange Process System (CXP). Cesium is removed from LAW feed via resin in Cesium Ion Exchange Columns and is concentrated prior to transfer to the High Level Waste Lag Storage and Feed Blending Process System (HLP) for incorporation into the HLW melter feeds. The Cesium Nitric Acid Recovery System also provides recovered nitric acid for reuse in the CXP system as eluant.

The CNP system is composed of tanks and miscellaneous unit systems with the following equipment.

Tank System

- Eluate Contingency Storage Vessel (CNP-VSL-00003)
- Cesium Evaporator Recovered Nitric Acid Vessel (CNP-VSL-00004)
- Cesium Evaporator Eluant Lute Pot (CNP-VSL-00001)
- Pumps, piping, and instrumentation for waste transfers
- Miscellaneous Unit Systems
- Cesium Evaporator Separator Vessel (CNP-EVAP-00001)
- Cesium Evaporator Concentrate Reboiler (CNP-HX-00001)
- Cesium Evaporator Nitric Acid Rectifier Column (CNP-DISTC-00001)
- Cesium Evaporator Primary Condenser (CNP-HX-00002)
- Cesium Evaporator Inter-Condenser (CNP-HX-00003)
- Cesium Evaporator After-Condenser (CNP-HX-00004)
- Pumps, piping, and instrumentation for waste transfers

The CNP system receives the cesium rich eluate from the CXP system, concentrates the dissolved salts in the eluate, and transfers the concentrate to the HLP system. The CNP system also recovers dilute nitric acid from the evaporator overheads stream, at the correct acid concentration, for reuse as eluant in the CXP system.

The CNP system consists of the vacuum evaporator/separator vessel, a reboiler, a concentrate recirculation pump, an acid rectifier column, 3 condensers, 2 vacuum steam ejectors, a lute pot, 2 breakpots, a recovered acid receiver vessel and an eluate contingency storage vessel. Utility systems include steam supply, including a desuperheater, steam condensate, and a closed loop cooling water supply and return system. The necessary sample points and instrumentation and controls for completing system functions in a safe and efficient manner are included in the system.

During the process of regenerating the cesium ion exchange resin beds, eluate composed of cesium-bearing nitric acid will be fed to the Cesium Evaporator Separator Vessel (CNP-EVAP-00001) operating under reduced pressure. A closed-loop circulation stream is fed from the evaporator to the steam-heated Cesium Evaporator Concentrate Reboiler (CNP-HX-00001) and back to the Cesium Evaporator Separator Vessel (CNP-EVAP-00001).

Vapor from the Cesium Evaporator Separator Vessel (CNP-EVAP-00001), composed primarily of water and nitric acid, is sent to the Cesium Evaporator Nitric Acid Rectifier Column (CNP-DISTC-00001) where the nitric acid is recovered for reuse as eluant. Recovered nitric acid is collected in the Cesium Evaporator Recovered Nitric Acid Vessel (CNP-VSL-00004) for reuse in the elution of cesium ion exchange column resin beds. Condensed water vapor is recovered from the Cesium Evaporator Primary Condenser (CNP-HX-00002), Cesium Evaporator Inter-Condenser (CNP-HX-00003), and Cesium Evaporator After-Condenser (CNP-HX-00004), and sent to the PWD system. These condensers are water-cooled shell-and-tube heat exchangers. Uncondensed vapors exiting from the after-condenser are routed to the PVP system for further treatment.

The cesium concentrated in the evaporator is routed to the HLW Feed Blend Vessel (HLP-VSL-00028) for blending and incorporation into the HLW melter feed streams. This cesium concentrate may also be stored in the Eluate Contingency Storage Vessel (CNP-VSL-00003), which is equipped with a cooling jacket for heat removal.

The Cesium Evaporator Separator Vessel (CNP-EVAP-00001) is fed through a break pot and the Cesium Evaporator Eluant Lute Pot (CNP-VSL-00001) in order to create a hydraulic seal to maintain a vacuum in the Cesium Evaporator Separator Vessel (CNP-EVAP-00001).

The recovered nitric acid is periodically sampled and, depending on the acid concentration of the recovered acid sample, some pH adjustment may be necessary. Fresh 2 molar nitric acid is available to the Cesium Evaporator Recovered Nitric Acid Vessel (CNP-VSL-00004) along with process condensate to adjust the recovered acid concentration as required.

The CNP system operates when a Cesium Ion Exchange Column (CXP-IXC-00001/2/3/4) is in the process of having its resin bed regenerated through an elution process. When elution of a cesium ion exchange column is not taking place, the nitric acid recovery system is maintained in a standby mode. The major vessels of the CNP system are equipped with internal wash rings for decontamination of the system.

The primary design features of the CNP system are:

- Instrumentation for monitoring and control of vessel liquid level.
- Pulse jet mixers in the Eluate Contingency Storage Vessel (CNP-VSL-00003) and the Cs Evaporator Recovered Nitric Acid Vessel (CNP-VSL-00004).
- Passive vessel overflow routes from the Eluate Contingency Storage Vessel, and the Cs Evaporator Recovered Nitric Acid Vessel.
- Connection of the vessel vapor space and condensers to the Pretreatment Vessel Vent Process (PVP) System.
- Remote sampling capabilities via autosampler ASX-SMPLR-00017.

4.1.2.7 Cesium Resin Addition Process (CRP) System

Figure 4A-11 presents a simplified process flow diagram of the Cesium Resin Addition Process (CRP) System. The purpose of the CRP system is to provide a means to add fresh resin to the Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4), prevent backflow from R5/C5 areas into R3/C3 areas, and vent the ion exchange columns. The system provides for preparation of the fresh cesium resin by hydraulically removing fines from the bulk of the resin particles as well as chemically conditioning the fresh resin. After conditioning, the resin is transferred to the ion exchange columns as a slurry, by gravity flow.

The main components of the CRP system are:

- Cesium Resin Addition Vessel (CRP-VSL-00001).
- Cesium Resin Addition Bulge.
- Cesium resin addition recycle pump.
- Pumps, piping, and instrumentation for waste transfers.

Cesium is removed from the LAW feed using the ion exchange resin. Each batch of the resin has a limited useful operating life after which it must be removed from the ion exchange column and replaced with fresh resin.

Fresh resin is delivered per specification by the vendor. It is then transferred from bulk storage with the aid of handling equipment to the resin addition room. The resin is transferred from the shipping container to the Cesium Resin Addition Vessel (CRP-VSL-00001) with an eductor and demineralized water. After transfer, the cesium resin undergoes resin conditioning processes. The resin is then transferred via the CRP-BULGE-00001 to a Cesium Ion Exchange Column (CXP-IXC-00001/2/3/4) as a slurry by gravity flow.

The CRP system contains resin and reagent products. However, ancillary equipment, such as piping and valves, located in the Cesium Resin Addition Bulge (CRP-BULGE-00001) will contain resin flush liquor and can be used to recycle spent resin from the Spent Resin Collection and Dewatering Process (RDP) System back to CXP-IXC-00001/2/3/4. The Cesium Resin Addition Bulge (CRP-BULGE-00001) provides secondary containment for the ancillary equipment located inside the bulge.

The Cesium Resin Addition Bulge (CRP-BULGE-00001), located on the 56’ elevation, contains piping and valves that connect the Cesium Resin Addition Vessel (CRP-VSL-00001) to the Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4). The function of the Cesium Resin Addition Bulge (CRP-BULGE-00001) is to contain the valves that prevent back-flow of contaminated gas, resin, or liquid, from entering the C3 area upstream of the bulge. In the unlikely event of back-flow into the Cesium Resin Addition (CRP-BULGE-00001), valves close and contain the contamination within the bulge. For hydrogen control, gas is vented to the Pretreatment Vessel Vent Process (PVP) System and other constituents gravity flow into the Plant Wash Vessel (PWD-VSL-00044) of the Plant Wash and Disposal Process (PWD) System.

The cesium resin must be conditioned before processing the LAW feed stream through the Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4). The purpose of conditioning is to fully expand the resin and convert the resin into the right ionic form for cesium removal.

The primary design features of the CRP system are:

- Instrumentation for monitoring and control of vessel liquid level.
- Passive vessel overflow routes from the Cesium Resin Addition Vessel (CRP-VSL-00001).
- Connection of the Vessel vapor space to the Pretreatment Vessel Vent Process (PVP) System.

4.1.2.8 Reserved

4.1.2.9 Reserved

4.1.2.10 Reserved

4.1.2.11 Treated LAW Evaporation Process (TLP) System

Process flow diagram of the Treated LAW Evaporation Process (TLP) System is provided in DWP Operating Unit Group 10, Appendix 8.1. The primary function of the TLP tank and miscellaneous unit system is to concentrate the pretreated feed to the LAW melters. The TLP system also collects the offgas condensate from LAW vitrification, neutralizes the stream, and evaporates the recycle stream with the treated LAW feed.

The main processes of the TLP tank and miscellaneous unit system are as follows:

- Receive waste from the treated LAW collection vessels.
- Receive and neutralize submerged bed scrubber purge and wet electrostatic precipitator (WESP) condensate from LAW vitrification.
- Evaporate a portion of the feed (reducing the volume and increasing the sodium concentration).
- Transfer the waste to the Treated LAW Concentrate Storage Process System (TCP).
- Condense the overhead vapors and transfer the condensate to the Radioactive Liquid Waste Disposal System (RLD).
- Vent non-condensable gases to the PVP for treatment.

The main components of the TLP tank and miscellaneous unit system are as follows:

Tank System

- LAW SBS Condensate Receipt Vessels (TLP-VSL-00009A/B)
- Treated LAW Evaporator Condensate Vessel (TLP-VSL-00002)
- Pumps, piping, and instrumentation for waste transfers
- Miscellaneous Unit Systems
- Treated LAW Evaporator Separator Vessel (TLP-SEP-00001)
- Pumps, piping, and instrumentation for waste transfers
- Treated LAW Evaporator Reboiler (TLP-RBLR-00001)
- Concentrate pumps with outlet valve header
- Treated LAW Primary Condenser (TLP-COND-00001)
- Treated LAW Inter-Condenser (TLP-COND-00002)
- Treated LAW After-Condenser (TLP-COND-00003)
- Pumps, piping, and instrumentation for waste transfers

Subsequent to sampling and analysis, the treated LAW is pumped from one of three Cesium Ion Exchange Treated LAW Collection Vessels (CXP-VSL-00026A/B/C) to the evaporator system. The Treated LAW Evaporator Separator Vessel (TLP-SEP-00001) will deliver treated LAW concentrate to the Treated LAW Concentrate Storage Process (TCP) System.

The TLP system also evaporates recycle streams from the Treated LAW Concentrate Storage Process (TCP) System and the Radioactive Liquid Waste Disposal Process (RLD) System, and submerged bed scrubbers in the LAW Facility. Overhead vapors from the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001) are routed to the Treated LAW Primary Condenser (TLP-COND-00001).

Process condensate from the Treated LAW Primary Condenser (TLP-COND-00001), Inter-Condenser (TLP-COND-00002), and After-Condenser (TLP-COND-0003) are collected in the Treated LAW Evaporator Condensate Vessel (TLP-VSL-00002) and discharged to the RLD system. The noncondensables from the condenser train are discharged to the Pretreatment Vessel Vent Process (PVP) System.

The TLP feed system includes two LAW SBS Condensate Receipt Vessels (TLP-VSL-00009A/B) for managing submerged bed scrubber recycles from LAW vitrification and pretreatment process recycles. One vessel will be in an accumulation mode while the alternate vessel is feeding the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001).

The primary design features of the TLP feed components include:

- Internal pulse jet mixers that blend and maintain solids suspension in the waste.
- Instrumentation for monitoring of vessel liquid level.
- Vessel vent to the PVP system.
- Passive air purge of the vessel vapor space.
- Pump and line flushing capability.
- Transfer flow rate indication and transfer volume totalizer.
- Remote sampling capability off the discharge of the transfer pumps.
- Vessel spray rings for vessel decontamination.

The Treated LAW Evaporator Separator Vessel (TLP-SEP-00001) is a forced-circulation unit operating under vacuum to reduce the operating temperature. A recirculation pump maintains a high flow rate from the evaporator separator vessel to the Treated LAW Evaporator Reboiler (TLP-RBLR-00001). The pump transfers the waste through the Treated LAW Evaporator Reboiler (TLP-RBLR-00001) and back into the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001). The recirculating waste stream is prevented from boiling in the reboiler tubes by maintaining sufficient hydrostatic head (submergence) above the reboiler tubes.

As the liquid travels out of the Treated LAW Evaporator Reboiler (TLP-RBLR-00001), the hydrostatic head diminishes and flash evaporation occurs as the flow enters the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001). The liquid continues to flash and the vapor and liquid streams are separated (liquid-vapor disengagement). The liquid stream circulates in this loop and becomes more concentrated, while the vapor stream passes through a demisting section to the evaporator condensers. A portion of the concentrate is also pumped from the bottom of the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001) at the controlled liquid density and is discharged to the TCP system as feed to LAW vitrification.

The primary design features of the evaporator trains include:

- Operating pressure indication and control.
- Differential pressure indication across the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001) demister section.
- Water sprays to the Treated LAW Evaporator Separator vessel (TLP-SEP-00001) demister section.
- Process condensate radiation monitoring and recycle capability.
- Low-pressure steam supply for heating the Treated LAW Evaporator Reboiler (TLP-RBLR-00001).
- Treated LAW Evaporator Reboiler (TLP-RBLR-00001) tube leak detection and diversion capability.

- Treated LAW Evaporator Reboiler (TLP-RBLR-00001) steam condensate collection.
- Instrumentation for monitoring and control of vessel liquid level.
- Passive venting via the downstream vessels connected to the vent header.
- Capability to drain, flush, and chemically clean the system.

The vapor stream exiting the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001) is condensed in a three-stage condenser system consisting of a Primary Condenser (TLP-COND-00001), an Inter-Condenser (TLP-COND-00002), and an After-Condenser (TLP-COND-00003). The noncondensable offgas exiting downstream of the After-Condenser (TLP-COND-00003) are routed to the PVP system for treatment.

The primary design features for vapor stream management include:

- Instrumentation for monitoring and control of vessel liquid level.
- Vessel vent to the PVP system to prevent pressurization of a vessel.
- Remote sampling capability of the transfer pump discharge via autosampler ASX-SMPLR-00017.
- Dip legs in the vessel that maintain a liquid seal (pressure boundary) between the vessel and the condensers.
- Makeup recycle water as required for startup.

The condensed vapor from the condensers is collected in the Treated LAW Evaporator Condensate Vessel (TLP-VSL-00002). A small fraction of the total condensate is recycled to the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001) demister water sprays. The balance of the condensate is transferred to the RLD system.

Condensate from the primary condenser is monitored for radioactivity. In the event of radioactivity breakthrough being detected, a Treated LAW Evaporator Separator (TLP) System shutdown is initiated and the contents of the Treated LAW Evaporator Condensate Vessel (TLP-VSL-00002) are transferred to a LAW SBS Condensate Receipt Vessels (TLP-VSL-00009A/B).

4.1.2.12 Treated LAW Concentrate Storage Process (TCP) System

Process flow diagram of the Treated LAW Concentrate Storage Process (TCP) System is provided in DWP Operating Unit Group 10, Appendix 8.1. The primary function of the TCP system is to receive treated LAW concentrate from the Treated LAW Evaporation Process (TLP) System and store the material for subsequent batch transfer to the LAW vitrification facility.

The main components of the TCP tank system are:

- Treated LAW Concentrate Storage Vessel (TCP-VSL-00001).
- Pumps for transferring treated LAW concentrate.
- Three waste transfer lines to LAW vitrification.
- Vessel inlet and outlet valve headers.
- Pumps, piping, and instrumentation for waste transfers.

Dilute treated LAW direct from the Cesium Ion Exchange Process (CXP) System can also be received and stored in the TCP system (evaporator by-pass option). The Treated LAW Concentrate Storage Vessel (TCP-VSL-00001) provides lag storage to sustain ILAW glass production if the pretreatment processing is interrupted.

Out-of-specification treated LAW concentrate can be recycled to the waste feed receipt process system (FRP) for rework through pretreatment, or recycled to the TLP system for blending and additional evaporation.

Under strict administrative control (sampling and jumper installation), the Treated LAW Concentrate Storage Vessel (TCP-VSL-00001) can also receive treated LAW entrained solids directly from the Ultrafiltration Feed Vessles (UFP-VSL-00002A/B) if the solids meet treated LAW feed specification.

During commissioning, treated LAW concentrate may be stored in a dedicated FRP vessel for additional lag storage capacity. Transfers from and to the TCP and FRP systems will also be under strict administrative control (sampling and jumper installation).

Treated LAW concentrate is batch-transferred from the tank to LAW vitrification through the inner pipe of any one of three co-axial transfer lines (two connected, one unconnected spare). The inlet and outlet valve headers and pumps are used in combination to facilitate circulation and sampling, forward transfer to LAW vitrification, and recycle to the TLP system or FRP system.

The primary design features of the TCP system include:

- Capability to pressure test both the inner and outer transfer lines for integrity.
- Transfer line leak detection system for integrity indication during transfer.
- Transfer line flushing and draining capability.
- Instrumentation for monitoring vessel liquid level.
- Vessel vent to the PVP system.
- Direct steam injection to maintain the concentrate temperature above the saturation temperature to prevent precipitation.
- Internal pulse jet mixers (PJMs) for solids suspension and slurry mixing.
- Remote sampling capability off the discharge of the transfer pump via autosampler ASX-SMPLR-00017.
- Vessel spray rings for vessel decontamination.
- Administrative controls and radiation monitoring to ensure that treated LAW transferred into and from the vessel meets waste specification for LAW vitrification.

The TCP system pumps and valve headers exposed to low radiation potential are located in a C3/R3 area for ease of maintenance.

4.1.2.13 Spent Resin Collection and Dewatering Process (RDP) System

Process flow diagram of the Spent Resin Collection and Dewatering Process (RDP) System is included in DWP Operating Unit Group 10, Appendix 8.1. The primary function of the RDP system to support the CXP system by providing equipment necessary for periodic removal of spent ion exchange resin. The RDP system has four main functions:

- Provide resin flush liquor to fluidize and transport the resin from the CXP columns to the RDP vessels.
- Temporarily store spent resin to allow sampling of spent resin.
- Transfer spent resin to the dewatering high integrity disposal container.
- Dewater spent resin to the required water content for transportation and disposal.

The primary components of the RDP system include:

- Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C).
- Dewatering skid, containing the Spent Resin Dewatering Moisture Separation Vessel (RDP-VSL-00004), shielded dewatering cask with high integrity container (HIC) inside, filters, blower, and pump.
- Pumps, piping, and instrumentation for waste transfers.

Spent resin is first eluted and then hydraulically discharged under pressure from the ion exchange column by fluidizing the bed of resin with transport liquid. The spent resin removal process is initiated by flushing an eluted Cesium and Ion Exchange Column (CXP-IXC-00001/2/3/4) and hydraulically discharging the contents into a Spent Resin Slurry Vessel (RDP-VSL-00002A/B/C). In these vessels, the resin slurry will be circulated, monitored for cesium content, and delivered to a sampling system (ASX-SMPLR-00015) to determine whether the resin is in compliance with the receiving TSD unit's waste acceptance criteria. Spent resins that meet the receiving TSD unit's waste acceptance criteria will be dewatered, containerized, and transferred to a TSD unit.

Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C)

Spent resin is removed from each Cesium Ion Exchange Column (CXP-IXC-00001/2/3/4) independently as a batch operation. Spent resin slurry from the ion exchange columns is collected in the three Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C), which are interchangeable and will be capable of storing transport liquid and resin slurry. Once in the Spent Resin Slurry Vessel (RDP-VSL-00002A/B/C), the resin slurry will be mixed by pulse jet mixers and monitored for radiation (gamma) content in a circulation loop to determine if elution has sufficiently removed radionuclides from the resin for disposal.

Spent resin that does not meet the predetermined treatment limits will be routed back through CRP-BULGE-00001 to the Cesium Ion Exchange Columns (CXP-IXC-00001/2/3/4) for additional elution. After completing the additional elution, the resin is transferred back to a Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C) where it is processed again.

Spent Resin Dewatering Moisture Separation Vessel (RDP-VSL-00004)

Following assurance that the spent resin is in compliance with the receiving TSD unit's acceptance criteria, the resin is pumped to the disposable spent resin dewatering HIC located inside the transportable shielding cask.

There are three steps to resin dewatering. First, a gross dewatering removes excess water as the slurry is pumped to the shielded cask/HIC. Next, a dewatering pump is used to remove standing water above the resin bed. Finally, in order to remove the final few inches of water from the HIC, dry air is circulated from the dewatering blower into the dewatering HIC. The dry air becomes humidified and is then pumped into the dewatering moisture separator vessel (RDP-VSL-00004). Inside the moisture separator vessel are coils that remove the water from the air. The condensation collects inside the moisture separator vessel (RDP-VSL-00004) while the dry air is then circulated back into the dewatering HIC. When the water content in the resin is reduced to an acceptable level, the dewatering operation is complete.

The primary design features of the RDP system are:

- Instrumentation for monitoring and control of vessel liquid level.
- Pulse jet mixers in the Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C).
- Passive vessel overflow routes from the Spent Resin Slurry Vessels (RDP-VSL-00002A/B/C).
- Remote sampling capabilities on the discharge transfer pumps.
- Connection of the vessel vapor spaces to the Pretreatment Vessel Vent Process (PVP) System.

4.1.2.14 Pretreatment Maintenance

The pretreatment facility will include maintenance facilities that will enable remote and hands-on maintenance of process equipment, and will consist of the following systems:

- Pretreatment in-cell handling system (PIH).
- Pretreatment filter cave handling system (PFH).
- Radioactive solid waste handling system (RWH).

The individual systems and their primary functions are described below:

Pretreatment In-Cell Handling (PIH) System

The purpose of this system is to decontaminate and perform maintenance on equipment in the hot cell and/or dispose of hot cell equipment. The PIH system will perform the following functions:

- Decontaminate equipment using carbon dioxide pellets or an acid and steam mixture sprays to decontaminate equipment surfaces.
- Decontaminate equipment internals in the Decontamination Soak Tank (PIH-TK-00001).
- Collecting liquids in catch pans.
- Holding components while doing work using fixtures.
- Disassembling, repairing, and reassembling process equipment remotely.

Typical process equipment that the system will handle are pumps, valves, jumpers, small vessels, and other ancillary equipment and/or tools. Maintenance equipment requiring periodic servicing by this system will include cranes, manipulators, and decontamination and disassembly tools.

Equipment in this system will include:

- Overhead cranes.
- Manipulators (powered and manual).
- Shield and airlock doors.
- Size reduction equipment (cutters, shears, etc.).
- Crane deployed equipment, such as impact wrenches and spreader bars.
- Fixtures.
- Decontamination equipment (carbon dioxide, wash down, Decontamination Soak Tank [PIH-TK-00001]).
- Manipulator-operated assembly/disassembly tools used in repair.
- Turntables.
- Pumps, piping, and instrumentation for waste transfers.

Pretreatment Filter Cave Handling (PFH) System

The purpose of this system is to provide a method for performing maintenance on ventilation equipment in the filter cave. The equipment in this system will provide the following functions:

- Lifting, holding, transporting, installing/uncoupling primarily filters, some process equipment, and failed in-cell cranes and powered manipulators.
- Providing fixtures for holding components while doing work.
- Operation of some manual valves.
- Decontamination and monitoring of contaminated equipment.

Typical ventilation equipment the PFH system will handle are High Efficiency Particulate Air Filter (HEPA) and High-Efficiency Mist Eliminators (HEMEs), and duct isolation valves, inside the cell. Maintenance equipment requiring periodic servicing by this system will include cranes, manipulators, and decontamination and disassembly tools.

Equipment in this system will include:

- Overhead cranes.
- Manipulators (powered and manual).

- Shield and airlock doors.
- Crane deployed equipment, such as impact wrenches and spreader bars.
- Decontamination equipment (carbon dioxide, wash down).
- Manipulator-deployed assembly/disassembly tools used in repair.

Radioactive Solid Waste Handling (RWH) System

The purpose of this system is to provide a means to dispose of mixed waste contaminated equipment. This system interfaces with system PIH, system PFH, and the spent resin dewatering system. The main functions system RWH provides are:

- Lifting, holding, and transporting disposal containers.
- Packaging disposal containers and preparing the containers for shipping.
- Cleaning and remote monitoring of disposal containers.
- Temporary shielding and confinement barriers.

Typical process and ventilation equipment the system will handle are failed process equipment, such as pumps and valves, filters, jumpers, and maintenance equipment.

Equipment in this system will include:

- Overhead cranes.
- Manipulators (manual).
- Carts for transporting waste containers.
- Associated support equipment, like impact wrenches and spreader bars.
- Decontamination systems, such as carbon dioxide.
- Remote radioactive monitoring.
- Temporary shielding and confinement barriers used for packaging.
- Disposal containers.

The primary design features of the PIH, PFH, and RWH systems are:

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4.1.2.15 Plant Wash and Disposal (PWD) System

Process flow diagrams of the Plant Wash and Disposal (PWD) System are provided in DWP Operating Unit Group 10, Appendix 8.1. The primary function of the PWD tank system is to receive, store, and transfer effluent. It will collect plant wash, drains, and acidic or alkaline effluent from the pretreatment facility.

The primary components of the PWD tank system include:

- Plant Wash Vessel (PWD-VSL-00044).
- Acidic/Alkaline Effluent Vessels (PWD-VSL-00015/16).
- HLW Effluent Transfer Vessel (PWD-VSL-00043).
- C3 Floor Drain Collection Vessel (PWD-VSL-00046).
- Ultimate Overflow Vessel (PWD-VSL-00033).
- Pumps, piping, and instrumentation for waste transfers.

Plant Wash Vessel (PWD-VSL-00044)

During operations, plant wash and drain effluents will be collected and mixed in with other effluents in the Plant Wash Vessel prior to transfer. The solution will be analyzed for pH and excess acidic effluent will be neutralized. Effluents will be recycled to the FEP system.

Pulse jet mixers are used to provide a uniform mixture during neutralization within the Plant Wash Vessel. Excess acidic effluent is neutralized with sodium hydroxide supplied from a reagent header. Wash rings are used for vessel washing. Vessel-emptying ejectors may be used for transfers to the Acidic/Alkaline Effluent Vessel (PWD-VSL-00016).

A reverse flow diverter supplies a representative sample of the contents of the Plant Wash Vessel (PWD-VSL-00044) for analysis. If the pH is confirmed to be above a predetermined value, reverse flow diverter(s) transfer the effluent from the Plant Wash Vessel (PWD-VSL-00044) to the Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B). Normally, the contents of the Plant Wash Vessel (PWD-VSL-00044) is blended with the contents of the Acidic/Alkaline Effluent Vessels (PWD-VSL-00015/16) in the Waste Feed Evaporator Feed Vessels to maintain a consistent evaporator feed.

Acidic/Alkaline Effluent Vessels (PWD-VSL-00015/16)

The Acidic/Alkaline Effluent Vessels (PWD-VSL-00015/16) primarily receive alkaline cleaning effluent from the Ultrafiltration Process (UFP) System, caustic rinse from the Cesium Ion Exchange Process (CXP) System, and process condensate from the Cesium Nitric Acid Recovery Process (CNP) System. The effluents are sampled to confirm that the pH is above a predetermined value, and reverse flow diverters transfer the high-activity effluents to the Waste Feed Evaporator Feed Vessels (FEP-VSL-00017A/B) for reprocessing.

HLW Effluent Transfer Vessel (PWD-VSL-00043)

The HLW Effluent Transfer Vessel (PWD-VSL-00043) receives HLW acidic wastes from HLW vitrification line drains from HLW vitrification/pretreatment facility transfer lines, and laboratory drains. The vessel may also receive flush wastes from the HLW facility. These effluents are transferred to the Plant Wash Vessel (PWD-VSL-00044) to recycle the effluents back into the process system.

C3 Floor Drain Collection Vessel (PWD-VSL-00046)

The C3 Floor Drain Collection Vessel (PWD-VSL-00046) receives effluents from miscellaneous floor drains in the C3 areas, and liquids from the sump in the local pit. Sampling capability has been provided but will not normally be used. This effluent will be transferred to the Alkaline Effluent Vessels (RLD-VSL-00017A/B). The C3 Floor Drain Collection Vessel (PWD-VSL-00046) is vented locally through a high-efficiency particulate air filtration system.

Ultimate Overflow Vessel (PWD-VSL-00033)

The Ultimate Overflow Vessel receives overflows from vessels in the pretreatment facility. Additionally, this vessel receives line drains and flushes. The vessel operating level is maintained below a predetermined level to allow the vessel to hold 30 minutes of overflow at the highest transfer rate within the facility.

The primary design features of the PWD system are:

- Instrumentation for monitoring and control of vessel liquid level.
- Pulse jet mixers in the Ultimate Overflow Vessel (PWD-VSL-00033), the HLW Effluent Transfer Vessel (PWD-VSL-00043), the Acidic/Alkaline Effluent Vessels (PWD-VSL-00015/16), and the Plant Wash Vessel (PWD-VSL-00044).

- Passive vessel overflow routes from the Acidic/Alkaline Effluent Transfer Vessels, and the Plant Wash Vessel.
- Remote sampling capabilities on the discharge of transfer pumps via autosamplers ASX-SMPLR-00019 and ASX-SMPLR-00025.
- Connection of the vessel vapor spaces to the Pretreatment Vessel Vent Process (PVP) System.

4.1.2.16 Radioactive Liquid Waste Disposal (RLD) System

Process flow diagrams of the Radioactive Liquid Waste Disposal (RLD) System are provided in DWP Operating Unit Group 10, Appendix 8.1. The primary function of the RLD tank system is to receive, store, and transfer contaminated liquid effluents. The RLD system will receive low-activity mixed waste effluents.

The primary components of the RLD tank system include:

- Process Condensate Tanks (RLD-TK-00006A/B).
- Alkaline Effluent Vessels (RLD-VSL-00017A/B).
- Pumps, piping, and instrumentation for waste transfers.

These RLD vessels primarily receive effluent from the caustic scrubber purges from the LAW vitrification facility and from the C3 Floor Drain Collection Vessel in PTF (PWD-VSL-00046).

When these vessels reach a predetermined level, they are sampled, and if the sample meets the LERF/ETF waste acceptance criteria, it will be transferred to the Process Condensate Tanks (RLD-TK-00006A/B). If the effluent does not meet LERF/ETF waste acceptance criteria, it will be returned to the Treated LAW Evaporation Process (TLP) System for reprocessing.

<u>Process Condensate Tanks (RLD-TK-00006A/B)</u>

Process condensates are the effluent condensed vapors removed from the waste streams by the PTF evaporators. Waste Feed Evaporator Feed Process (FEP) effluents and Treated LAW Evaporation Process (TLP) condensates are normally received directly into the Process Condensate Tanks (RLD-TK-00006A). The effluents from the Process Condensate Tank (RLD-TK-00006A) are recycled into the process or discharged to the Process Condensate Tank (RLD-TK-00006B).

The effluent in the Process Condensate Tanks will be sampled, to demonstrate compliance with the LERF/ETF waste acceptance criteria. It may also be sampled should a process upset occur. If analysis determines that the effluent is outside the waste acceptance criteria, it will be returned to the TLP for reprocessing.

The Alkaline Effluent Vessels (RLD-VSL-00017A/B) and Process Condensate Tanks (RLD-TK-00006A/B) are vented to the PVP system.

The primary design features of the RLD system are:

- Instrumentation for monitoring and control of vessel liquid level.
- Passive vessel overflow routes from the Alkaline Effluent Vessels (RLD-VSL-00017A/B).
- Remote sampling capabilities on the discharge of transfer pumps via autosampler ASX-SMPLR-00017.
- Connection of the vessel vapor spaces to the Pretreatment Vessel Vent Process (PVP) System.

4.1.2.17 Vessel Vent Process and Exhaust (PVP/PVV) System

Process flow diagrams of the Pretreatment facility Vessel Vent Process and Exhaust (PVP/PVV) System are provided in DWP Operating Unit Group 10, Appendix 8.1.

The Pretreatment Vessel Vent Process (PVP) System and Exhaust (PVV) system provide air purging of the head spaces of various process vessels for radiolytic hydrogen control, collection of vent exhausts from process vessels, and process treatment and filtration of the vessel vent exhaust gases before discharging to the PTF stack.

The PVP and PVV systems are composed of tanks and miscellaneous treatment systems, as follows:

Tank System

- Vessel Vent HEME Drain Collection Vessel (PVP-VSL-00001).
- Pumps, piping, and instrumentation for waste transfers.

Miscellaneous Unit Systems

- Vessel Vent Caustic Scrubber (PVP-SCB-00002).
- Vessel Vent HEME (Mist Eliminators) (PVP-HEME-00001A/B/C).
- Vessel Vent Primary HEPA Filters (PVV-HEPA-00001A/B).
- Vessel Vent Secondary HEPA (PVV-HEPA-00002A/B).
- Vessel Vent VOC Oxidizer Unit (PVP-OXID-00001).
- Vessel Vent After-Cooler (PVP-CLR-00001).
- Vessel Vent Carbon Bed Adsorbers (PVP-ADBR-00001A/B).
- Vessel Vent Adsorber Outlet Filter (PVP-FILT-00001).
- Pumps, piping, and instrumentation for waste transfers.
- Vessel Vent Exhaust Fans (PVV-FAN-00001A/B).

Purge Air Supply

Continuous air purge to process vessels is the primary control strategy for radiolytic produced hydrogen. Additional airflow above the minimum hydrogen control rate may be introduced to each vessel to help balance the system and ensure that vessels are obtaining the minimum required flow.

The purge air in-bleed to vessels in the pretreatment area is a passive feature. The process vessels located in the C5 ventilation area will draw passive purge air in-bleed from the C5 ventilation area near the vessels via subheaders. Other vessels located in the C3 ventilation area and Process Condensate Tanks (RLD-TK-00006A/B) located outside the pretreatment building will draw air in-bleed from the C3 ventilation area nearest to the vessels through the inlet HEPA filters. The exhaust fans provide the motive force for airflow through each vessel by maintaining a negative pressure.

Forced purge air to the selected process vessels is also provided from the plant service air supply header. Each of the selected process vessels is provided with the required airflow to control the hydrogen concentration below 1% in the vessel during normal operation and below 4 % (lower flammability limit) during abnormal conditions. The supply line to each of these selected process vessels, which requires forced purge air during normal operation, is provided by two parallel trains of valves and flow elements to meet the high reliability requirements.

For the Waste Feed Evaporator Separator Vessels (FEP-SEP-00001A/B) and the Treated LAW Evaporator Separator Vessel (TLP-SEP-00001), which require forced purge air only during a shutdown or a loss of off-site power event, there are two separate trains of actuated valves and flow elements provided for each. The actuated valves for both of these trains are normally in closed position, but will fail open during the shutdown or loss of off-site power event.

Collection of Vent Gases

From the individual process vessel, a vent line routes exhaust gases to a subheader, usually one for each cell. The connection to the subheaders from the process vessels are arranged, where possible, to maintain airflow from normally lower activity vessels to (or past) normally higher activity level vessels. Vent exhaust gases from various process vessels are combined to flow via subheaders to the Vessel Vent Caustic Scrubber (PVP-SCB-00002). The vent gases from the vessels located in the C3 areas and the Process Condensate Tanks (RLD-TK-00006A/B), located outside the pretreatment building, will be collected via other subheaders that combine into the common exhaust header. Any condensate formed in the common exhaust header will flow by gravity into Plant Wash Vessel (PWD-VSL-00044).

Vessel Vent Caustic Scrubber (PVP-SCB-00002)

The vessel vent exhausts flow into the Vessel Vent Caustic Scrubber (PVP-SCB-00002). The Vessel Vent Caustic Scrubber (PVP-SCB-00002) is operated continuously to remove the nitrogen oxide and acid gases from the vessel vents. The vent gases flow to the inlet of the scrubber and flow upwards through a packed bed. Alkaline scrubbing liquid flows down through the packed bed. Contact between the gas and the scrubbing liquid in the bed causes part of the nitrogen oxide and acid gases present in the vent offgases to react with the caustic in the scrubbing liquid to adsorb and form sodium salts, which stay in solution. The scrubbing liquid solution is collected in the scrubber sump vessel located below the packed bed section of the scrubber.

Two scrubber recirculation pumps (one operating and one in standby) continuously recirculate the scrubbing liquid solution to the top of the packed bed section of the scrubber. The operating pump also directly recirculates part of the solution into the sump vessel located below the scrubber to provide adequate mixing of the liquid in the vessel. The scrubber pump also transfers the collected condensate and scrubbing liquid normally once a day or on high level to the Plant Wash Vessel (PWD-VSL-00044). A section of dry packing located above the main packed section removes any entrained liquid droplets from the exit gases. A wash-water ring is provided above each of the packed sections to wash off any accumulation of solids. Fresh five molar caustic solution is added intermittently from the sodium hydroxide reagent process system (SHR). The caustic solution is added intermittently to scrubber sump vessel to maintain the pH range for the scrubbing liquid recirculating to the top of the main packed section.

When needed, demineralized water is also added to the Vessel Vent Caustic Scrubber (PVP-SCB-00002) wash rings to clean the dry packing or for makeup requirements.

The outlet gases from the Vessel Vent Caustic Scrubber (PVP-SCB-00002) flow to the Vessel Vent HEME (Mist Eliminator). The inlet, outlet, and bypass valves are provided for the Caustic Scrubber. The valves will be remotely operated by a manipulator in the pretreatment filter cave area.

Vessel Vent HEME (Mist Eliminators) (PVP-HEME-00001A/B/C) (HEME)

The HEMEs will be composed of deep-bed fiber filter elements configured in an annular shape to remove fine aerosols. Vent gases from the scrubber flow into two HEMEs, with the third HEME available as standby. Gases flow from the outside to the hollow core. The treated gas exits at the top and the liquid collects at the sealed bottom in a drainpipe. The HEMEs are operated wet at all times to allow drainage of soluble liquid aerosols that accumulate in the fibers, form a liquid film, and drop to the drain line below to the Vessel Ventilation HEME Drain Collection Vessel (PVP-VSL-00001). Atomizing spray of demineralized water is provided at the gas inlet nozzle for each operating HEME. An intermittent wash spray of the filter elements will be used to remove any accumulated debris, thus extending the service life of the HEME elements. Intermittent washing will normally be carried out off-line.

Three separate HEMEs will treat the vessel vent offgas stream. This configuration will permit washing each HEME while it is offline.

The HEME effluent will be discharged to the Vessel Vent HEME Drain Collection Vessel (PVP-VSL-00001) and then to the Plant Wash Vessel (PWD-VSL-00044) in the PWD system.

After treatment in HEMEs, heated air is added from the inbleed HEPA filters to prevent condensation in the downstream PVV HEPA filters.

Vessel Vent Primary HEPA Filters (PVV-HEPA-00001A/B)

The preheated vent exhaust gases from the heaters flow into one of the two Primary HEPA filter banks, which will be on line while the other one is available as standby. The HEPA filters will remove the particulates from the gas stream. The Vessel Vent Primary HEPA Filters will be located in the pretreatment filter cave area (room P-0335) for remote maintenance.

Vessel Vent Secondary HEPA Filters (PVV-HEPA-00002A/B)

The gases from the Vessel Vent Primary HEPA Filter flow into one of the two Vessel Vent Secondary HEPA Filter banks, which will be on line while the other one is available as standby. The Vessel Vent Secondary HEPA Filters will remove any remaining particulates from the exhaust gases.

After the Primary and Secondary HEPA Filters remove the particulates from the vessel vent exhaust stream in the PVV system, the filtered vent exhaust stream returns to the PVP system for abatement of volatile organic compounds. The volatile organic compound abatement process removes vapor-phase organic compounds from the PVP vent gas. This abatement process takes place within an oxidation system followed by an adsorption system. The oxidation system includes a VOC Oxidizer Unit (PVP-OXID-00001) and an After-Cooler (PVP-CLR-00001). The adsorption system includes Carbon Bed Adsorbers (PVP-ADBR-00001A/B) and a medium efficiency Adsorber Outlet Filters (PVP-FILT-00001A/B).

Vessel Vent VOC Oxidizer Unit (PVP-OXID-00001)

To remove volatile organics compounds (VOC) from the vessel vent stream, a skid-mounted electric, noncatalyzed oxidizer unit will be used. In this unit, volatile organic compounds in the off-gas are oxidized to carbon dioxide and water vapor at high temperature in the presence of excess oxygen.

The offgas then enters the heat recovery unit to transfer the heat to the bed, which will then be used for preheating the incoming offgas. The cooled gas stream is then directed to the Vessel Vent AfterCooler (PVP-CLR-00001). The treated gases are cooled by the cooling water. Any condensate generated by cooling of the gases will flow to the C3 Floor Drain Collection Vessel (PWD-VSL-00046).

Vessel Vent Carbon Bed Adsorbers (PVP-ADBR-00001A/B)

Two parallel Vessel Vent Carbon Bed Adsorbers are provided for the final treatment of vent gases. The adsorbers are filled with activated carbon. The Vessel Vent Carbon Bed Adsorber will further reduce volatile organic compounds from the vessel vent exhaust gases. The Vessel Vent VOC Oxidizer Unit (PVP-OXID-00001) will remove most of the volatile organic compounds from the vessel vent gases, and the Vessel Vent Carbon Bed Adsorbers (PVP-ADBR-00001A/B) will remove the remaining volatile organic compounds. Normal operation will be one unit online while the other is in maintenance mode.

Vessel Vent Adsorber Outlet Filter (PVP-FILT-00001)

The treated gases from the Vessel Vent Carbon Bed Adsorbers (PVP-ADBR-00001A/B) will flow into this filter, where fine carbon particles, if any are present in the vent gases, will be filtered. This filter is also provided with a bypass line and isolation valves to enable replacement of the filter.

Vessel Vent Exhaust Fans (PVV-FAN-00001A/B)

After the filtration in the Vessel Vent Adsorber Outlet Filter (PVP-FILT-00001), the vent gases will flow into the Vessel Vent Exhaust Fan (PVV-FAN-00001A/B) in the PVV system. Two Exhaust Fans are provided. One will be in operation while the second one will be on standby.

The Vessel Vent Exhaust Fans (PVV-FAN-00001A/B) provide the necessary motive force to extract the vent gases from the head spaces of various process vessels and provides for the required pressure drop through various treatment equipment in the PVP/PVV systems. The Vessel Vent Exhaust Fans (PVV-FAN-00001A/B) will maintain a constant suction pressure at the inlet to the Vessel Vent Caustic Scrubber (PVP-SCB-00002). The Vessel Vent Exhaust Fans (PVV-FAN-00001A/B) will have suitable speed control to accommodate variation in the vent gas flow rates from various vessels.

In addition to the instrumentation, alarms, controls, and interlocks addressed in section 4.1.2, the following will be provided for the PVP/PVV systems to indicate or prevent the following conditions:

- For purge air flow measurement:
  - Passive purge air flow rate will be measured for the process vessels including low flow alarm for each of these flow instruments.
  - Forced purge air flow rate will be measured and low flow alarmed for the process vessels that require the control of hydrogen concentration. These instruments will have important-to-safety instrument function.
- For the HEMEs:
  - The outlet pressure, pressure drop, and the flow rates will be monitored and controlled.
  - Demineralized water supply for HEMEs will have monitoring for the inlet pressure and flow rates.
- For the HEPA filters, the pressure drop will be monitored and controlled within the required limits.
- For the VOC Oxidizer Unit (PVP-OXID-00001):
  - The thermal oxidizer reaction zone, the outlet temperatures, and the pressure drop will be monitored and controlled.
  - The oxidizer bypass valve cannot be opened unless the reaction zone temperature has been attained.
- For the carbon bed adsorber:
  - The pressure drop through the bed will be monitored and controlled.
  - The differential temperature across the carbon bed will be monitored.
- For the adsorber outlet filter, the pressure drop will be monitored and controlled.

The PVP and PVV systems have the following design features:

- Provide the function of air purging of the head spaces of various process vessels for radiolytic hydrogen control.
- Collect vent exhausts from process vessels.
- Treat the combined exhaust gases to adsorb soluble nitrogen oxide(s) and acid gases, remove liquid droplets, condensate, mists, and solid particulates in the PVP system.
- Preheat vent gases to control relative humidity and then remove particulates with two stages of High-Efficiency Particulate Air (HEPA) filters.
- Provide additional treatment for the oxidation and removal of volatile organic compounds from the filtered exhaust gases in the PVP system. The filtered treated exhaust gases will then flow to the exhaust fans in the PVV system for venting to the atmosphere.
- Remote sampling capabilities via autosampler ASX-SMPLR-00019.

4.1.2.18 Pulse Jet Ventilation (PJV) System

Process flow diagrams of the Pulse Jet Ventilation (PJV) System are provided in DWP Operating Unit Group 10, Appendix 8.1. The PJV system provides the safety function to treat the exhausts from reverse flow diverters and pulse jet mixers operating inside various process vessels before release to the atmosphere via the pretreatment facility stacks. The PJV system consists of process and HVAC equipment for removal of aerosols and particulates. The PJV system is composed of miscellaneous treatment systems, as follows:

Miscellaneous Unit Systems

- PJV Demisters (PJV-DMST-00002A/B/C).
- PJV Primary HEPA Filters (PJV-HEPA-00001A/B/C/D/E/F/G).
- PJV Secondary HEPA Filters (PJV-HEPA-00002A/B/C/D/E/F).
- PJV Exhaust Fans (PJV-FAN-00001A/B/C).
- Pumps, piping, and instrumentation for waste transfers.

The PJV system provides the containment and confinement of exhausts from various reverse flow diverters and pulse jet mixers operating inside the PTF process vessels. This system provides the removal of mists and aerosols from the combined PJV exhausts stream by demisters (medium-efficiency mist eliminators). The treated exhaust gases are mixed with hot air in-bleed from the C3 ventilation area to adjust their relative humidity followed by two stages of HEPA filtration to remove particulates. The filtered effluent gases are drawn by the PJV Exhaust Fans (PJV-FAN-00001A/B/C). The treated filtered exhaust stream will be monitored before it is discharged to the atmosphere.

Collection of Exhaust Gases (Exhaust Piping System)

The PJV system receives the exhaust via several subheaders from the reverse flow diverters and pulse jet mixers operating in various process vessels in the pretreatment area. The exhausts are combined from various subheaders to flow via the inlet header to the PJV Demisters (PJV-DMST-00002A/B/C). The low points of the inlet header and subheaders are provided with drain lines, which drain condensate collected in the header to the Ultimate Overflow Vessel (PWD-VSL-00033) in the Pretreatment Facility Wash and Disposal (PWD) System.

PJV Demisters (PJV-DMST-00002A/ B/ C)

The PJV system is provided with three PJV Demisters (PJV-DMST-00002A/B/C), which are medium-efficiency mist eliminators. Two of these demisters are in service at a given time and one is available as a standby off-line.

The PJV Demisters are used to remove fine aerosols and mist, and exhibit medium removal efficiencies for submicron aerosols. They are passive devices with low maintenance requirements and high reliability. The demisters will adequately protect the HEPA filters, located downstream in this system, from excessive activity buildup, and provide the desired HEPA filter life of 4 to 5 years.

All PJV Demisters (PJV-DMST-00002A/B/C) for this system are located, along with the HEPA filters, in the filter cave (room P-0335) in a C5 ventilation area due to the expected radionuclide loading. The PJV Demisters (PJV-DMST-00002A/B/C) are either isolated, or put into service, by opening or closing isolation valves provided at the inlet and outlet of each PJV Demister. These isolation valves are operated remotely by using the manipulator and the filter cave operating crane. The headers are designed without any bypass around the PJV Demisters (PJV-DMST-00002A/B/C) to prevent the downstream HEPAs from accelerated loading of particulates. Remote change out capability for the Demister filter elements is provided.

The outlet gases from the Demisters (PJV-DMST-00002A/B/C) flow to the outlet header to the extract part of the PJV system, as described below.

Hot Air In-Bleed

Air in-bleed from a C3 ventilation area is filtered, heated, and then mixed with the exhaust gases from the Demister outlet to reduce the relative humidity of the stream flowing into the primary HEPA Filter banks. The in-bleed air is filtered with medium efficiency Air In-Bleed Filters (PJV-FLTH-00001A/B) and then heated to the temperature required to keep the humidity of the mixed gases below 70% and prevent the wetting of the primary HEPA Filters.

PJV Primary Exhaust HEPA Filters (PJV-HEPA-00001A/B/C/D/E/F/G)

There are seven PJV Primary HEPA Filter (PJV-HEPA-00001A/B/C/D/E/F/G) banks, arranged in parallel and configured in a running/standby arrangement to allow on-line filter change. There will be five PJV Primary HEPA Filter banks in operation, and two PJV Primary HEPA Filters will be on standby or in maintenance. The PJV Primary HEPA Filters (PJV-HEPA-00001A/B/C/D/E/F/G) will be remote change type located in the pretreatment filter cave area. Filter inserts are radial type. Inlet and outlet isolation valves for the PJV Primary HEPA Filters (PJV-HEPA-00001A/B/C/D/E/F/G) are remotely operated by a manipulator and maintenance crane in the pretreatment filter cave (room P-0335).

PJV Secondary Exhaust HEPA Filters (PJV-HEPA-00002A/B/C/D/E/F)

Exhaust gases from the PJV Primary Exhaust HEPA Filters (PJV-HEPA-00001A/B/C/D/E/F/G) are routed to the outlet header, then to the PJV Secondary Exhaust HEPA Filters (PJV-HEPA-00002A/B/C/D/E/F) located in a C3 ventilation area. There are six PJV Secondary Exhaust HEPA Filter (PJV-HEPA-00002A/B/C/D/E/F) banks, arranged in parallel and configured in a running/standby arrangement to allow on-line filter change. There will be four PJV Secondary Exhaust HEPA Filter (PJV-HEPA-00002A/B/C/D/E/F) banks in operation, and two Secondary HEPA Filter banks will be on standby or in maintenance. PJV Secondary Exhaust HEPA Filters (PJV-HEPA-00002A/B/C/D/E/F) will be the safe change type.

PJV Exhaust Fans (PJV-FAN-00001A/B/C)

The filtered exhaust from the PJV Secondary Exhaust HEPA Filters (PJV-HEPA-00002A/B/C/D/E/F) will be drawn by three PJV Exhaust Fans (PJV-FAN-00001A/B/C). Two fans will be in operation while the third fan will be on standby. The PJV Exhaust Fans (PJV-FAN-00001A/B/C) provide the necessary motive force to extract the vent gases from the fluidics discharge racks and provide for the required pressure drop through the treatment equipment in the PJV system. The PJV Exhaust Fans (PJV-FAN-00001A/B/C) will maintain a constant suction pressure condition for the inlet gas stream to the Demisters. The PJV Exhaust Fans will have suitable speed control to accommodate variation in the exhaust flow rates from reverse flow diverters and pulse jet mixers operating inside various vessels.

In the event of failure of one of the two PJV Exhaust Fans (PJV-FAN-00001A/B/C) in operation, the standby fan automatically starts. Each fan is provided with manual isolating dampers on the fan inlet and pneumatic actuated isolating dampers on the fan outlet. From the PJV Exhaust Fans (PJV-FAN-00001A/B/C), pulse jet mixer and reverse flow diverter treated effluents flow via a dedicated, continuously monitored flue to the PTF stack.

The PJV system has the following design features:

- Instrumentation for monitoring process flows and equipment performance.
- Remote sampling system to confirm system performance.

In addition to the instrumentation, alarms, controls, and interlocks addressed in section 4.1.2, the following will be provided for the PJV system to indicate or prevent the following conditions:

- Flow rate for the combined exhaust gas entering the PJV Demisters (PJV-DMST-00002A/B/C) will be monitored. Suction pressure for the inlet gas will be maintained by varying the speed for the PJV Exhaust Fans (PJV-FAN-00001A/B/C).
- Pressure drop for the PJV Demisters (PJV-DMST-00002A/B/C) will be monitored.
- Each PJV HEPA filter bank will be monitored and alarmed on high differential pressure.

4.1.2.19 Sodium Hydroxide Reagent (SHR) System

The PTF sodium hydroxide reagent (SHR) system includes a vessel (SHR-VSL-00001), ancillary equipment, and instruments associated with its operation. Sodium hydroxide is stored in vessel SHR-VSL-00001for emergency elution of the cesium ion exchange (CXP) columns. The vessel SHR-VSL-00001 receives sodium hydroxide from the BOF sodium hydroxide reagent storage vessel after dilution to 0.1 M using ionized water. When the high temperature alarm is detected on the CXP columns, the sodium hydroxide is gravity transferred from the SHR-VSL-00001 to the cesium ion exchange system.

The SHR system does not manage dangerous waste and is provided here for completeness of the PTF process description.

4.1.2.20 Pretreatment Facility Ventilation

Pretreatment facility ventilation includes the following systems:

- C1 ventilation system (C1V)
- C2 ventilation system (C2V)
- C3 ventilation system (C3V)
- C5 ventilation system (C5V)

The primary consideration in the design of the ventilation systems is to confine airborne sources of contamination to protect human health and the environment from exposure to hazardous materials during normal and abnormal operating conditions. Physical barriers or structures supported by the ventilation systems will ensure air released to the environment and residual contamination is well below acceptable, safe levels for public exposure.

The pretreatment facility will be divided into four numbered zones, listed below, with the higher number indicating greater hazard potential that needs greater control or restriction. The ventilation system zoning is based on the classifications assigned to building areas for potential contamination. Zones classified as C5 are potentially the most contaminated, such as the pretreatment cells. Zones classified as C1 are uncontaminated areas.

The confinement provided by physical barriers is enhanced by the ventilation system, which creates a pressure gradient and causes air to flow through engineered routes from an area of lower contamination potential to an area of higher contamination potential. There will be no C4 areas in the pretreatment facility. The cascade system, in which air passes through more than one area, will reduce the number of separate ventilation streams and, hence, the amount of air requiring treatment.

<u>C1 Ventilation System (C1V)</u>

C1 areas are normally occupied. C1 areas will typically consist of administrative offices, control rooms, conference rooms, locker rooms, rest rooms, and equipment rooms. C1 areas will be operated slightly pressurized relative to atmosphere and other adjacent areas.

C2 Ventilation System (C2V)

C2 areas typically consist of nonprocess operating areas, access corridors, and control/instrumentation, and electrical rooms. Filtered air will be supplied to these areas by the C2 supply system and will be cascaded into adjacent C3 areas or HEPA filtered and exhausted by the C2 Exhaust system.

C3 Ventilation System (C3V)

C3 areas normally will be unoccupied, but operator access during maintenance will be allowed. C3 areas typically will consist of filter plant rooms, workshops, maintenance areas, and monitoring areas. Access from a C2 area to a C3 area will be via a C2/C3 subchange room. Air will generally be drawn from C2 areas and cascaded through the C3 areas into C5 areas. In general, air cascaded into the C3 areas will be from adjacent C2/C3 subchange rooms. In some areas, where higher flow may be required into C3 areas, a dedicated C2 supply will be provided with a backdraft damper on the C2 supply duct, which will be closed in the event of a loss of C3 extract. This system will shut down should there be a failure of the C5 exhaust system.

C5 Ventilation System (C5V)

The pretreatment facility C5 areas are designed with the cell or cave perimeter providing radiation shielding as well as a confinement zone for ventilation purposes. C5 areas typically consist of a series of process cells where waste will be stored and treated. The pretreatment facility hot cell will house major pumps and valves and other process equipment. Air will be cascaded into the C5 areas, generally from adjacent C3 areas, and extracted by the C5 extract system. The C5 exhaust system will be composed of primary and secondary HEPA Filters and variable speed exhaust fans. Fans designed to maintain continuous system operation will drive the airflow. This system will also be interlocked with the C3 HVAC system, to prevent backflow by shutting down the C3 system if the C5 HVAC system shuts down.

4.1.3 LAW Vitrification Facility

The purpose of this section is to describe the major systems associated with the LAW vitrification facility. Figure 4A-3 presents a simplified process flow diagram of the LAW vitrification processes. This facility will consist of several process systems designed to perform the following functions:

- Receive and store pretreated LAW feed.
- Convert blended LAW feed and glass formers into glass.
- Provide melter offgas treatment systems.
- Treat melter offgas.
- Handle ILAW containers.
- Store ILAW containers.
- Provide supporting equipment in the melter gallery.
- Handle miscellaneous waste.
- Ventilate the LAW vitrification facility.

The following figures located in Appendix 4A and drawings found in DWP Operating Unit Group 10, Appendix 9, provide additional detail for the LAW vitrification facility:

- Simplified flow diagrams for the WTP and the LAW vitrification facility.
- Process flow figures and drawings for process information.
- Typical system figures depicting common features for each regulated system.
- General arrangement figures and drawings showing locations of regulated equipment.
- Waste management area figures and drawings showing facility locations to be permitted.

Instrumentation, alarms, controls, and interlocks will be provided for the tank systems and miscellaneous treatment unit sub-systems to indicate or prevent the following conditions, as appropriate:

- Overfilling: Plant items are protected against overfilling by liquid level indication, high level instrumentation interlocks to shut off feed sources, and process control system control functions backed up by hard wired trips as required.
- Loss of containment: Plant items are protected against containment loss by liquid level indication, and by process control system control and alarm functions as required, including shut off of feed sources. Tanks or miscellaneous units (MUs) that manages liquid mixed or dangerous waste is provided with secondary containment. Ancillary equipment and miscellaneous unit ancillary equipment is provided with secondary containment or is visually inspected for leaks on a daily basis in accordance with WAC 173-303-640(4)(f). Some LAW tanks or MUs utilize daily visual inspection for leak detection. Sumps associated with the management of mixed or dangerous waste are provided with liquid level instrumentation and an ejector or pump to empty the sump as needed.
- Inadvertent transfers of fluids: System sequential operations are properly interlocked to prevent inadvertent transfers at the wrong time or to the wrong location.
- Loss of mixing function: Tank systems are instrumented (air pressure/flow indication) to prevent hydrogen accumulation and solids settling. Tanks with agitators are instrumented to prevent agitator and/or vessel damage at low liquid level.
- Unsafe or off-normal melter operating conditions.
- Degraded emissions control equipment and/or operating conditions
- Loss of air flow: The ventilation system are designed to creates a pressure gradient which causes air to flow through engineered routes from an area of lower contamination potential to an area of higher contamination potential.
- Loss of site power.

In addition to level control, temperature and pressure may be monitored for tank systems and miscellaneous treatment unit systems in some cases. Additional information may be found in the system logic descriptions located in DWP Operating Unit Group 10, Appendix 9.13. Regulated process and leak detection system instruments and parameters will be provided in DWP Table III.10.E.F for tank systems and in DWP Table III.10.H.C for miscellaneous treatment unit sub-systems.

Descriptions of the LAW vitrification process, melter offgas treatment systems, and ILAW glass container handling systems are provided in the following sections.

4.1.3.1 LAW Melter Feed Process

The LAW melter feed consists of the following systems:

- LAW concentrate receipt process system (LCP)
- LAW melter feed process system (LFP)
- Glass former reagent system (GFR) (the GFR system does not manage dangerous waste and is provided for information only)

Process flow diagram of the LAW Concentrate Receipt Process (LCP) System and the LAW Melter Feed Process (LFP) System are provided in DWP Operating Unit Group 10, Appendix 9.1. The LCP and LFP systems prepare feed for the LAW melters to produce a vitrified product. An analysis of the waste determines a glass additive formulation for the conversion of the waste to glass. The glass additives specified in the formulation are weighed and mixed with the waste. There are two melter feed trains to supply the two LAW melters. Each melter feed train consists of a melter concentrate receipt vessel, a melter feed preparation vessel, and a melter feed vessel.

The LCP system includes the melter concentrate receipt vessels. The LFP system includes the melter feed preparation vessel and the melter feed vessel for each of the two melters.

The LCP tank system consists of the following tanks and their associated ancillary equipment:

- Melter Concentrate Receipt Vessels (LCP-VSL-00001/2)

The LFP tank system consists of the following tanks and their associated ancillary equipment:

- Melter Feed Preparation Vessels (LFP-VSL-00001/3)
- Melter Feed Vessels (LFP-VSL-00002/4)

Melter Concentrate Receipt Vessels (LCP-VSL-00001/2)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2). The Melter Concentrate Receipt Vessels receive melter feed concentrate from the pretreatment facility. The Melter Feed Preparation Vessels are located in two process cells, and each process cell contains a Melter Concentrate Receipt Vessel, a Melter Feed Preparation Vessel, and a Melter Feed Vessel. The vessels are equipped with the following:

- Mechanical agitator
- Pumps to transfer LAW concentrate
- Instrumentation for liquid level
- Internal spray wash nozzles
- Overflow nozzle to C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)
- Spare nozzles

Valves are located in valve bulges LCP-BULGE-00001/2/3. Valving in LCP-BULGE-00001 receives LAW concentrate from the PTF and directs it to the LAW Concentrate Receipt Vessels (LCP-VSL-00001/2). Valving in bulges LCP-BULGE-00001/3 allows the LAW concentrate to be routed to the Melter Feed Preparation Vessels (LFP-VSL-00001/3), or to the Plant Wash Vessel (RLD-VSL-00003) if the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2) are being cleaned out or if the contents of the vessels cannot be satisfactorily processed. In addition, LAW concentrate can be transferred between the two Melter Concentrate Receipt Vessels (LCP-VSL-00001/2), or directs it to the ASX system for sampling (ASX-SMPLR-00012/13).

Glass Former Reagent (GFR) System

The GFR system contains the glass former feed mixers that receive blended glass formers and sucrose by dense-phase pneumatic conveyors from the glass former system.

The feed mixers are equipped with filters to remove the dust from air used for pneumatic conveying and blending. A series of single filter cartridges will be mounted on the top of the mixers. The filters are cleaned by introducing compressed air through the cleaning nozzle to blow accumulated dust back into the hoppers.

The feed mixers are equipped with load cells to weigh the glass formers to confirm that the material in the upstream blending silo is conveyed to the feed hoppers and to confirm that the glass formers are transferred out of the feed hoppers to the Melter Feed Preparation Vessels.

The glass formers are gravity-fed with a rotary feeder into the Melter Feed Preparation Vessels, where the glass formers are mixed with the waste feed. This equipment is located in an isolated area that serves as a contamination barrier between the melter feed preparation vessels and the glass former supply. The rotary valve controls the rate of glass former addition into the melter feed preparation vessels.

Melter Feed Preparation Vessels (LFP-VSL-00001/3)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Melter Feed Preparation Vessels (LFP-VSL-00001/3). The Melter Feed Preparation Vessels mix LAW concentrate from the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2) with glass formers and sucrose from the glass former feed hoppers. The vessels are equipped with the following:

- Mechanical agitator
- Pumps
- Instrumentation for liquid level measurement
- Internal spray wash nozzles
- Overflow nozzle to the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)
- Spare nozzles

The Vessel pumps LFP-PMP-00001A/B and LFP-PMP-00003A/B transfer wastes using valve bulges LFP-BULGE-00001/2. Valves in the bulge allow melter feed to be routed to the associated Melter Feed Vessel (LFP-VSL-00002/4) or to the Plant Wash Vessel (RLD-VSL-00003) if the Melter Feed Preparation Vessels (LFP-VSL-00001/3 are being cleaned out. The vessel contents can be circulated through the pump and injected back into the vessel in the recirculation mode. In addition, melter feed can be pumped between the two Melter Feed Preparation Vessels (LFP-VSL-00001/3), or directs it to the ASX system for sampling (ASX-SMPLR-00012/13).

Melter Feed Vessels (LFP-VSL-00002/ 4)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Melter Feed Vessels (LFP-VSL-00002/4). The Melter Feed Vessels receive blended melter feed, consisting of LAW concentrate and glass formers, from the Melter Feed Preparation Vessels (LFP-VSL-00001/3). The vessels are equipped with the following:

- Mechanical agitator
- Air displacement supply (ADS) pumps to transfer feed to the corresponding LAW melter
- Feed vessel pump
- Instrumentation for liquid level measurement
- Miscellaneous solution addition line
- Internal spray wash nozzles
- Overflow nozzle to the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)
- Spare nozzles

The feed vessel pumps (LFP-PMP-00002/4) transfer waste feed through the valve bulges LFP-BULGE-00001/2. Valving in the bulges allows the waste feed to be pumped between all four vessels: the two Melter Feed Preparation Vessels (LFP-VSL-00001/3) and the two Melter Feed Vessels (LFP-VSL-00002/4). Waste feed can also be transferred from the Melter Feed Vessels to the Plant Wash Vessel (RLD-VSL-00003) for vessel cleanout, or directs it to the ASX system for sampling (ASX-SMPLR-00012/13). Normally, ADS pumps transfer the melter feed from the melter feed vessel to the melter.

4.1.3.2 LAW Melter Process System (LMP)

Figure 4A-21 presents a simplified process flow diagram of the LAW Melter Process (LMP) System. DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the LAW Melter Process System (LMP). The purpose of the LMP system is to convert a blended slurry of liquid LAW feed and glass former additives into a durable ILAW product.

The locally shielded LAW melter system design is based on operating two joule-heated melters located in a C3 environment. The melters are equipped with ceramic refractory that has two unique sections. These sections are the refractory in contact with the molten glass pool (glass pool refractory), and the refractory surrounding the gas space above the glass pool (plenum refractory). Glass pool refractory is designed to withstand corrosion from molten glass. The plenum is lined with refractory designed to withstand hot corrosive gases, thermal shock, and glass and feed splatter. Key functions of LMP include containment, joule heated melting, melter feed, and glass discharge.

Miscellaneous Treatment Unit Sub-Systems

- LAW Melters (LMP-MLTR-00001/ 2)

The LAW Melters (Appendix 4A, Figure 4A-48) have a nameplate capacity of 15 metric tons of glass per melter per day. Each LAW Melter has a single internal glass chamber with a rectangular surface area. The melter is powered by three pairs of electrodes that are mounded opposite each other along the long axis of each melter. The glass is discharged through either of two discharge chambers located within one of the long axis walls of the melter. The lid of the melter is composed of layers of refractory backed by a corrosion-resistant metal plate and support structure. The lid also supports the components that are submerged in the melt pool and suspended in the melter plenum. The melter is encased in an integral shielding and secondary containment enclosure.

The refractory is part of the melter containment and can be described as two separate sections. These sections are the refractory in contact with the molten glass pool and the refractory surrounding the gas space above the glass pool, which is referred to as the plenum. The glass pool refractory, used in conjunction with active cooling provided by a water jacket, will provide glass containment, thermal insulation, and electrical isolation. The plenum refractory is primarily designed to resist thermal breakdown, resist corrosion by offgases, and resist corrosion by splashed feed and glass.

The melter shell is comprised of the base, walls, lid, and gas barrier plates structurally supported by the enclosure. The melter shell inner surface is designed to allow operation of the melter at a negative pressure. This inner surface will also minimize the release of melter gases and contaminants in the event of melter pressurization. A small air purge will be provided for the annular space between the cooling panels and the shell to reduce the deposition of materials. This purge will be driven by melter vacuum.

The LAW melter system has been designed to shield and contain the melter so that no additional shielding or contamination control will be required for normal operations. This has been accomplished by enclosing the melter assembly in a steel box. Shielding is provided by the entire enclosure. Access panels are provided through the external shielding. When removed, these panels will allow access to equipment such as jack-bolts, electrodes, electrode thermocouples, viewing cameras.

The heat for the LAW melter startup is provided by temporarily installed radiant electric heaters mounted on the roof of the melter. These heaters melt glass formers sufficiently to make it ionically conductive between the melter's joule heating electrodes. When a conducting path is established, the melter is heated in a controlled manner by passing more and more current between the electrodes through the glass (a process known as *joule heating*). After some time, the melter reaches its operating temperature and slurry feeding can start. As water evaporates, the feed forms a "cold cap" on the surface of the melt. As more slurry is fed, molten glass is formed by dissolution and melting of the cold cap materials into the glass melt. When the melt level rises to a predetermined level, it is discharged into a container.

The melter plenum is maintained at a controlled vacuum with offgas system fans and injection of air into the offgas line near the melter exhaust. This assures containment and avoids pressurization.

Joule Heating

The joule heating system contains the melter electrodes, melter electrode power supplies, melter glass pool thermocouples, and the melter electrode control system.

The electrode configuration for each LAW Melter will consist of three pairs of plate electrodes mounted parallel to each other on the long axis of the melter. The electrodes will have forced-air cooled electrode extensions. The extensions will penetrate the side of the melter below the glass level to minimize the effects of thermal expansion and to minimize the potential for corrosion by sulfate. Active cooling of the extensions and the use of a water-cooling jacket will prevent glass from migrating through the refractory package adjacent to the electrode extension penetrations. Power to the electrodes will be single-phase alternating current applied across opposing electrodes. The nominal glass melt pool temperature is approximately 1,150 °C. This is measured with thermocouples in thermowells submerged into the pool at various locations. The power to the electrodes is regulated to maintain the temperature within a selected range.

Melter Feed System

Feed will be introduced to the melter as a slurry through nozzles in the melter lid. Water and volatile constituents in the slurry will evaporate, leaving behind a layer of material known as the cold cap. Waste feed components in the cold cap will undergo chemical reactions, be converted to their respective oxides, and dissolve in the molten glass. The feed rate determines the cold cap coverage on the glass melt pool. The feed rate can be controlled based on the average plenum temperature measured by plenum thermocouples mounted in the melter lid. New slurry will be added at about the same rate as the cold cap dissolves, maintaining the quantity of cold cap material at a steady level. Air injectors will be used to mix and agitate the molten glass. When the melt level rises to a predetermined upper limit, an air lift mechanism is actuated and glass is discharged to a container.

Glass Discharge System

Melter glass pool level measurement will be used to indicate when to start and stop glass discharge. It also provides alarms for high or low glass pool levels. Each LAW Melter has two identical and independently operated glass discharge systems located adjacent to each other on one side of the melter. Each of these systems includes an airlift riser, a glass pour trough, a heated discharge chamber, and other components and instruments needed to control the discharge of glass. When a container is required for filling, it is retrieved from the clean container staging area and lowered through the import hatch onto one of the two pour turntable bogies. The bogie travels to a position in front of one of the pour caves. The container is retrieved by one of the four monorail hoists and transported to one of the four pour cave turntables. The container is then rotated into the pour position. A through-wall position sensor confirms that the container is in position prior to lock pin engagement. A through-wall lock pin engages the turntable in its pour position and prevents accidental rotation while the container elevator raises the container to the melter seal head and the container is filled with glass. The level of glass in the container is controlled by an infrared camera and the container load cell.

The glass discharge from the melter is initiated by injecting air or an inert gas at the bottom of the airlift riser. As the gas bubbles rise in the glass they will entrain glass in the riser, which is replaced by glass flowing in from the pool through the riser throat. The glass is lifted to the inlet of the trough, where the air bubbles disengage and the entrained glass flows into the trough. The glass then flows down the trough due to gravity and falls from the pour tip at the end of the trough into the container. The rate of glass discharge is controlled by adjusting the rate at which air is injected into the bottom of the riser.

Instrumentation, alarms, controls, and interlocks will be provided for the LMP to indicate or prevent the following conditions:

- Decrease or loss of melter plenum vacuum.
- Glass temperature that is too high or too low.
- Electrode extension temperature too high.
- Loss of melter cooling water.

- Plugged feed nozzle.
- Overfilling of glass container.

4.1.3.3 LAW Melter Offgas System

The LAW Melter Offgas System consists of the following process systems:

- LAW Primary Offgas Process (LOP) System
- LAW Secondary Offgas/Vessel Vent Process (LVP) System

Process flow diagram of the LAW Primary Offgas Process (LOP) System are provided in DWP Operating Unit Group 10, Appendix 9.1. The LOP tank system consists of the following tanks and miscellaneous treatment unit sub-systems and their associated ancillary equipment:

Tank System

- LAW Melter SBS Condensate Vessels (LOP-VSL-00001/2)
- Pumps
- Eductor (LOP-EDUC-00001)

Miscellaneous Treatment Unit Sub-Systems

- Melter 1 and Melter 2 Primary and Standby Film Coolers (LOP-FCLR-00001/2/3/4), one set for each melter
- Melter 1 and Melter 2 Submerged Bed Scrubbers (SBS)(LOP-SCB-00001/2)
- Melter 1 and Melter 2 Wet Electrostatic Precipitators (WESP) (LOP-WESP-00001/2)

Process flow diagram of the LAW Secondary Offgas/Vessel Vent Process (LVP) System are provided in DWP Operating Unit Group 10, Appendix 9.1. The LVP tank system consists of the following tanks and miscellaneous treatment unit sub-systems and their associated ancillary equipment.

Tank System

- LAW Caustic Collection Tank (LVP-TK-00001)

Miscellaneous Treatment Unit Sub-Systems

- Melter Offgas HEPA Preheaters(LVP-HTR-00001A/1B/3A/3B)
- Melter Offgas HEPA Filters (LVP-HEPA-00001A/1B/2A/2B/3A)
- Offgas Mercury Adsorbers (LVP-ADBR-00001A/1B)
- Catalytic Oxidizer Electric Heater (LVP-HTR-000002)
- Thermal Catalytic Oxidizer (LVP-SCO-00001)
- NOx Selective Catalytic Reduction Unit (LVP-SCR-00001)
- Catalytic Oxidizer Heat Recovery Unit (LVP-HX-00001)
- Melter Offgas Exhausters (LVP-EXHR-00001A/B/C)
- Melter Offgas Caustic Scrubber (LVP-SCB-00001)

Melter offgas is generated from the vitrification of LAW feed in the two joule-heated ceramic melters and the vessel ventilation system. The rate of generation of gases in the melter is dynamic. The melters generate offgas resulting from decomposition, oxidation, and vaporization of feed material. Constituents of the offgas include:

- Nitrogen oxides from decomposition of metal nitrates in the melter feed.

- Chloride, fluoride, and sulfur as oxides, acid gases, and salts.
- Particulates and aerosols.
- Entrained feed material and glass.
- Mercury.

In addition, the LAW Melters generate small quantities of other volatile compounds including iodine-129, carbon-14, tritium, and volatile organic compounds. Carbon-14 and tritium are in the form of carbon dioxide and water, respectively.

The purpose of the LAW Melter offgas system is to cool and treat the melter offgas and vessel ventilation offgas to a level that is protective of human health and the environment. The offgas system must also provide a pressure confinement boundary that will control melter pressure and prevent vapor release to the cell. The design of the melter offgas system must accommodate changes in offgas flow from individual melters without causing either melter to pressurize and without allowing variations in the flow from one melter to impact the other melter.

Separate systems are provided for the initial treatment of offgas from each melter. This is considered the primary offgas treatment system. This primary offgas system is designed to handle intermittent surges of seven times the normal steam generation rate and three times the normal non-condensable gas generation rate from the melter feed without causing interruption of melter operations. The primary system consists of Film Coolers (LOP-FCLR-00001/3), Submerged Bed Scrubbers (LOP-SCB-00001/2), and a Melter Wet Electrostatic Precipitator (LOP-WESP-00001/2). This system cools the offgas and removes particulates.

There is a second offgas line from the Melter to the Submerged Bed Scrubbers (LOP-SCB-00001/2) consisting of a Standby Film Cooler (LOP-FCLR-00002/4) and a butterfly valve as the isolation device. The melter is operated under negative pressure. In the event that the primary offgas line plugs or the melter surges beyond design basis, the butterfly valve opens allowing offgas flow to the submerged bed scrubber through the second offgas line, thereby preventing melter pressurization. The line is also designed to handle surges up to seven times the normal steam generation rate and three times the non-condensable gas generation rate from melter feed without causing interruption in melter operations. In the event that the melter surge exceeds the pressure relief set point the pressure relief device opens venting the offgas to the process cell. The pressure relief device closes as the melter pressure approaches the desired set point. Offgas from the wet process cell is drawn through C5V HEPA Filters to remove particulates before discharged to the atmosphere.

The vessel ventilation system offgas consists primarily of air, water vapor, and minor amounts of aerosols generated by the agitation or movement of vessel contents. The vessel ventilation system header joins the primary offgas system after the Wet Electrostatic Precipitators (LOP-WESP-00001/2), and the combined offgas is routed to the secondary offgas treatment system.

The secondary offgas system (from HEPA preheater to final discharge) is designed to handle maximum sustained flowrate from the two melters assuming both melters are operating. The system is also capable of operating effectively if only one melter is running. The secondary offgas system consists of Melter Offgas Preheater (LVP-HTR-00001A/1B and 00003A/3B) with Melter Offgas HEPA Filter trains (LVP-HEPA-00001A/2A/3A and 00001B/2B), and the Melter Offgas Exhausters (LVP-EXHR-00001A/B/C). The balance of the secondary offgas system includes the Offgas Mercury Adsorbers (LVP-ADBR-00001A/B), LVP-SKID-00002 madeup of a Thermal Catalytic Oxidizer (LVP-SCO-00001)/Selective Catalytic Reducer (LVP-SCR-00001), the Catalytic Oxidizer Heat Recovery Unit (plate and frame heat exchanger) (LVP-HX-00001), Catalytic Oxidizer Electric Heater (LVP-HTR-00002), the catalyst for volatile organic compound oxidation and the catalyst for nitrogen oxides reduction; and a Melter Offgas Caustic Scrubber (LVP-SCB-00001).

The melter offgas exhausters will be located downstream of the LVP Caustic Scrubber (LVP-SCB-00001) and maintain negative pressure across the LVP primary and secondary offgas equipment upstream of the exhausters. The following sections provide descriptions of major melter offgas treatment components.

4.1.3.3.1 LAW Primary Offgas Process (LOP) System

Process flow diagram ~~of~~ for the LAW Primary Offgas Process (LOP) System ~~are~~ is provided in DWP Operating Unit Group 10, Appendix 9.1. The purpose of the LOP tank system and miscellaneous treatment unit sub-systems is to cool the offgas and remove aerosols generated by each of the two LAW melters. The primary components consist of a film cooler, submerged bed scrubber, and a wet electrostatic precipitator.

Melter Film Coolers (LOP-FCLR-00001/2/3/4)

The primary function of the Film Cooler miscellaneous treatment unit sub-system is to cool the offgas and entrained molten glass droplets below the glass sticking temperature to minimize glass deposition on the offgas piping walls. The offgas exits the melter and is mixed with steam or steam/air mixture in the offgas Film Cooler. The Film Cooler is a double-walled pipe designed to introduce air/steam axially along the walls of the offgas pipe through a series of holes or slots in the inner wall. Each melter has a primary and a standby Film Cooler.

Melter Submerged Bed Scrubber (LOP-SCB-00001/2)

Each LAW Melter has a dedicated Submerged Bed Scrubber miscellaneous treatment unit sub-system. After each primary Film Cooler (LOP-FCLR-00001/3), the offgas enters the Submerged Bed Scrubber column for further cooling and solids removal. The Submerged Bed Scrubber is a passive device designed for aqueous scrubbing of entrained particulates from melter offgas, cooling and condensation of melter vapor emissions, and interim storage of condensed fluids. It will also quench the offgas to a desired discharge temperature through the use of cooling coils/jacket. The offgas leaves the Submerged Bed Scrubber in approximate thermal equilibrium with the scrubbing solution.

The Submerged Bed Scrubbers (LOP-SCB-00001/2) have two offgas inlets, one for the normal operations line and one for the standby line. Standby Film Coolers (LOP-FCLR-00002/4) can be routed to either Submerged Bed Scrubber. Each Standby Film cooler is normally routed to its respective submerged bed scrubber, however each film cooler can be routed to the alternate submerged bed scrubber. The offgas enters the Submerged Bed Scrubber through the appropriate inlet pipe that runs down through the center of the bed to the packing support plate. The bed-retaining walls extend below the support plate creating a lower skirt to allow the formation of a gas bubble underneath the packing. The entire bed is suspended off the floor of the Submerged Bed Scrubber to allow the scrubbing solution to circulate freely through the bed. After formation of the gas bubble beneath the packing, the injected offgas then bubbles up through the packed bed. The rising gas bubbles also cause the scrubbing liquid to circulate up through the packed bed, resulting in a general recirculation of the scrubbing solution. The packing breaks larger bubbles into smaller ones to increase the gas to water contacting surface, thereby increasing particulate removal and heat transfer efficiencies. The warmed scrubbing solution then flows downward outside of the packed bed past the cooling coils/jacket.

To maintain a constant liquid level within the Submerged Bed Scrubbers (LOP-SCB-00001/2), it will be equipped with overflow lines that allows for the continuous discharge of offgas condensate and some scrubbed particulates to the Melter SBS Condensate Vessels (LOP-VSL-00001/2) located next to the Submerged Bed Scrubber. The Melter SBS Condensate Vessels are equipped with a cooling jacket. The rate of condensate discharge is determined by how much the offgas temperature is lowered below its dew point. The condensate and some collected particulates overflow into the Melter SBS Condensate Vessels.

To minimize the buildup of the solids in the bottom of the Submerged Bed Scrubber, condensate from the Melter SBS Condensate Vessels (LOP-VSL-00001/2) will be re-circulated back to the Submerged Bed Scrubber and injected through multiple lances to agitate and suspend solids on the submerged bed scrubber floor. The collected solids will then be pumped directly off the Submerged Bed Scrubber vessel floor to the Melter SBS Condensate Collection Vessel (RLD-VSL-00005). This purging and recycling process occurs simultaneously. Submerged Bed Scrubber condensate from the SBS Condensate Collection Vessels (LOP-VSL-00001/2) ultimately flows to the TLP system. Venting of the Melter SBS Condensate Vessels is via the Submerged Bed Scrubber into the main offgas discharge pipe.

The scrubbed offgas discharges through the top of the Submerged Bed Scrubbers (LOP-SCB-00001/2) and is routed to the Melter Wet Electrostatic Precipitators (one per melter) (LOP-WESP-00001/2) for further particulate removal.

In addition to the instrumentation, alarms, controls, and interlocks addressed in section 4.1.3, the following will be provided for the Submerged Bed Scrubber to indicate or prevent the following conditions:

- High scrubber liquid temperature.
- Low and High scrubber liquid level.
- High condensate vessel liquid level.
- Loss of chilled water supply.
- Differential pressure across the unit.

Melter Wet Electrostatic Precipitators (LOP-WESP-00001/2)

The Submerged Bed Scrubber (LOP-SCB-00001/2) discharge is routed to the Melter Wet Electrostatic Precipitator miscellaneous treatment unit sub-system for removal of aerosols down to and including submicron size. Each melter system has a dedicated Melter Wet Electrostatic Precipitator (LOP-WESP-00001/2). The offgas enters the unit and passes through a distribution plate. The evenly distributed saturated gas then flows up through tubes which act as positive electrodes. Each of the tubes has a single negatively charged electrode, which runs down the center of the tube. A high voltage, direct current transformer supplies power to the electrodes. A strong electric field is generated along the electrodes giving a negative charge to the aerosols passing through the tubes. The negatively charged particles move towards the positively charged tube walls for collection. Collected particles are continuously washed from the tube walls along with collected mists. The final condensate continuously drains to the Melter Wet Electrostatic Precipitators' (LOP-WESP-00001/2) dished bottom area. A water spray may be used periodically to facilitate washing collected aerosols from the tubes. The tube drain and wash solution are routed to the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004).

In addition to the instrumentation, alarms, controls, and interlocks addressed in section 4.1.3, the following will be provided for the Melter Wet Electrostatic Precipitators to indicate or prevent the following conditions:

- Loss of electrical power to the unit.
- High differential pressure across the unit.
- Accumulation of liquid.
- Loss of process water supply.

Standby Offgas Line

The standby line consists of an offgas pipe from the melter to a Submerged Bed Scrubber (LOP-SCB-00001/2), a Standby Film Cooler (LOP-FCLR-00002/4), and a butterfly valve as the isolation device.

During an off-normal melter surge or if the primary offgas pipe becomes plugged, this valve will open rapidly, providing an alternative path for the melter offgas to flow to the Submerged Bed Scrubbers (LOP-SCB-00001/2). With this alternative routing, pressure control on the melter plenum can be maintained. This standby offgas pipe will extend to the bottom of the Submerged Bed Scrubber packed bed, identical to the main offgas line. It is the same size as the main offgas line, thus providing a doubling of flow cross-section for melter-generated gases.

The LAW Melters are also equipped with a maintenance bypass line allowing offgases from one melter to be routed to the other's Submerged Bed Scrubber for cooling. The gas will be processed through both a primary and secondary offgas treatment system in the same manner as the normal path. The purpose of this line is to provide melter ventilation during idling conditions in the unlikely event that a Submerged Bed Scrubber (LOP-SCB-00001/2) or Melter Wet Electrostatic Precipitator (LOP-WESP-00001/2) requires maintenance. Prior to initiating use of the maintenance bypass line, waste feed would be secured, and the melters placed into an idle condition. No waste feed would be fed to the melters when the maintenance bypass line is in use.

Idling emissions from the melter are mainly heated air at a lower gas volume than expected during slurry feeding. The gas will be processed through secondary offgas treatment system that includes HEPA filtration, thermal catalytic oxidation, and selective catalytic reduction.

4.1.3.3.2 LAW Secondary Offgas/Vessel Vent Process (LVP) System

Process flow diagram ~~of~~ for the LAW Secondary Offgas/Vessel Vent Process (LVP) System ~~are~~ is provided in DWP Operating Unit Group 10, Appendix 9.1. The offgas system prevents migration of waste contaminants into the process cells and potentially operating areas. It does this by maintaining the various LAW process vessels under a slight vacuum relative to the cell. The composition of the ventilation air is expected to be primarily air with slight mixed waste particulate contamination.

The vessel ventilation air is combined with the melter offgas prior to entering the secondary offgas system HEPA filter electric preheaters. The combined air streams are treated together in the remaining sections of the secondary offgas treatment systems. A pressure control valve is used to regulate the pressure between the vessel ventilation offgas system and the melter offgas system.

The melter offgas stream that is treated through the primary offgas system is combined with the vessel ventilation offgas stream and treated through the LVP tanks and miscellaneous treatment sub-systems. The secondary offgas system removes the remaining particulate, mercury and miscellaneous acid gases, gaseous nitrogen oxide compounds, carbon monoxide, and volatile organic compounds.

Descriptions of the tanks and miscellaneous treatment sub-systems comprising the LVP are provided below:

Melter Offgas HEPA Filters, HEPA Preheaters, and Exhausters

The purpose of these miscellaneous treatment unit sub-systems is to provide a final protection against dispersion of particulate and to protect the downstream equipment from particulate contamination. The combined offgas stream is ~~first passed through the~~split and each stream is passed through one of two parallel LAW Melter Offgas HEPA Preheaters (LVP-HTR-00001A/1B and 00003A/3B). Preheating utilizing electric heating elements increases the gas temperature sufficiently above its dew point to ~~avoid~~ prevent condensation in the melter offgas HEPA filters. Sizing of these heaters is such that if one fails, the other unit can maintain the required combined stream offgas temperature increase on its own. Two heaters (LVP-HTR-00001A/3A) operate during normal operations, and two heaters (LVP-HTR-00003A/3B) are provided to be activated during an off-normal event such as the failure of the primary heaters to maintain the required offgas stream temperature.

The offgas then passes through radial flow HEPA Filters (LVP-HEPA-00001A/2A/3A or 00001B/2B). The system is composed of two parallel trains of two filter banks in series.

The offgas passes through one train while the other remains available as an installed backup. Motive force for the ventilation is provided by the Melter Offgas Exhausters (LVP-EXHR-00001A/B/C). The melter offgas exhausters will be located downstream of the LVP Caustic Scrubber (LVP-SCB-00001) and maintain negative pressure across the LVP primary and secondary offgas equipment upstream of the exhausters.

Instrumentation, alarms, controls, and interlocks will be provided for the LVP system to indicate or prevent the following conditions:

- High or low differential pressure across a HEPA filter alarms.
- Loss of electric heater element.

Additional information to the instrumentation, alarms, controls, and interlocks associated with a bypass of the LVP system addressed in section 4.1.3 are described in the *LAW Vitrification Offgas Bypass Analysis*, 24590-LAW-PER-PR-03-001.

Offgas Mercury Adsorber (LVP-ADBR-0001A/B)

The Offgas Mercury Adsorbers (LVP-ADBR-00001A/B) make up LVP-SKID-00001 and are the miscellaneous treatment sub-system that removes volatile mercury, iodine, and some acid gases from the offgas. The offgas flows through two internal activated carbon beds normally operated in series. When gaseous mercury is detected breaking through the leading activated carbon bed, indicating that the carbon is loaded, the offgas flow is manually changed to make the trailing bed the leading bed. Only one activated carbon bed is used when the spent activated carbon media is removed, and replaced. The flow is then changed to make the fresh activated carbon bed the trailing bed.

The activated carbon is batch loaded into the adsorber by gravity. The spent activated carbon media is batch transferred by gravity into waste containers.

Instrumentation, alarms, controls, and interlocks will be provided for the Offgas Mercury Adsorbers (LVP-ADBR-00001A/B) to indicate or prevent the following conditions:

- Mercury breakthrough in the leading carbon bed signaling to switch to the trailing carbon bed.
- With the detection of high carbon monoxide/carbon dioxide concentrations the inlet and outlet valves are closed, isolating the carbon media and bypassing the carbon beds from the offgas stream. This limits the available oxygen to a carbon bed fire and is the primary fire suppression control.
- A water suppression system is available in the event of a carbon bed fire. Alarms notify an operator allowing the connection of the water fire suppression system and manual activation of the suppression system if needed.

Thermal Catalytic Oxidizer (LVP-SCO-00001) and NOx Selective Catalytic Reduction (SCR) Unit (LVP-SCR-00001)

The offgas passes through the catalytic oxidizer/reducer skid (LVP-SKID-00002) housing a heat recovery unit (LVP-HX-00001), an electric heater (LVP-HTR-00002), VOC catalyst (LVP-SCO-00001), and SCR catalyst (LVP-SCR-00001) miscellaneous treatment unit sub-systems to remove volatile organics compounds, carbon monoxide, nitrogen oxide compounds in the offgas stream.

The heat recovery exchange first raises the offgas temperature using the hot offgas from the catalyst beds. The electric heater is used to supplement the heat recovery exchange primarily during start-up and when operating with low NO_x concentrations. The heated offgas is passed through the VOC catalyst to oxidize VOCs and carbon monoxide to carbon dioxide and water vapor. The offgas is then injected with a mixture of ammonia vapor and C3 air from an ammonia/air dilution skid. Following ammonia injection, the offgas is passed through the SCR catalyst to reduce NO_x to nitrogen and water vapor.

The reduction reaction is exothermic, significantly increasing the offgas temperature. The outgoing hot offgas is cooled down in the heat exchanger and concurrently serves as the heating media for the incoming offgas. The cooled offgas stream is then directed to the Caustic Scrubber for acid gas removal and final cooling.

Instrumentation, alarms, controls, and interlocks will be provided for the Thermal Catalytic Oxidizer / Selective Catalytic Reducers to indicate or prevent the following conditions:

- High differential pressure across each catalyst bed.
- Loss of ammonia gas supply to the nitrogen oxides selective catalytic reduction unit.
- Failure of the electric heater.
- Ammonia analyzer to indicate ammonia slip in the outlet.
- Low offgas temperature entering the unit.
- High temperature differential across the unit.
- High nitrogen oxide concentration in the unit outlet stream.
- High volatile organic compound concentration in the unit outlet stream.

Offgas Caustic Scrubber (LVP-SCB-00001)

The LAW Melters' offgas Caustic Scrubber miscellaneous treatment unit sub-system further treats the offgas by removing iodine and acid gases and providing final offgas cooling. The offgas stream enters the bottom of the scrubber and flows upward through a packed bed. Contaminants in the offgas stream are absorbed into the liquid stream through interaction of the gas, liquid, and packing media. To neutralize the collected acid gases, a sodium hydroxide solution is added periodically to the LAW Caustic Collection Tank (LVP-TK-00001). The clean offgas is then discharged through an internal mist eliminator to prevent droplet carryover. The scrubbing liquid flows downward through the packing bed and drains into the LAW Caustic Collection Tank (LVP-TK-00001). The contents of this tank are periodically transferred to the pretreatment facility. After passing through the Caustic Scrubber (LVP-SCB-00001) and the Melter Offgas Exhausters (LVP-EXHR-00001A/B/C), the offgas is released to the environment via a flue in the plant stack.

In addition to the instrumentation, alarms, controls, and interlocks addressed in section 4.1.3, the following will be provided for the Caustic Scrubber to indicate or prevent the following conditions:

- Loss of recirculation pump.
- Loss of caustic supply.
- Loss of process water supply.
- High differential pressure across the column.
- Low scrubbing liquid level.
- High scrubbing liquid level.
- Loss of transfer pump.
- Low pH.
- High specific gravity (density).

4.1.3.4 Radioactive and Nonradioactive Liquid Waste Disposal (RLD and NLD) Systems

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Radioactive and Nonradioactive Liquid Waste Disposal (RLD and NLD) System. The RLD receives LAW vitrification process effluents for storage and transfer.

The RLD tank system consists of three main vessels:

- Plant Wash Vessel (RLD-VSL-00003)
- LAW C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)
- SBS Condensate Collection Vessel (RLD-VSL-00005)

The SBS Condensate Collection Vessel (RLD-VSL-00005) and the Plant Wash Vessel (RLD-VSL-00003) are located in the LAW effluent cell. The C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004) is located below grade to provide fire protection water collection and to collect effluents from the wet electrostatic precipitator, and C3/C5 gravity floor drains and sumps.

Sources of effluents into the RLD system are production and nonproduction-related activities. Production effluents are mixed waste liquids or slurries routinely or periodically generated by the waste treatment process. These effluents are routed directly or indirectly to the SBS Condensate Collection Vessel (RLD-VSL-00005). Liquid effluent from nonproduction activities, such as vessel, equipment and cell/cave washes, and sump discharges, are routed to one of the three vessels, depending on the nature of the effluent. Dangerous or mixed waste is routed to either the Plant Wash Vessel (RLD-VSL-00003) or the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004). Liquid that is nondangerous/nonradioactive is routed to the C1/C2 Floor Drain/Sump Collection Tank in the NLD system.

The functional purpose of the RLD system is to receive effluents for interim storage and to transfer the effluent to the pretreatment facility. In addition, mixing and sampling of the effluent may be performed in this system as required.

Plant Wash Vessel (RLD-VSL-00003)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the Plant Wash Vessel (RLD-VSL-00003). This vessel is designed to receive the total volume of either the largest vessel in the LAW vitrification facility or the largest volume from the vessel/equipment wash or drain in the LAW vitrification facility. The largest volume is from the SBS Condensate Collection Vessel (RLD-VSL-00005). Effluent sources for the Plant Wash Vessel (RLD-VSL-00003) are vessel washes and the overflow from the SBS Condensate Collection Vessel (RLD-VSL-00005). The vessel is fitted with level instrumentation. The vessel is vented into a common vessel ventilation header that drains into the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004). During normal operation, the effluent characterized in the Plant Wash Vessel (RLD-VSL-00003) is expected to be transferred to the pretreatment facility.

LAW C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the LAW C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004). This vessel is designed to contain the maximum amount of fire protection water and the volume equivalent to the largest C3/C5 floor area wash. The C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004) routinely collects liquid drained from the Melter Wet Electrostatic Precipitators (LOP-WESP-00001/2). The overflow from the Melter Concentrate Receipt Vessels (LCP-VSL-00001/2) is also routed to the C3/C5 Drains/Sump Collection Vessel.

Routine process-related effluent from Wet Electrostatic Precipitator drains will be routed from this vessel to the SBS Condensate Collection Vessel. Effluent generated from other sources will drain to the Plant Wash Vessel (RLD-VSL-00003) until it reaches a predetermined level to maintain adequate capacity for fire protection water.

The C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004) is fitted with level instrumentation. The C3/C5 Drains/Sump Collection Vessel is vented into a common vessel ventilation header. Condensate that forms in the header drains into the C3/C5 Drains/Sump Collection Vessel. Sampling capability is provided using a sampling leg off the pump recirculation line to an autosampler unit.

The C3/C5 Drains/Sump Collection Vessel is located in an enclosed C3/C5 cell area. The C3/C5 Drains/Sump Collection Vessel overflows to a sump in the same cell. During normal operation, the effluent characterized in the C3/C5 Drains/Sump Collection Vessel is expected to be transferred to the TLP system via the SBS Condensate Collection Vessel (RLD-VSL-00005).

SBS Condensate Collection Vessel (RLD-VSL-00005)

DWP Operating Unit Group 10, Appendix 9.1 contains a process flow diagram of the SBS Condensate Collection Vessel (RLD-VSL-00005). This vessel is designed to store SBS column purge effluent. The SBS Condensate Collection Vessel (RLD-VSL-00005) routinely receives effluent from the Submerged Bed Scrubber (LOP-SCB-00001/2) and the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004).

The SBS Condensate Collection Vessel is fitted with level instrumentation and is vented into a common vessel ventilation header that drains into the C3/C5 Drains/Sump Collection Vessel (RLD-VSL-00004). Sampling capability is provided using a sampling leg off the pump recirculation line to an autosampler unit. The SBS Condensate Collection Vessel overflows to the Plant Wash Vessel (RLD-VSL-00003). During normal operation, the effluent characterized in the SBS Condensate Collection Vessel is expected to be transferred to the TLP system.

4.1.3.5 Radioactive Solid Waste Handling (RWH) System

The primary functions of this system will be to provide equipment for the change out of LAW process vessels and other miscellaneous mixed wastes. This system provides the equipment to move waste out of the building.

The vessels are designed for 40 years of service. However, in the event of a failure, the process vessel will be prepared for export by rinsing, disconnection of the process lines, and decontamination. The vessel will be lifted out of the process cell and covered to prevent a spread of contamination. The vessel will be placed in an approved package staged for vessel receipt. Once closed and secured, the package, containing the vessel, will be delivered to an appropriate TSD facility. A similar process in reverse will be used for the introduction and installation of new LAW process vessels.

It is anticipated that LAW Melters will require periodic replacement. When the end of a melter's operational life is reached, as much residual molten glass as is practical will be removed as immobilized glass product. The LAW Melter will be allowed to cool and then will be disconnected. Openings in the melter shell will be seal welded, and the melter shell will be decontaminated if required, and transported to an appropriate TSD facility.

Disposal of miscellaneous mixed waste streams created during operation will be done by packaging at the point of generation. Localized collection points and disposal routes will be established at logical and optimal locations to accommodate maintenance and operations. Waste containers will be transferred to a staging area where packages will be weighed, labeled, and decontaminated for nonfixed contamination, if needed, prior to export. The packaged waste will then be stored at the WTP, and as needed transported to a Hanford site or off-site commercial treatment facility prior to final disposal at the Hanford site.

4.1.3.6 ILAW Glass Container Handling

The ILAW glass container handling activities will consist of the following systems:

- LAW container receipt handling system (LRH)
- LAW container pour handling system (LPH)
- LAW container finishing handling system (LFH)
- LAW container export handling system (LEH)

The individual systems and their primary functions are described below:

LAW Container Receipt Handling (LRH) System

The LRH system takes delivery of new ILAW containers and provides a means to transfer these empty containers to the LPH transfer bogie (wheeled cart for container transfer).

Container Receipt

After removal of the shipping over-wrap and initial receipt inspection, the containers are placed on a conveyor system and transferred into the facility as needed. New containers are then logged into the tracking system.

Container Import

Prior to the need for additional containers, a final inspection and transfer takes place in the container import bay. Each new container is moved to a container inspection stand. This allows an operator to assess the upper head/lifting flange area, including the “fill” opening, and to observe the inside of the container with a light.

The rest of the container is inspected as required, then the container is placed on the import line 1 or 2 staging conveyer, and the tracking log is updated. If the container inspection fails, it is logged and tagged appropriately and set aside.

Each time a container is placed on the conveyor, an operator initiates a conveyor transfer. The transfer serves to index containers on the staging conveyor forward so there is always a container in the “pickup” position on the airlock conveyor.

Container import instrumentation, alarms, controls, and/or interlocks will be provided as follows:

- The hatches are interlocked with the hoist and bogies so the hatch cannot be opened unless a process crane is positioned above the hatch. Conversely, the process cranes cannot leave hatch positions unless the hatch is closed and locked.
- The hatches are interlocked with the bogies so that the hatches can not open unless a bogie is positioned below the hatch. The interlock prevents the bogie from leaving the hatch position unless the hatch is closed.

LAW Container Pour Handling (LPH) System

Each of the LAW melters has two glass discharges that operate independently. Each melter discharge chamber is aligned with a glass pour cave under the melter cell with associated features for filling a container with glass. Containers can be filled using one pour cave, using alternating caves, or both caves at the same time using alternating lifts. The LPH system handles and positions product containers for filling with LAW glass product. The major pieces of equipment include the container turntable, container elevator, transfer bogies, and monorail hoists.

Container Turntable, Container Elevator, Glass Pour Seal Head

A container turntable is provided in each pour cave for handling containers. The turntable accommodates three containers and rotates to position them at three stations: the container transfer station, the container fill station, and the container cooling station. At each container location in the turntable is a lower overpack section that locates the containers and provides support. Containers remain in the overpack during the elevating and glass filling cycle.

As containers are filled and cooled, the turntable rotates to the transfer station where container changeout occurs. Cooled, full product containers are removed from the turntable and replaced with empty containers. The turntable is rotated to position the empty container at the fill station. The container elevator raises the empty container and lower overpack up to the glass pour seal head for container filling.

The elevator is equipped with features to provide a weight of the product container being supported. Weight is used to verify that a container is present and that it is empty. The weight must be between established minimum and maximum values for glass pouring to occur. Additionally, the weight can be used to ensure that container filling is occurring and to provide the rate of glass pouring. The elevator weight is not intended to give an accurate weight of the container; it is merely used as an indication of container presence and condition.

The glass pour seal head is the interface between the melter discharge and the product container during glass pouring. The seal head consists of a metal bellows arrangement that is connected to the melter discharge with the other end of the bellows open for interface with product containers.

Container fill level is monitored by a thermal imaging camera. The camera provides a view of the diameter and the upper one-half of a container. The thermal imaging camera indicates container fill level for primary control of fill rate and pour shut off. In the event of primary level detection failure, a gamma detector activates a high-high level shutdown.

The container is filled using several pours. The pour process occurs more quickly than glass can be made in the melter, resulting in lag time between pours. Rapid pouring allows molten glass to flow out to all edges of the container. Following the final glass pour batch, the container remains in position to provide initial container cooling and containment of final glass discharges. The container is then lowered to the turntable. The turntable is again rotated, placing the recently filled container at the cooling/venting station. Container cooling continues while another container undergoes the fill cycle. Once cooled, the container is rotated to the transfer position for export and the process is repeated.

Container Transportation

Another function of the LPH system is to provide product container transportation between the container transfer bogie and the pour cave turntable. The system transfers empty product containers from the container transfer bogie to the melter turntable, and transfers full product containers from the turntable to the transfer bogie in a manner that supports the facility throughput goals.

Concrete walls separate the pour caves from the bogie transfer tunnel. These walls have doorways large enough to allow the hoist units loaded with new or filled product containers to pass through them. The doorways are fitted with steel shield doors.

Concrete walls also separate the monorail maintenance facility from the bogie transfer tunnel. These walls have openings sized to prevent an ILAW container from entering the maintenance area. These doorways are also fitted with steel shield doors that provide radiological shielding from sources in the transfer tunnel during hands-on maintenance activities in the monorail maintenance facility.

Pour cave transfer operations are conducted remotely with only a few exceptions. Maintenance and recovery operations in the bogie transfer tunnel, such as a jammed grapple, may require hands-on intervention. Monorail hoist maintenance operations conducted in the maintenance facility are completely hands-on. Monorail hoist recovery operations can become a hands-on/remote combination depending on the failure details.

The LPH system provides a buffer storage area for ILAW containers in the event downstream processing lines become backed up. Additionally, ILAW container rework is conducted in the buffer storage area. Anticipated activities include ILAW container transfers into the buffer storage area from the container transfer bogies, container transfers within the buffer storage area, container transfer from the buffer storage area to the transfer tunnel, and container rework. The buffer storage area is adjacent to a crane maintenance facility. The crane maintenance area is shielded from the buffer storage area to allow hands-on maintenance in the crane maintenance facility and transfer tunnel while containers are present in the buffer storage area.

The LPH transfer tunnel runs from the bogie maintenance area on the west end of the facility to the buffer storage area at the east end of the building. The buffer storage area import/export positions are located within the container transfer corridor. Concrete walls with passages for ILAW containers separate the north and south buffer storage areas and the container transfer corridor. The passages are equipped with manually operated steel shield doors to support maintenance or bogie recovery operations that might be required in this portion of the transfer tunnel. The LFH hoists operating in the lidding area above this section of the container transfer corridor transfer ILAW containers to and from the buffer storage area import/export position.

Buffer storage area container transfer operations are conducted with the use of a bridge crane. The crane rails begin in the crane maintenance facility adjacent to the north end of the buffer storage area and extend south. The runway provides crane coverage to the crane maintenance area, the ILAW container buffer storage area, the container transfer corridor, and the two container import/export positions. There are container storage positions in the north and south portions of the store, and one rework position also in the south portion of the store. The rework position is located in the southeast corner of the ILAW container buffer storage area/rework area. The rework position can be fitted with a powered turntable, a pair of master-slave manipulators. A shielded window is located in this area. Directly east of the rework position, on the cold side of the buffer storage area, is a rework area operating platform that provides operator access to the master-slave manipulators and shielded window.

A winch is provided to support maintenance operations on the buffer storage area bridge crane. A steel shield door and a concrete wall separate the crane maintenance facility from the buffer storage area, allowing maintenance operations to be conducted while the buffer storage area contains full ILAW containers.

LAW Container Finishing Handling (LFH) System

Figure 4A-24 presents a simplified process flow diagram of the LAW container finishing handling system (LFH). There are two LFH finishing lines. The functions of the LFH system are to verify the container fill level, determine if inert fill is required, complete closure of the ILAW container, decontaminate the exterior of the container, and verify surface contamination levels before exporting the container. The system also has the ability to sample the solidified glass, place the glass shards in a vial, and make these vials available for transfer to the laboratory.

The filled containers are raised from the transfer tunnel into one of two finishing lines and placed on a bogie. The bogie with the container travels to the shard sampling station. A sample of the glass may be taken with the glass shard sampler. Based on the measured level in the container, inert fill is added as needed. From there the bogie travels to the container lidding station where the lid is mechanically secured to the container. After mechanically sealing the lid to the container, the bogie travels to the decontamination area.

At the decontamination station, the container is decontaminated with carbon dioxide pellets. Debris produced during decontamination is collected with a HEPA filtered exhaust system. This gas stream is then routed to the plant vent system where it is passed through the facility's HEPA filters before being discharged through the stack.

Once the container is decontaminated, it is transported to the swabbing station where it is surveyed for loose surface contamination to verify it meets the contamination requirements. The swabbing machine uses a power manipulator to maneuver the swabs over the surface. The contaminated swabs are then monitored to determine gamma-beta levels for smearable contaminates. If contamination levels exceed C2 contamination criteria, the container can go through the carbon dioxide decontamination station. ILAW containers can be routed back through the decontamination stations until the radiological contamination levels are within specification. Once the container meets C2 contamination criteria, the bogie moves into the monitoring/export station.

The container is transported into the monitoring/export station from the swabbing station, and the gamma monitor measures the surface dose rate of the decontaminated container. If the container exceeds the dose rate, it is classified as an out-of-specification container. Otherwise, the dose rate is measured and is recorded with the container's records. The container is then exported for shipment to the disposal site.

In the off-normal event that an out-of-specification ILAW container is generated, the container will be segregated and a corrective action plan generated. Container characterization data will be evaluated to determine if it can be disposed in accordance with approved Hanford Site Solid Waste Acceptance Criteria.

Instrumentation, alarms, controls, and interlocks will be provided for the LFH system to indicate or prevent the following conditions:

- Opening of personnel access door when container is present in the line transfer station.
- Opening of personnel access door when either line transfer trap doors are open.
- Opening of both line transfer trap doors at the same time.
- Opening of personnel access door if airborne contamination levels are higher than design contamination classification within the line transfer station.

Decontamination Station

A decontamination station is located within each of the finishing lines in the LAW vitrification facility. After the ILAW container has been sealed, it is transported to the decontamination station. Equipment items located in the decontamination station include the carbon dioxide decontamination manipulator, turntable, and exhaust system. Most other items are located outside of the decontamination station, including the carbon dioxide pelletizer, the transport air compressor, and the liquid carbon dioxide storage and delivery system, exhaust fans, and HEPA filters.

The containers are decontaminated using carbon dioxide pellets. The carbon dioxide decontamination manipulator is fitted with an exhaust recovery hood to recover the effluent from the decontamination operation. Debris produced during decontamination is collected with a HEPA filtered exhaust system. This gas stream is then routed to the plant vent system where it is passed through the plant's HEPA filters before being discharged through the stack.

Once the container is decontaminated, it is transported from the decontamination station to the swabbing station.

Instrumentation, alarms, controls, and interlocks will be provided for the decontamination station to indicate or prevent the following conditions:

- Opening of the decontamination or decontamination/swabbing containment door during decontamination.
- Opening of the decontamination and decontamination/swabbing containment door at the same time.

Swabbing and Swabbing-Monitoring Station

At the swabbing station, containers are surveyed for loose surface contamination to verify that they meet the contamination requirement. The swabbing machine maneuvers the swabs over the container surface. After a prescribed area is covered, the contaminated swabs are exported away from radioactive source for monitoring to determine gamma-beta levels for smearable contaminates. If contamination levels exceed C2 criteria, the container is transported back into the decontamination station for rework. If the container meets C2 criteria, the turntable bogie moves into the export station.

Once the container is transported into the monitoring/export station from the swabbing station, a gamma monitor measures the dose rate of the decontaminated container.

If the container exceeds the specified dose requirement, it is classified as an out-of-specification container; otherwise, the dose rate is measured and is recorded within the container's records. The container is then exported out of the monitoring/export station for shipment to the disposal site.

Instrumentation, alarms, controls, and interlocks will be provided for the swab monitoring station to indicate or prevent the following conditions:

- Personnel access when a container is present in swab monitoring station.
- Opening of decontamination/swabbing or swabbing/export containment door during swabbing.
- Opening of personnel access door when container is present in the swabbing station.
- Opening of personnel access door if airborne contamination levels are higher than design contamination classification within the decontamination area.
- Opening of personnel access door if high concentration of carbon dioxide is present within the decontamination area.
- Rotation of posting turntable during swabbing.
- Export of swab if radiation levels from swab are higher than design radiation classification in the operational area.

LAW Container Export Handling (LEH) System

The purpose of the LEH system is to load ILAW containers onto a transportation vehicle for transfer to a Hanford Site TSD unit. This system is contained in a truck bay on the east end of the LAW vitrification facility.

Under normal operations the ILAW container will be received from the LFH system through a hatch. Radiological dose rate and contamination level are determined and verified to be within limits prior to entering the LEH system. An overhead crane lifts the ILAW container through the hatch and places it on the transportation vehicle.

Operations are remote and maintenance is "hands-on" in the LEH system. The overhead crane is provided with closed circuit television cameras for operation when radiological conditions do not permit personnel access during the ILAW container loading.

4.1.3.7 LAW Melter Equipment Support Handling (LSH) System

The primary function of the LSH system is to provide the equipment and support necessary to complete maintenance tasks on all melters and equipment in the melter gallery of the LAW vitrification facility. The primary equipment used in support of the maintenance efforts are:

- Consumable change-out boxes.
- Consumable change-out boxes storage racks.
- Consumable change-out boxes preparation stand.
- Melter gallery process cranes.
- Consumable change-out boxes handler.
- Lifting head.
- Melter gamma gate.
- Shield cover removal tool.

Melter consumables will be removed through the top of the melter shielding. Melter consumable items will be those that require routine and nonroutine maintenance, but provide necessary functions to continue melter operations. The routine consumable items will include bubbler assemblies. New bubbler assemblies will be shipped to the facility and will be installed into the melter.

Spent bubblers will be extracted from the melter, and transferred into a consumable change-out box (CCB) and then transferred into a box for treatment and disposal.

Refractory thermocouples, airlifts, level detectors, feed nozzles, and film coolers will be removed, bagged and loaded into the CCB and then transferred to a disposal box. These waste management tasks will be considered nonroutine and are replaced on an as-needed basis according to secondary waste management procedures and with appropriate LSH equipment.

4.1.3.8 LAW Vitrification Facility Ventilation

The LAW vitrification facility will be divided into four numbered zones (the C4 designation is not used) listed and defined below, with the higher number indicating greater radiological hazard potential and therefore a requirement for a greater degree of control or restriction. The zoning of the ventilation system will be based on the classifications assigned to building areas for potential radiological contamination. Zones classified as C5 are potentially the most contaminated and include the pour caves, buffer storage area, and process cells. Zones classified as C1 are uncontaminated areas.

Containment will be achieved by maintaining C5 areas at the greatest negative pressure, with airflows cascaded through engineered routes from C2 areas to C3 areas and on to the C5 areas. The cascade system, in which air passes through more than one area, will reduce the number of separate ventilation streams and hence the amount of air requiring treatment. Adherence to this concept in the design and operation of the LAW vitrification facility will ensure that the ventilation air does not become a significant source of exposure to operators, and that the air emissions do not endanger human health or the environment.

An exhaust air radiation monitoring system, consisting of sensors to monitor radiation in the exhaust air stream, or a representative sampling system is provided in the discharge header downstream of the exhaust fans. A monitoring system would consist of probe assemblies, vacuum pumps, a stack flow sensor, temperature sensor, and radiation sensors. A temperature transmitter is also provided in the discharge header downstream of the exhaust fans for continuous monitoring of exhaust air temperature.

<u>C1 Ventilation (C1V) System</u>

C1 areas are normally occupied. C1 areas will typically consist of administrative offices, control rooms, conference rooms, locker rooms, rest rooms, and equipment rooms. C1 areas will be operated slightly pressurized relative to atmosphere and other adjacent areas.

<u>C2 Ventilation (C2V) System</u>

C2 areas will typically consist of non-process operating areas, equipment rooms, stores, access corridors, and plant rooms adjacent to areas with higher contamination potential. The C2V is served by dedicated air handling units and exhaust fans. Ventilation air supplied to C2 areas will be exhausted by the C2 exhaust system and cascaded into adjacent C3 areas. The sum of the volumetric flow rates exhausted by the C2 exhaust system and cascaded into adjacent C3 areas will be greater than the volumetric flow rate supplied to C2 areas. This will cause the C2 areas to maintain a nominal negative pressure relative to atmosphere. C2 exhaust will pass through one stage of HEPA filters and be discharged to the atmosphere by the exhaust fans. Supply and exhaust fans are provided with variable frequency drives.

<u>C3 Ventilation (C3V) System</u>

C3 areas are normally unoccupied, but allow operator access, for instance during maintenance. C3 areas will typically consist of filter plant rooms, workshops, maintenance areas, and monitoring areas. Air will generally be drawn from C2 areas and, wherever possible, cascaded through the C3 areas into C5 areas, or alternatively exhausted from the C3 areas by the C3 exhaust system. In general, air cascaded into the C3 areas will be from adjacent C2/C3 subchange rooms. C3 exhaust will pass through one stage of HEPA filters and be discharged to the atmosphere by the exhaust fans. C3 exhaust fans are provided with variable frequency drives.

C5 Ventilation (C5V) System

Where there is in-bleed air from the C3 system to the C5 system, fan cascade trip interlocks protect the system from backflow.

The C5 areas in the LAW vitrification facility will be composed of the following:

- Pour caves
- Container transfer tunnel
- Buffer storage area
- C3/C5 drains/sump collection vessel room
- Process cells
- Finishing line

Air will be cascaded into the C5 areas and exhausted by the C5 exhaust system. Engineered ventilation pipe entries (air in-bleeds) through the C5 confinement boundary will be protected by backflow isolation dampers. C5 exhaust will pass through two stages of HEPA filters and be discharged to the atmosphere by the exhaust fans. C5 exhaust fans are provided with variable frequency drives.

4.1.3.9 LAW Melter Handling (LMH) System

The Low Activity Waste (LAW) melter handling system (LMH) provides the mechanical handling equipment associated with the import of new Locally Shielded Melters (LSMs) and the export of failed or spent LSMs. The LMH system also provides specific facility structures to support LAW LSMs import and export operations, as well as miscellaneous mechanical handling equipment to support operations.

The function of System LMH include:

- Transfer new LAW melter from equipment pad to LAW Melter operating position (L-0112).
- Transfer equipment between C1/C2 airlock (L-0113) and monorail hoist maintenance rooms (L-B023A/ L-B023B).
- Transfer spent melters that are seal-welded and ready for transport from operating position (L-0112) to equipment pad.

The LAW Assembly/Staging Pad Area is located external to the LAW Facility at an elevation of +3’-0”. New melters are assembled in the assembly/staging pad area. The East side of the pad is configured as a loading dock to permit transfer of a spent LAW melter to the Tank Operating Contractor (TOC) supplied melter transport system. The pad incorporates LAW melter rails and provides multiple embed locations to mount a winch assembly.

The LAW Winch Assembly provides the motive force for transferring the new or spent LSM along fixed melter rails. The winch assembly operates in conjunction with pulley block assemblies to transfer an LSM. The winch assembly is only installed for LSM transfer operations and then is removed and stored.

When the LAW melter has reached the end of its operating life, it is disconnected from all systems and all penetrations on the enclosure are seal welded before it is be moved out of the LAW vitrification facility. Prior to deployment the LSM is surveyed and decontaminated as required and is loaded on the TOC melter transport system.

4.1.4 High Level Waste Facility

Figure 4A-4 presents a simplified process flow diagram of the High Level Waste (HLW) processes. The HLW facility will consist of several process systems designed to perform the following functions:

- Receive pretreated HLW slurry.
- Convert blended HLW slurry and glass formers into glass.
- Treat melter offgas.
- Handle IHLW canisters.
- Store IHLW canisters.
- Provide supporting equipment in the melter cave.
- Handle miscellaneous secondary waste.
- Ventilate the HLW facility.

The following figures located in Appendix 4A and design drawings found in Appendix 10 provide additional detail for the HLW facility:

- WTP Simplified Flow Diagram (Fig. 4A-1)
- HLW Facility Flow Diagram (Fig. 4A-4)
- Typical System Figures (Fig. 4A-53 and 4A-54) common features for each regulated system

Instrumentation, alarms, controls, and interlocks will be provided for the tank systems and miscellaneous treatment systems to indicate or prevent the following conditions, as appropriate:

- Overfilling: Plant items are protected against overfilling by liquid level indication, high level instrumentation interlocks to shut off feed sources, and process control system control functions backed up by hard wired trips as required.
- Loss of containment: Plant items are protected against containment loss by liquid level indication, and by process control system and alarm functions as required, including shut off of feed sources. Tanks or miscellaneous units (MUs) that manage liquid mixed or dangerous waste is provided with secondary containment. Tank and MU system ancillary equipment is provided with secondary containment or is visually inspected for leaks on a daily basis in accordance with WAC-173-303-640(4)(f). Some tanks or MUs may utilize daily visual inspection for leak detection. Sumps associated with the management of mixed or dangerous waste are provided with liquid level instrumentation and an ejector or pump to empty the sump as needed.
- Inadvertent transfers of fluids: System sequential operations are properly interlocked to prevent inadvertent transfers at the wrong time or to the wrong location.
- Loss of mixing function: Tank systems are instrumented (air pressure/flow indication) to prevent hydrogen accumulation and solids settling. Tanks with agitators are instrumented to prevent agitator and/or vessel damage at low liquid level.
- Unsafe or off-normal melter operating conditions.
- Degraded emissions control equipment and/or operating conditions.
- Loss of air flow: The ventilation system is designed to create a pressure gradient which causes air to flow through engineered routes from an area of lower contamination potential to an area of higher contamination potential.
- Loss of site power.

In addition to level control, temperature and pressure may be monitored for tank systems and miscellaneous treatment systems in some cases.

Regulated process and leak detection system instruments and parameters will be provided in Table III.10.E.G for tank systems and in Table III.10.J.C for miscellaneous treatment sub-systems.

Descriptions of the HLW vitrification process, melter offgas treatment systems, and IHLW glass canister handling systems are provided in the following sections.

4.1.4.1 HLW Melter Feed Process

Process flow diagrams of the HLW Melter Feed Process (HFP) System are provided in Appendix 10.1. The following HLW melter feed description is identical for both Melter 1 (HMP-MLTR-00001) and Melter 2 (HMP-MLTR-00002). The HLW melter feed process consists of the following:

- HLW Concentrate Receipt Process (HCP) System.
- HLW Melter Feed Process (HFP) System.
- HLW Glass Formers Reagent (GFR) System (the GFR system does not manage dangerous waste and is provided for information only).

HLW Concentrate Receipt Process (HCP) System

The HCP system consists of the transfer piping from Pretreatment Facility (PTF) to HLW, a sump (HCP-SUMP-00001), and its ancillary equipment.

HLW Melter Feed Process (HFP) System

The primary function of the HFP system is to receive HLW feed slurry via the HCP from the PTF, mix glass formers with HLW feed to form a uniform blend, and provide a blended feed to the HLW melter. An analysis of a waste sample determines a glass additive formulation for the conversion of the waste to glass. The glass additives specified in the formulation are weighed, transferred to HLW, and mixed with the waste.

The HFP system consists of the following vessels and associated ancillary equipment:

- HLW Feed Preparation Vessel (HFP-VSL-00001/5)
- HLW Melter Feed Vessel (HFP-VSL-00002/6)
- Pumps, demisters, piping, and ancillary equipment

HLW Feed Preparation Vessel (HFP-VSL-00001/5)

The HLW Feed Blend Vessel (HLP-VSL-00028) or backup HLW Lag Storage Vessel (HLP-VSL-00027/AB) located in the PTF feed waste through the HLP/HCP underground waste transfer piping to the HLW HFP system Feed Preparation Vessels (HFP-VSL-00001/5). The HFP vessels are provided with sample supply and return lines to autosamplers ASX-SMPLR-00029 (HFP-VSL-00001/2) and ASX-SMPLR-00042 (HFP-VSL-00005/6). Samples of the waste are taken from the HLW Feed Preparation Vessel to determine the ratio of glass formers to waste. Blended glass formers are sent to the glass former feed mixers in HLW via the balance of facilities glass former system. The blend may include materials, such as silica, boric acid, calcium silicate, ferric oxide, lithium carbonate, and sucrose. The glass formers are gravity-fed to the HLW Feed Preparation Vessel (HFP-VSL-00001/5) and blended with the waste to form a uniform slurry.

HLW Melter Feed Vessel (HFP-VSL-00002/6)

The blended slurry is transferred from the HLW Feed Preparation Vessel (HFP-VSL-00001/5) to the corresponding HLW Melter Feed Vessel (HFP-VSL-00002/6) and then to a HLW melter (HMP-MLTR-00001/2).

All four HFP vessels are equipped with the following:

- Mechanical agitators and pumps.
- Air spargers for purging hydrogen from the vessel head space during offnormal events.
- Demister on the vessel vent line for de-entrainment.
- Cooling jackets.
- Steam ejectors.
- Antifoaming agent addition capability.
- Overflow line to sump HFP-SUMP-00002/5, equipped with flapper valve to prevent air in-leakage.

HLW Glass Formers Reagent (GFR) System

The HLW GFR system contains glass former feed mixers located at the 73 ft. elevation of the HLW facility. The feed mixers receive blended glass formers by dense-phase pneumatic conveyors from transporters. The transporters are located in the glass formers room within the balance of facilities building.

Following the blending cycle, the glass formers are gravity-fed with a rotary feeder into the HLW Feed Preparation Vessels (HFP-VSL-00001/5), where the blended glass formers are mixed with the waste feed. This GFR equipment is located in an isolated area that serves as a contamination barrier between the Feed Preparation Vessels (HFP-VSL-00001/5) and the glass former supply. The rotary feeder valve controls the rate of glass former addition into the Feed Preparation Vessels (HFP-VSL-00001/5).

The HLW GFR mixers are equipped with filters to remove dust from the air used for pneumatic conveying and blending. It is anticipated that a series of single filter cartridges will be mounted on the top of the mixers. The filters are cleaned by introducing compressed air through the cleaning nozzle to blow accumulated dust back into the mixers. The HLW GFR mixers are equipped with load cells to weigh the glass formers to confirm that the material in the upstream blending silo is conveyed to the feed mixers. The load cells also confirm that the glass formers are transferred out of the feed mixers to the HLW Feed Preparation Vessels (HFP-VSL-00001/5).

4.1.4.2 HLW Melter Process (HMP) System

Figure 4A-27 presents a simplified process flow diagram of the HLW melter process (HMP) system. Process flow diagrams of the HMP System are provided in Appendix 10.1. The primary functions of HMP miscellaneous treatment sub-system are to convert blended waste feed and glass formers into molten glass, deliver molten glass to HLW canisters, fill the canisters with molten glass waste, and monitor and control glass waste level during waste filling. The melter process system (HMP) is identical for both HLW Melters (HMP-MLTR-00001/2).

The HMP system includes the HLW Melters (HMP-MLTR-00001/2), two discharge chambers and two pour spouts per melter, and primary and secondary canister level detection systems. The melter and pour spout will be remotely operated in the C5/R5 melter cave. There will be no personnel access to this cell after processing of the HLW feed stream begins.

HLW Melters (HMP-MLTR-00001/2)

The two HLW Melters (HMP-MLTR-00001/2), located in melter cave 1 and melter cave 2, respectively, are encased in a rectangular steel shell. Each is lined inside with refractory material as thermal insulation and to withstand corrosion by molten glass. The melter is provided with water cooling to maintain a thermal gradient in the bricks, prevent migration of glass through the bricks, and reduce heat load to the process cell. The lid of the HLW Melter will be sealed to the melter shell in order to provide gas containment. The lid will provide a support structure through which subcomponents can be mounted. Penetrations are sealed by appropriate fittings that allow remote removal and replacement.

Waste feed will be introduced to the melter as a slurry through nozzles in the melter lid. Each feed nozzle will be individually supplied from a slurry pump. The water and volatile feed constituents in the slurry will evaporate, leaving behind a layer of material known as the cold cap. Waste feed components and glass formers will undergo chemical reactions, be converted to their respective oxides, and dissolve into the molten glass. New slurry will be added at about the same rate as the cold cap dissolves, maintaining the quantity of cold cap material at a steady level. The molten glass level in the melter is maintained between the top of the electrodes and below the upper edge of the glass contact refractory blocks. The rate of feed addition to the melter determines the cold cap coverage in the melt pool. The feed addition rate can be controlled based on the average plenum temperature measured by thermocouples mounted in the melter lid. Air injectors may be used to mix molten glass and improve heat distribution.

Each melter (HMP-MLTR-00001/2) includes three internal compartments: the melter chamber (glass pool), two discharge chambers, and a plenum just above the glass pool. Melter pool level measurement is used throughout melter operations in conjunction with alarms for high or low glass pool levels. Each discharge chamber is a heavily insulated box on the south side of the melter, housing the discharge trough and a connection flange for the pour spout assembly. The plenum is lined with refractory to withstand hot corrosive gases, thermal shock, and waste splatter.

The power to the electrodes is regulated by the process control system to maintain the temperature within range. The heat for the initial HLW Melter startup is provided by radiant electric heaters temporarily mounted on the lid of the melter. These heaters melt the glass formers sufficiently to make it ionically conductive between the Melter's joule heating electrodes. When a conducting path is established, the Melter is heated in a controlled manner by increasing the current between the electrodes through the glass (a process known as *joule heating*). The nominal glass melt pool temperature is approximately 1150°C. As the slurry is fed, molten glass is formed by vitrification of the cold cap materials into the glass melt. When the melt level rises to a predetermined level, it can be discharged into a canister.

The gas produced during melting is mainly steam and contains volatile components and airborne matter that require removal prior to discharge to the atmosphere. This offgas is diluted by air from four sources; air in-leakage through the Melter lid and discharge port, instrumentation and sparging, film cooler air, engineered air in-bleeds in the melter shell. The Melter plenum is maintained at a vacuum with offgas system blowers and control injection of air into the film cooler near the Melter exhaust. This ensures containment and avoids Melter pressurization. This vacuum is sensed at a location near the plenum where blockage and feed splatter is unlikely. The sensed vacuum is used to drive a control valve that regulates the in-flow in the Melter exhaust line.

The glass level in the Melters (HMP-MLTR-00001/2) is maintained between the top of the upper electrodes and below the upper edge of the melter's refractory blocks. The level is determined directly by bubbler tubes that indicate density and glass depth. Thermocouples housed in thermowells that penetrate the cold cap and are immersed in the molten glass also indirectly indicate molten glass level. Level measurement is used throughout melter operations in conjunction with alarms for high or low glass pool levels.

Glass Discharge System

Discharge is achieved by transferring glass from near the bottom of the melt pool up through a riser and out of the Melter through a side discharge chamber. Under each of the two discharge chambers there is a pour spout that directs the molten glass flow from the Melter discharge chamber to the respective HLW canister.

The glass level in the Melter is maintained between the top of the electrodes and the overflow level of the discharge trough. The Melter glass pool level will be measured to indicate when to start and stop glass discharge. Each Melter has two independently operated glass discharge systems, adjacent to each other on one side of the Melter.

Each system includes an airlift riser, an airlift lance, a glass pour trough, and a heated discharge chamber. Glass is discharged by introducing gas into the molten glass in the discharge riser. The gas increases the level in the riser, causing the molten glass to flow down the trough and fall from the tip of the trough into the canister. When the desired level in the canister is reached, the air lift gas is turned off, and the glass level in the riser recedes stopping the flow of glass to the canister. During pouring operations, a remote camera is used to view the pour stream within the pour spout assembly. The camera is for observation only and is not a regulated operation.

Canister Level Detection

The purpose of each canister level detection system is to monitor the molten glass level within the HLW canister and to prevent canister overfilling. During glass pour, the level detection system is used to monitor the glass level to ensure the canister is filled to the desired level. The level detection system also will be able to monitor the rate at which the glass level is rising in the canister. There is a primary and a secondary monitoring system, which is consistent with standard vessel level control. A primary system that operates through the process control system is used for normal operations, and a secondary "hard-wired" system is used to back up the primary system and automatically shut down the fill before the overflow limit is reached. The primary level detection system is a thermal imaging camera that provides continuous level monitoring over the upper 60% of the canister. In the event that the primary thermal imaging camera malfunctions, the backup discrete point radiation detection system will indicate a filled canister. The backup system is designed only to detect a discrete high glass level, producing a contact closure when the high level is sensed. When the high level has been reached, the system will automatically shut down the melter air lift which, in turn, will stop the glass pour. The system is limited to discrete levels of glass fill, not continuous monitoring.

During glass pour, the canister level detection system will display a thermal image on a monitor and will utilize a serial connection to interface with the process control system for indication and control purposes. The imaging software will be used to continuously monitor the level of glass in the canister and will provide an output of the glass level to control loops in the process control system. A high-level condition will be indicated by the process control system, which will initiate alarms and/or control sequences to control the melter pour. The infrared image will be available through the plant closed circuit television system. The control system will be able to store the level of the glass in a canister between batch pours when the temperature in the canister could be cooled down sufficiently to prevent the thermal imaging system from detecting the glass level. The level is reset to zero with each new canister. The control system will also be used to monitor the average temperature of the glass near the top of the pour. If the temperature is lower than a set point value, an alarm will be initiated by the process control system.

Another function of the system is to detect the rate at which the glass level is rising in the canister. This rate gives an indication of deviation between expected normal pour rates. A deviation could indicate a malfunction of the glass discharge system, and an alarm would be initiated.

Instrumentation, alarms, controls, and interlocks will be provided for the HMP system to indicate or prevent the following conditions:

- The melter cannot pour without verification that the bogie is present.
- The melter cannot pour without verification that the canister is present.
- The melter cannot pour if the canister is greater than 95% full.

4.1.4.3 Melter Offgas Treatment Process (HOP) System

Process flow diagrams of the HOP System are provided in Appendix 10.1. The HOP system is composed of vessels and miscellaneous units (sub-systems), separated into the primary and secondary melter offgas treatment systems.

Melter offgas is generated from the vitrification of HLW in the joule-heated melter. The rate of generation of gases in the melter is dynamic depending on water content and not steady. Each HLW Melter (HMP-MLTR-00001/2) generates offgas resulting from decomposition, oxidation, and vaporization of feed material. The typical constituents contained in the HLW offgas stream are as follows:

- Nitrogen oxides from decomposition of metal nitrates in the melter feed.
- Chloride, fluoride, and sulfur as oxides, acid gases, and salts.
- Entrained feed material and glass.

In addition, the HLW Melters (HMP-MLTR-00001/2) generate small quantities of other volatile compounds including iodine-129, carbon-14, tritium, and volatile organic compounds. The carbon-14 and tritium emissions are in the form of carbon dioxide and water, respectively.

The HOP system is divided into a primary system and a secondary system. The purpose of the HOP system is to cool and treat the Melter offgas and vessel ventilation offgas to a level that is protective of human health and the environment. The offgas system must also provide a pressure confinement boundary that will control Melter pressure and prevent vapor releases inside the plant. The design of the melter offgas system must accommodate changes in offgas flow from the Melter (HMP-MLTR-00001/2) without causing the melter to pressurize.

Controls developed to prevent or mitigate equipment malfunction are incorporated into the design. The *Description of HLW Vitrification Bypass Events*, 24590-HLW-PER-PR-03-001 (Appendix 10.18), identifies operating conditions that would divert the melter offgas to an alternate flow path. The bypasses are automatically activated via interlocks or remotely operated via a valve when an upset or maintenance situation occurs.

Initial treatment of offgas from the melter is provided by the primary offgas treatment system. This primary offgas system is designed to handle intermittent surges of up to seven times steam normal flow and up to three times non-condensable flow from feed. Each primary offgas system consists of a film cooler, submerged bed scrubber, a wet electrostatic precipitator, a high efficiency mist eliminator (HEME), and high efficiency particulate air (HEPA) filters. This system cools the offgas and removes aerosols and particulates.

Additionally, a standby line from the Melter (HMP-MLTR-00001/2) to the Submerged Bed Scrubber (HOP-SCB-00001/2) is provided in the unlikely case that the primary offgas line plugs. This standby line includes an actuated valve as the isolation device. As soon as the Melter vacuum decreases to a set point, the valve is actuated open and offgas flow is allowed through both lines to the Submerged Bed Scrubber, thereby preventing melter pressurization. In the event that a Melter surge is much higher than the system is designed to handle, a pressure relief valve acts as the pressure relief point venting the offgas to the melter cave. Any offgas that diverts to the Melter cave is drawn through C5V HEPA Filters to remove particulates and then is discharged through the stack to the atmosphere. Once the Melter pressure is relieved, the valve closes.

Offgas from vessel ventilation system (PVV) consists primarily of air, water vapor, and minor amounts of aerosols generated by the mixing or movement of vessel contents. The vessel ventilation header joins the primary offgas system after the Wet Electrostatic Precipitators (HOP-WESP-00001/2) and prior to the HEMEs. After the HEPA Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B), the offgas is routed to the secondary offgas treatment system.

The following sections provide descriptions of major melter offgas treatment components and are identical for both Melter 1 (HMP-MLTR-00001) and Melter 2 (HMP-MLTR-00002).

4.1.4.3.1 Primary Melter Offgas Treatment (HOP) System

The purpose of the primary offgas treatment system is to cool the melter offgas and to remove offgas aerosols and particulates generated by the Melter (HMP-MLTR-00001/2) and from the vessel ventilation air. This treatment system consists of the following:

Tank System:

- SBS Condensate Receiver Vessel (HOP-VSL-00903/4)

Miscellaneous Treatment Units (Sub-Systems):

- Offgas Film Cooler (HOP-FCLR-00001/2) and Standby Offgas Insert (HOP-FCLR-00003/4)
- Submerged Bed Scrubber (HOP-SCB-00001/2)
- Wet Electrostatic Precipitator (HOP-WESP-00001/2)
- High-Efficiency Mist Eliminator (HEME) (HOP-HEME-00001A/1B/2A/2B)
- HEPA Preheater (HOP-HTR-00001B/2A/5A/5B)
- High Efficiency Particulate Air (HEPA) Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B)

Film Cooler (HOP-FCLR-00001/2/3/4)

The function of the Film Cooler (HOP-FCLR-00001/2) is to cool the offgas and entrained molten glass droplets below the glass adhesion temperature to minimize glass deposition on the offgas piping walls. The offgas exits the Melter (HMP-MLTR-00001/2) and is mixed with air in the offgas Film Cooler. The Film Cooler is a double-walled pipe designed to introduce injected gas axially along the walls of the offgas pipe through a series of holes or slots in the inner wall. Each melter has a single Film Cooler.

A mechanical reamer may be mounted on the Film Cooler (HOP-FCLR-00001/2) to periodically remove solids build-up on the inner film cooler wall. The reaming device (wire brush or drill) would be periodically inserted into the film cooler for mechanical solids removal.

Submerged Bed Scrubber (HOP-SCB-00001/2)

The offgas from the HLW melter Film Cooler (HOP-FCLR-00001/2) enters the Submerged Bed Scrubber (HOP-SCB-00001/2) for further cooling and solids removal. The Submerged Bed Scrubber is a passive device designed for removal of large entrained particulate from melter offgas, cooling and condensation of melter vapor emissions, and interim storage of condensed fluids. It will also quench the offgas to a desired discharge temperature through the use of cooling coils/jacket.

The Submerged bed Scrubber (HOP-SCB-00001/2) has two offgas inlets. The offgas normally enters the Submerged Bed Scrubber through the primary inlet pipe that runs down through the center of the bed to the packing support plate. The bed-retaining walls extend below the support plate, creating a lower skirt to allow the formation of a gas bubble underneath the packing. The entire bed is suspended off the floor of the Submerged Bed Scrubber to allow the scrubbing solution to circulate freely through the bed. After formation of the gas bubble beneath the packing, the offgas then buoys up through the packed bed. The packing breaks larger bubbles into smaller ones to increase the gas to water contacting surface, thereby increasing particulate removal and heat transfer efficiencies.

To maintain a constant liquid level within the Submerged Bed Scrubber (HOP-SCB-00001/2), it will be equipped with an overflow line that allows for the continuous discharge of offgas condensate and some scrubbed particulates to the SBS Condensate Receiver Vessels (HOP-VSL-00903/4). The SBS Condensate Receiver Vessels are also equipped with a cooling jacket. The rate of condensate discharge is determined by how much the offgas temperature is lowered below its dew point.

To minimize the buildup of the solids in the bottom of the Submerged Bed Scrubber, condensate from the SBS Condensate Receiver Vessels (HOP-VSL-00903/4) will be re-circulated back to the Submerged Bed Scrubber and injected through multiple lances to agitate and suspend solids on the Submerged Bed Scrubber vessel floor. The solids will then be pumped directly off the Submerged Bed Scrubber vessel floor to the Plant Wash and Drains Vessel (RLD-VSL-00008). This purging and recycling process occurs simultaneously. Venting of this condensate receiver vessel is via the submerged bed scrubber into the main offgas discharge pipe.

The scrubbed offgas discharges through the top of the submerged bed scrubber and is routed to the Wet Electrostatic Precipitator (HOP-WESP-00001/2) for further particulate removal.

Wet Electrostatic Precipitator (HOP-WESP-00001/2)

The Submerged Bed Scrubber offgas is routed to the Wet Electrostatic Precipitator (HOP-WESP-00001/2) for removal of aerosols down to and including submicron size. The offgas enters the unit and passes through a distribution plate. The evenly distributed saturated gas then flows up through the tubes which act as the positive electrodes. Each of these tubes has a single negatively charged electrode, which runs down the centerline of each tube. A high-voltage, direct current transformer supplies the power to the electrodes. A strong electric field generated along the electrodes gives a negative charge to the aerosols. The negatively charged particles move toward the positively charged tube walls for collection. Collected particles are then washed from the tube walls along with collected mists. As the gas passes through the tubes, the first particles captured are the water droplets. As the water droplets gravity drain through the electrode tubes the collected particles are washed off and the final condensate is collected in the wet electrostatic precipitator dished bottom area. A water spray may be used periodically to facilitate washing collected aerosols from the tubes. The tube drain and wash solution is routed to the SBS Condensate Receiver Vessels (HOP-VSL-00903/4).

High-Efficiency Mist Eliminator (HOP-HEME-00001A/1B/2A/2B)

Further removal of aerosols is accomplished using the High-Efficiency Mist Eliminator (HEME). The HEMEs also reduce the particle loading rate on the HEPA filters. Each HEME is a high-efficiency demister that has a removal efficiency of greater than 99% for aerosols down to the submicron size. As the offgas passes through the HEME (HOP-HEME-00001A/1B/2A/2B), the liquid droplets and other aerosols within the offgas interact with High-Efficiency Mist Eliminators' filter elements. As the aerosols contact the filaments they adhere to the filaments surface by surface tension. As the droplets agglomerate and grow, they eventually acquire enough mass to fall by gravity to the bottom of the unit. These collected droplets are estimated to contain the majority of the water soluble offgas radioactivity and will be collected in the bottom of the High-Efficiency Mist Eliminators (HOP-HEME-00001A/1B/2A/2B). The collected condensate will gravity drain into the SBS Condensate Receiver Vessel (HOP-VSL-00903/4). As the condensate flows down through the bed, a washing action is initiated that will help collect solids from the filter elements. However, some solids may accumulate in the bed over time, causing the differential pressure drop across the bed to increase. When the pressure drop across the High-Efficiency Mist Eliminators reaches a predefined level, it is washed with water to facilitate removal of accumulated solids. Some insoluble solids may remain, and their accumulation will eventually lead to the replacement of the High-Efficiency Mist Eliminators' filter elements.

HEPA Preheater (HOP-HTR-00001B/2A/5A/5B) and Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B)

Next, the offgas is heated using HEPA Preheaters (HOP-HTR-00001B/2A/5A/5B) to avoid condensation in the HEPA Filters a temperature above the gas streams dew point and then passed through a dual set of HEPA Filters (HOP-HEPA-00001A/1B/2A/2B/7A/7B/8A/8B) to provide high-efficiency submicron removal.

When the differential pressure drop across the filters becomes too high, they will be remotely changed out. The system is composed of two parallel HEME/HEPA Preheater/HEPA Filter trains. The offgas passes through one train while the other remains available as an installed backup.

Maintenance Ventilation Bypass

A maintenance bypass will also be installed, allowing the Melter offgas to bypass the Film Cooler (HOP-FCLR-00001/2), the Submerged Bed Scrubber (HOP-SCB-00001/2), and the Wet Electrostatic Precipitator (HOP-WESP-00001/2). The bypass line would feed into the HEME/HEPA filtration and other gas cleaning steps. Prior to initiating use of the maintenance ventilation line, waste feed would be secured, and the melter placed into an idle condition. No waste feed would be fed to the affected melter when the maintenance ventilation line is in use. The *Description of HLW Vitrification Bypass Events*, 24590-HLW-PER-PER-03-001 (Appendix 10.18), provides additional information on HLW bypass events.

4.1.4.3.2 Secondary Offgas Treatment (HOP) System

There is one secondary offgas treatment train for each HLW Melter. The combined primary offgas stream and vessel ventilation offgas stream is discharged to the secondary offgas treatment system. The secondary offgas system will treat the combined offgas to a level protective of human health and the environment. Specifically, the secondary offgas treatment system will remove radioactive iodine, oxides of nitrogen (NOx), volatile organic compounds, and acid gases, as required, to meet the facility's air discharge requirements. The secondary offgas treatment system consists of the following miscellaneous treatment sub-systems:

- Booster Extraction Fans (HOP-FAN-00001A/1B/1C/9A/9B/9C)
- Activated Carbon Adsorber (HOP-ADBR-00001A/1B/2A/2B)
- Silver Mordenite Preheater (HOP-HX-00002/4)
- Silver Mordenite Column (HOP-ABS-00002/3)
- Catalyst Skid Preheater (HOP-HX-00001/3)
- Catalyst Skid Electric Heater (HOP-HTR-00001/7)
- Thermal Catalytic Oxidizer (HOP-SCO-00001/4)
- NOx Selective Catalytic Reducer (HOP-SCR-00001/2)
- Stack Extraction Fans (HOP-FAN-00008A/8B/8C/10A/10B/10C)

Activated Carbon Adsorber (HOP-ADBR-00001A/1B/2A/2B)

The Activated Carbon Adsorber miscellaneous unit (sub-system) removes mercury from the offgas. The activated carbon adsorber will contain a total of four units (two per Melter). The offgas from each melter normally flows through two activated carbon adsorber units in series. When gaseous mercury is detected breaking through the leading unit, the offgas flow is manually changed to place the trailing unit into the lead. In this configuration, only one adsorber is used while the exhausted adsorber media in the off-line unit is removed and replaced. The newly loaded unit is then placed back on-line in the lag position.

The new activated carbon media are gravity batch loaded into the top of the unit. The spent activated carbon is gravity unloaded at the bottom of the unit into containers for disposal. Each activated adsorber is provided with a means to add water for the fire suppression system.

Silver Mordenite Column (HOP-ABS-00002/3)

Two Silver Mordenite Column assemblies (one for each Melter) will be located in the HLW vitrification facility. The Silver Mordenite Columns will be used to remove gaseous radioactive iodine (I-129) and other gaseous halogens, such as fluorine and chlorine.

The Silver Mordenite Columns (HOP-ABS-00002/3) will consist of approximately 36 silver mordenite adsorbers mounted in a bank configuration to a mounting frame within a housing. Offgas will enter the upper (or inlet) plenum of each Silver Mordenite Column, flow in parallel through the adsorbers to the lower (or exit) plenum, pass through a replaceable roughing filter, and exit. The columns' design will allow manual removal and replacement of adsorbers. Adsorbers will be sized to fit into standard 55 gallon waste drums for disposal.

The silver mordenite adsorbers are essentially cartridges filled with silver mordenite. Silver mordenite is a silver zeolite adsorption media in the form of cylindrical pellets. Halogens will react with the silver in the bed and become trapped within the matrix. Halogens are not loaded uniformly within the Silver Mordenite Adsorber cartridges. Adsorption reactions occur within an action zone (or mass transfer zone) that varies in length depending on the temperature of the bed and the gas velocity through the bed. Halogens will begin loading at the beginning of the silver mordenite beds and progressively load the silver through the column until breakthrough is reached at the end of the column. Once halogen breakthrough occurs or a predetermined lifespan is reached, the silver mordenite adsorbers will require replacement.

Thermal Catalytic Oxidizer (HOP-SCO-00001/4) and NOx Selective Catalytic Reducer (HOP-SCR-00001/2)

The offgas is passed through catalytic oxidizer/reducer skids (HOP-SKID-00005/7) housing a heat recovery exchanger (HOP-HX-00001/3), an electric heater (HOP-HTR-00001/7), Thermal Catalytic Oxidizer (HOP-SCO-00001/4), and NOx Selective Catalytic Reducer (HOP-SCR-00001/2) miscellaneous treatment unit sub-systems to remove volatile organics compounds (VOC), carbon monoxide, nitrogen oxide compounds, and acid gases in the offgas stream.

The heat recovery exchange first raises the offgas temperature using the hot offgas from the catalyst beds. The electric heater is used to supplement the heat recovery exchange primarily during start-up and when operating with low NO_x concentrations. The heated offgas is passed through the VOC catalyst to oxidize VOCs and carbon monoxide to carbon dioxide and water vapor. The offgas is then injected with a mixture of ammonia vapor and C3 air from an ammonia/air dilution skid. Following ammonia injection, the offgas is passed through the SCR catalyst to reduce NO_x to nitrogen and water vapor. The reduction reaction is exothermic, significantly increasing the offgas temperature. The outgoing hot offgas is cooled down in the heat exchanger and concurrently serves as the heating media for the incoming offgas. The cooled offgas stream is then directed to the exhaust stack through the stack monitoring system.

4.1.4.4 Process Vessel Vent (PVV) System

The process vessel vent system consists of vessel ventilation piping and the header that is combined with the primary offgas treatment system. The vessel ventilation header joins the primary offgas system after the Wet Electrostatic Precipitators (HOP-WESP-00001/2) prior to entering high efficiency mist eliminators (HOP-HEME-00001A/B/2A/B). The vessel ventilation system offgas consists primarily of air, water vapor, and minor amounts of aerosols generated by the movement of vessel contents.

The process vessel vent system provides a vacuum on connected vessels relative to the host cell. The vacuum is controlled by an automatic pressure control valve system on the vessel vent header. The vessels attached to the vessel vent system are the melter feed and feed preparation vessels (HFP-VSL-00001/2/5/6), waste neutralization vessel (HDH-VSL-00003), acidic waste vessel (RLD-VSL-00007), the plant wash and drains vessel (RLD-VSL-00008) indirectly via the acidic waste vessel, and breakpots.

4.1.4.5 HLW Pulse Jet Ventilation (PJV) System

A process flow diagram of the PJV System is provided in Appendix 10.1. The PJV system consists of the following miscellaneous treatment units (sub-systems):

- HEPA Filter (PJV-HEPA-00004A/4B/5A/5B)
- Pulse Ventilation HEPA Electric Preheater (PJV-HTR-00002)
- Pulse Vent Extraction Fan (PJV-FAN-00002A/B)

The PJV system draws exhaust air from selected HLW vessels, primarily those that use fluidic equipment, pulse jet mixers (PJMs) and reverse flow diverters (RFDs), for mixing and transfer of process fluids out of vessels for processing or sampling. Fluidic equipment use a column of air to lift and drop the liquid level in PJM or RFD vessels, which are located inside process vessels. Fluidic equipment will produce gaseous exhaust air as part of their normal operations. Fluidic exhaust air from individual vessels combines in a common header. Prior to discharge to the atmosphere, the exhaust air is heated in the pulse ventilation electric preheater (PJV-HTR-00002) to eliminate aerosols and reduce relative humidity of the gas stream and filtered by the HEPA filters (PJV-HEPA-00004A/4B/5A/5B) to remove particulates that may be present. The exhaust air is then pulled through the pulse jet extraction fans (PJV-FAN-00001A/B) and discharged through a dedicated stack. The HLW vessels attached to the PJV system are SBS condensate receiver vessels (HOP-VSL-00903/904), SBS (HOP-SBC-00001/2), acidic waste vessel (RLD-VSL-00007), plant wash and drains vessel (RLD-VSL-00008) and canister decontamination vessels (HDH-VSL-00002/4).

4.1.4.6 Radioactive Liquid Waste Disposal (RLD) System

Process flow diagrams of the RLD System is provided in DWP Appendix 10.1. The primary functions of the RLD tank system are to receive, store, and transfer various effluents from different HLW treatment systems. Various operations, such as neutralization, mixing, and sampling of the waste, are performed by theRLD system as required. Sampling capabilities are provided for the RLD vessels (RLD-VSL-00007/8) by the HLW facility autosampler ASX-SMPLR-00028. The RLD system includes sample supply and return lines to RLD vessels RLD-VSL-00007/8.

The RLD system contains three tanks located in the HLW facility wet process cell:

- Acidic Waste Vessel (RLD-VSL-00007)
- Plant Wash and Drains Vessel (RLD-VSL-00008)
- Offgas Drains Collection Vessel (RLD-VSL-00002)

The RLD system receives mixed waste effluent from the HOP system, the HLW canister decontamination handling (HDH) system, and periodic plant and vessel washes within the HLW facility.

These effluents include the following:

- Purge liquid from the Submerged Bed Scrubbers (HOP-SCB-00001/2)
- Drains from the Wet Electrostatic Precipitators (HOP-WESP-00001/2)
- Drains from the High-Efficiency Mist Eliminators (HOP-HEME-00001A/1B/2A/2B)
- Various plant and vessel washes and sump water
- Miscellaneous mixed waste streams, including PJV line drain, autosampler drains, canister decontamination effluents, and effluents from decontamination of equipment in the HSH Decontamination Tank (HSH-TK-00001/2)

<u>Acidic Waste Vessel (RLD-VSL-00007)</u>

This vessel collects liquid from the Submerged Bed Scrubber (HOP-SCB-00001/2) and the SBS Condensate Receiver Vessel (HOP-VSL-00903/4).

The collected liquid waste consists of submerged bed scrubber purge, wet electrostatic precipitator drain, high-efficiency mist eliminator drain, and neutralized canister decontamination waste. Sampling for pH will be performed prior to each transfer. The contents are transferred to the PWD system in the pretreatment facility for treatment, as required.

Plant Wash and Drains Vessel (RLD-VSL-00008)

This vessel collects liquids from vessels, sumps, and plant washes within the HLW facility, including wash water from cell floors, equipment exterior surfaces, and stainless steel liners. This vessel also collects the C3 area fire water. Sampling will be performed by an automated sample system to characterize the liquid waste. The contents are transferred to the PWD system in the pretreatment facility for treatment, as required.

Offgas Drains Collection Vessel (RLD-VSL-00002)

This vessel receives condensate from the HOP pipes and PJV drains downstream from the High-Efficiency Mist Eliminator (HOP-HEME-00001A/1B/2A/2B) during off-normal operation. The contents are transferred to the Plant Wash and Drains Vessel (RLD-VSL-00008) in the HLW facility for processing.

4.1.4.7 IHLW Glass Canister Handling Process

The IHLW glass canister handling will consist of the following systems:

- HLW canister receipt handling (HRH) system
- HLW canister pour handling (HPH) system
- HLW canister decontamination handling (HDH) system
- HLW canister export handling (HEH) system

The individual systems and their primary functions are described below:

HLW Canister Receipt Handling (HRH) System

The HRH system consists of the equipment, controls, and interlocks required for importing a clean canister into the facility. This system consists of the canister import truck bay, the canister import room, and the canister import tunnel. These areas are located on the south side of the facility.

The sequence of operations and the equipment used for canister import are as follows:

- The shipping crates are unloaded from the transport truck with the canister import crane and placed in the staging area.
- The canisters are then individually removed from the shipping crate and set on the canister inspection/rotation table.
- The canister import room roller shutter door is opened and the canister inspection/rotation table rotates the canister to vertical. The canister import monorail hoist and grapple lift and transfer the canister to the canister import room. The canister is either set in the canister import buffer rack or placed in the canister import bogie. When the canister is transferred to the canister import tunnel, the shielded clean canister import hatch is opened and the canister is lowered into the canister import bogie below, and the hatch is closed and sealed.
- The canister import bogie is transferred under the canister handling cave to the shielded canister handling cave import hatch location. The canister handling cave hatch is then opened and the canister handling cave crane and grapple raises the canister into the canister handling cave. The canister handling cave import hatch is closed and the canister import bogie is returned to under the clean canister import hatch.

Instrumentation, alarms, controls, and/or interlocks will be provided for the HRH system.

HLW Canister Pour Handling (HPH) System

The primary functions of the HPH system are to transport empty product canisters and full IHLW canisters within the facility and perform product canister sampling, canister closure, and canister rework activities. The HPH system supports both HLW Melters (HMP-MLTR-00001/2). The HPH system includes the canister handling cave and Pour Tunnel 1 and 2. Each melter (HMP-MLTR-00001/2) is provided with a separate Pour Tunnel 1 or 2, appropriately, where molten glass is poured into the canisters. The crane decontamination and maintenance areas are also part of the HPH system, located west of the canister handling cave. Pour tunnels 1 and 2 include the bogie decontamination and maintenance areas.

The primary functions of the canister handling cave are as follows:

- Receive canisters from HRH system canister receipt handling.
- Transport empty canisters to import racks.
- Transfer empty canisters to Pour Tunnel 1 or 2 to be filled.
- Transport full canisters to cooling rack.
- Transport canisters to weld station tables.
- Transfer canisters to HDH system canister decontamination handling.
- Provide equipment for canister import and storage.

Pour Tunnel

Pour tunnel 1 (H-B032) is designed to provide facilities for glass pouring from the HLW Melter 1 and pour tunnel 2 (H-B005A) is designed to serve HLW melter 2. The pour tunnels are located at the -21 ft level and extend from north-south beneath the south end of the melter cave to an area below the canister handling cave. Bogie decontamination is performed in the tunnels, and bogie maintenance areas are provided in a designated shielded area at the south end of the tunnels. The tunnels will have a hatch that segregates the pour tunnels and the canister handling cave. The tunnels will also have a bogie maintenance shield door. The bogie maintenance area has a shield personnel access door and a roof access plug from the corridor above. The pour tunnels are designated as C5 areas.

Canister Transport

Canisters are transported within the canister handling cave by means of an overhead crane. A standby crane is available when the primary overhead crane is out of service. Viewing windows and camera are provided for viewing of equipment and operations within the cave area. Integrated networks of programmable logic controllers, which form part of the process control system, are used to control the mechanical handling.

Clean canisters are transferred from the HRH system to the HPH system through the canister import tunnel hatch. The hatch opens and the handling cave crane raises the canister into the canister handling cave. The hatch is closed and the canister is taken to the buffer storage area racks. When a canister is required for filling, it is taken out of the buffer rack using the canister handling cave crane and transferred above the appropriate pour tunnel hatch. The hatch is opened and the canister is lowered into the pour tunnel bogie below. The grapple is released and raised and the hatch is closed. The bogie travels to a position under the pour spout. As the bogie moves into position under the pour spout, the pour spout glass catch tray is pushed back and signals that a canister is present. A proximity switch detects that the bogie is in position, the bogie is then locked into position, and the canister is filled with glass. Canister filling is controlled and monitored by the canister level detection system (system HMP melter process). After completion of filling, the canister remains at the pour spout for approximately one hour to allow a “skin” to form over the glass that provides a seal to prevent additional offgassing. The filled canister is allowed to cool prior to removal from the pour tunnel.

After cooling, the canister is moved south in the pour tunnel until it is beneath the canister handling cave hatch. The hatch is opened, the canister handling cave crane removes the full canister, and the hatch is closed. The filled canister is then cooled in cooling racks in preparation for welding the lid in place.

After cooling, in the cooling racks, a crane transfers the canister for lid welding, sampling of glass, and/or rework. The canister is lowered into the welding station table and the grapple released from the canister. After the welding station operations, the crane transfers the canister to the buffer storage racks or to the decontamination system rinse bogie, via the decontamination hatch.

The canister handling cave is classified as a C5 area; therefore, activities in the handling cave will be conducted remotely. This will be accomplished with viewing windows, cameras, manipulators, and overhead cranes. Windows are strategically located above the transfer hatches for viewing the canisters as they are raised and lowered. The crane decontamination area is located on the west end of the canister handling cave. The decontamination area is classified as a C3/C5 area. The crane maintenance area is located west of the crane decontamination area. The crane maintenance area is classified as a C3 area.

Canister Weld, Glass Sampling, and Rework

The canister lid welding, glass sampling, canister inspections, and rework will be performed at one of two welding stations located along the south wall of the canister handling cave. Each station is located next to a shield window. Master-slave manipulators, closed circuit television, and lights are provided to assist weld station operations.

After the canister is cooled in the canister handling cave, the overhead crane moves the canister from the cooling rack into a port on the welding table. The canister is weighed and confirmed to be below the maximum allowable weight. While the canister is being lowered, cameras inspect the outside of the canister. Typically, glass waste residue is not expected on the exterior of the canister. However, prior to welding the lid on the canister, the canister is inspected. If glass is found on the canister, the glass will be removed using a needle descaler manually operated with the master-slave manipulator. A vacuum system will be used to capture the removed glass and prevent the spread of debris. The canister is then checked to confirm that its temperature is within the allowable range for welding. This is done using a thermocouple at the weld station. Glass samples are collected using a master-slave manipulator-operated glass sampling tool that uses a vacuum to draw shards of glass from the top surface. These shards are then transferred into sample vials and transferred to the laboratory using a pneumatic transfer system.

The lid is placed on the canister and welding is performed using an automated welder. The welding parameters are recorded in the plant tracking system. The finished weld is visually inspected using in-cave inspection cameras. Rejected welds may be repaired by re-melting the weld, mechanically removing the weld and re-welding, or welding a secondary lid over the primary lid. The sealed canister is then transferred to the HDH system.

Instrumentation, alarms, controls, and interlocks will be provided for the HLW canister handling system to indicate or prevent the following conditions:

- The crane decontamination shield doors are interlocked with the crane maintenance shield door to prevent both sets of doors from being open simultaneously.
- Interlocks will prevent the inadvertent access of personnel or equipment movement.
- The bogie maintenance shield door is interlocked with the shielded personnel access door to ensure that personnel do not enter the bogie maintenance area when the bogie maintenance shield door is open.
- Radiation monitoring equipment is interlocked to the shielded personnel access door to ensure no personnel are able to access the maintenance area if a radiation/contamination source above prescribed limits is present.

HLW Canister Decontamination Handling (HDH) System

A process flow diagram of the HDH System is provided in Appendix 10.1. The primary function of the HLW canister decontamination handling system (HDH) is to decontaminate the IHLW canisters and to swab and monitor decontaminated IHLW canisters for radiological contamination.

The HDH system includes the process and equipment to perform the cerium nitrate canister decontamination process, surface swabbing, and swab monitoring process. The following vessels and their associated ancillary equipment are included in the HDH system:

- Canister Rinse Vessel (HDH-VSL-00001)
- Waste Neutralization Vessel (HDH-VSL-00003)
- Canister Decon Vessels 1/2 (HDH-VSL-00002/4)

The HDH system consists of a canister rinse tunnel, canister decontamination station, swabbing and monitoring station, bogie maintenance areas, crane maintenance area, and canister transfer tunnel. The decontamination system consists of two stations: the decontamination station, which is located in-cave, and a chemical product mixing station, which is located out-cave. Vertical separation between the stations facilitates gravity flow of process solutions from the chemical product mixing station to the Canister Decontamination Vessels (HDH-VSL-00002/4). Beneath the canister decontamination cave is a canister rinse tunnel and a canister storage transfer tunnel. The canister rinse tunnel houses the canister rinse bogie, which transfers the canister from the canister handling cave to the canister decontamination cave while performing a prewash at an intermediate station. The canister storage transfer tunnel houses the canister storage transfer bogie, which transfers the decontaminated canisters from the canister decontamination cave to the canister export cave.

A filled, cooled, and welded IHLW canister is initially transported to the HDH system via a crane located in the canister handling cave. The IHLW canister is loaded into the canister rinse bogie and washed in a sealed vessel using low-pressure demineralized water to remove loose contamination. This water wash is performed in the Canister Rinse Vessel (HDH-VSL-00001) mounted on the canister rinse bogie, which travels from below the canister handling cave to below the canister decontamination cave. After the water wash, the canister is transferred by a crane to the canister decontamination vessel for further decontamination by chemically etching a thin layer of stainless steel from the canister surface, using cerium ion in a dilute nitric acid. The canister is then washed with nitric acid, followed by a second washing with de-mineralized water. After draining de-mineralized water from the Canister Decontamination Vessel (HDH-VSL-00002/4), the canister remains in the vessel to dry. The decontamination fluids are pumped into a Waste Neutralization Vessel (HDH-VSL-00003) to which hydrogen peroxide is added to neutralize remaining cerium ion. Following neutralization, the fluid is transferred to the plant waste stream to recycle back to thepretreatment facility. The decontaminated canister is transported by overhead crane to the canister swabbing and monitoring area.

After decontamination and drying, the canister is swabbed using an automated power manipulator. If the radiological contamination is below acceptable limits, the IHLW canister is placed into a canister storage transfer bogie located below the canister decon cave floor, and transported to the HLW canister export handling system (HEH). IHLW canisters exceeding the acceptable radiological contamination limits are returned to the HDH system for further decontamination.

In addition to the instrumentation, alarms, controls, and interlocks addressed in section 4.1.4, the following will be provided for the HDH system to indicate or prevent the following conditions:

- Interlocks will be provided on bogie decontamination/maintenance area shield door to protect facility personnel from radiation and contamination exposure.
- Interlocks will be provided on crane maintenance area shield door to protect facility personnel from contamination exposure.

HLW Canister Export Handling (HEH) System

The primary functions of this system are to store filled IHLW canisters in racks, transfer the IHLW canisters into the canister storage/export cave, load the IHLW canisters into shielded casks, evaluate casks for radiological contamination, and load IHLW casks into transport vehicles. The HEH system consists of a canister storage/export cave, a cask handling tunnel, a cask loading area, and a truck bay, and is equipped to support both HLW Melters.

Decontaminated IHLW canisters are transferred to the canister storage/export cave from the HDH system using a bogie and an overhead crane and placed in the canister storage racks. When an IHLW canister is ready for exporting to an appropriate Hanford Site TSD unit, a dedicated transport vehicle is dispatched to the IHLW truck bay. The empty shielded cask is removed from the vehicle and placed on a cask transfer bogie located in the cask handling tunnel. The bogie transfers the cask to a lid lifting station where the lid is removed, and then to a canister receiving station. The IHLW canister is visually inspected in the canister storage cave and its identification confirmed. After the inspection information is recorded, the canister is lifted by overhead crane and placed into the emptyshielded cask. The bogie then returns the cask to the lid lifting station where the lid is replaced and bolted. The loaded cask is then transferred to the export station where the cask is lifted by an overhead crane and placed on the transport vehicle. The cask exterior is verified to be below the acceptable radioactive contamination and activity levels, the cask is transported to a Hanford Site storage facility.

Closed circuit television cameras will provide general viewing of the canisters and the storage area. Descriptions of inspections of IHLW canister storage areas are included in Chapter 6.0 of this permit. An IHLW canister tracking system will retain required information such as the IHLW identification number, weight, and dimensions of the IHLW canisters.

In addition to the instrumentation, alarms, controls, and interlocks addressed in section 4.1.4, the following will be provided for the HEH system to indicate or prevent the following conditions:

- Interlocks to prevent the canister storage/export cave import and export hatches from being open at the same time.
- Gamma monitoring/interlocks to prevent the cask export hatch from opening when high radiation levels exist.
- Gamma monitoring/interlocks to prevent cask handling bogie travel to the cask export hatch unless the cask lid is properly installed.
- Interlock to prevent both truck bay “exit” and “entrance” (external) roller shutter doors from being open at the same time.
- Interlock to prevent the truck bay inner roller shutter door from being open at the same time as either of the “exit” or “entrance” roller shutter doors.
- The shielded personnel access door in the canister export cave crane maintenance area is interlocked with the canister export cave crane maintenance horizontal and vertical shield door. The shielded personnel access door is also interlocked with a gamma monitor to prevent opening when a source is present.
- The process crane is prevented from striking the crane maintenance area shield door by end of travel and over-travel limit switches.

4.1.4.8 HLW Melter Cave Mechanical Systems

Each HLW melter cave mechanical system will consist of the following individual systems:

- HLW melter handling (HMH) system
- HLW melter cave support handling (HSH) system

The individual systems and their primary functions are described below:

HLW Melter Handling (HMH) System

The primary function of the HMH system is identical for both Melters (HMP-MLTR-00001/2). The HMH system provides the equipment and controls necessary to:

- Transport new melter units into the HLW melter cave in conjunction with the HSH system.
- Remove spent melter units from the HLW melter cave.
- Decontaminate and monitor the spent melter overpacks.

A melter transporter will be used to move a new HLW Melter to the HLW facility loading dock. The melter will be transferred through the rollup doors to the melter cave airlock, transferred through the airlock, and docked to the melter cave shield door. After opening the shield and overpack doors, the melter will be moved out of its overpack and installed in the melter cave.

The process of removing a spent HLW Melter from a cave and loading it back into its overpack is the reverse of the installation. The overpack will provide a shielded disposal/storage canister for the spent melter. After the outside surfaces of the overpack have been checked for radiological contamination and decontaminated as required, the spent melter and its overpack will be moved through the melter airlock through the rollup doors and placed on the transporter, to be moved out of the HLW vitrification facility.

Decontamination of the overpack in the C3/C5 airlock, before it is exported, will be performed manually using moist cloths. The HLW Melter overpack's primary function is to serve as a shielded, box-like enclosure for the storage, transport, and disposal of the HLW Melter. The overpack performs a radiological shielding function of the highly radioactive spent HLW Melter. Due to the high radiation levels associated with a spent HLW Melter, the walls on all sides of the HLW Melter overpack will be seal-welded and have a nominal thickness of approximately 8 in. of carbon steel. The estimated weight of the HLW Melter overpack is 250 tons with an empty melter, and 350 tons when carrying a payload of the HLW Melter full of glass. The spent Melter weight when full of glass is a worst case in the event that the residual glass removal described in section 4.1.4.7 cannot be performed. After approximately 5 years of service, an HLW Melter is expected to reach the end of useful life service, and will be placed in the overpack before removing it from the HLW vitrification facility. The overpack, with the spent HLW Melter inside, will be moved to the HLW failed melter storage facility prior to land disposal. The overpack with spent HLW Melter will be disposed at the Hanford Site if it meets the land disposal facility waste acceptance criteria. Regulatory issues and permitting actions associated with onsite disposal of spent and/or failed HLW melters will be addressed in the future.

Justification for on-site burial of the 8 in. carbon steel overpack results from a corrosion study of submarine reactors based on chemical content, resistivity, aeration, and burial methods. The predicted maximum pitting corrosion penetration for a 100-year period was 0.350 in. for reactors buried in geologic conditions similar to those in which the overpacks will be buried. (*Prediction of Pitting Corrosion Performance of Submarine Reactor Compartments After Burial at Trench 94, Hanford, Washington, March 1992*).

Prior to disposal, the spent Melter will be stored in the failed melter storage facility. If a Melter fails to meet the receiving TSD waste acceptance criteria, it will be stored until the HLW facility operating conditions are suitable for the spent melter to be returned to the melter cave for further decontamination, treatment, repackaging, and/or other process to enable the spent melter to meet the receiving facility's waste acceptance criteria.

HLW Melter Cave Support Handling (HSH) System

The primary function of this system is to provide remotely operated equipment to perform these support activities in each melter cave:

- Melter maintenance and replacement.
- Melter component and consumable maintenance and replacement.
- Melter component and consumable dismantling, sorting, and loading.
- Equipment decontamination and hands-on maintenance.

Decontamination Tanks 1 and 2 (HSH-TK-00001/2) and associated ancillary equipment are included in the HSH system.

Each melter cave will contain an HLW Melter (HMP-MLTR-00001/2), Feed Preparation Vessels (HFP-VSL-00001/5), and HLW Melter Feed Vessels (HFP-VSL-00002/6), and the following offgas system components:

- Offgas Film Cooler/Standby Insert (HOP-FCLR-00001/2/3/4)
- Submerged Bed Scrubber (HOP-SCB-00001/2)
- High-Efficiency Mist Eliminators (HOP-HEME-00001A/1B/2A/2B)

Overhead cranes, hoists, and master-slave and power manipulators will be the primary equipment used to carry out various replacement, size reduction, and packaging tasks. Auxiliary tools will include impact wrenches, nut-runners, and hydraulic shears.

In addition, the HSH system will provide the means to dismantle and reduce the size of spent melter components or consumables for export out of the cave in waste canisters. Various size reduction tools will be used to cut down the equipment. The waste will be placed on a sorting table for screening and segregation prior to packaging and export.

Prior to melter replacement, residual glass heel will normally be removed from a spent Melter. Lid heaters will keep the glass pool at the desired temperature ranges. Air and vacuum lines will be inserted to draw the molten glass into a canister. The spent melter will then be disconnected and prepared for transport out of the cave.

A consumable bucket will be used to import and export melter consumables. The HFP vessels will be designed and organized such that power manipulators can disconnect connections and prepare failed vessels and components for export. Components of the HOP system found in this cave will also be designed and organized for similar activities.

The HSH system will provide a Decontamination Tank (HSH-TK-00001/2) in the equipment decontamination pit, to allow for decontamination of consumables and equipment before hands-on maintenance in the crane maintenance area. In the Decontamination Tank, the equipment will be soaked in demineralized water and/or nitric acid. The equipment decontamination pit will be used to additionally decontaminate equipment using manipulators before items can be removed for hands-on maintenance. A crane decontamination area is located above the C3/C5 airlock.

4.1.4.9 HLW Filter Handling (HFH) System

The HFH system provides the remote maintenance capability for the equipment inside the filter cave located in room H-0104. The filter cave houses the HOP, PJV, and primary C5 Ventilation HEPA filters. The filter cave contains the spent filter export hatch, which interfaces with the drum transfer tunnel. The filter cave also contains a pair of shield doors at the interface between the filter cave and the crane maintenance area. The shield doors provide the barrier between the filter cave and the man-accessed maintenance area. The filter cave is designated as a C5 area. A decontamination area is located near the southeast corner of the filter cave with capabilities to perform radiological decontamination of the loaded filter disposal basket and other items, such as power manipulator, tools, and crane hook. Specialized decontamination equipment such as carbon dioxide or compressed air spray wands are provided to perform cleaning operations.

The filter housings will be of stainless steel. The filter lids will be flush with a stainless steel clad false floor (filter cave deck) that covers the entire cave at 14 ft elevation. The following equipment will be used for replacement of HEPA Filters and with other in-cave activities.

- Power manipulators
- Crane and cable reeling system
- Spent filter export hatch

Spent HEPA filters will be placed in a waste disposal basket sized to fit inside a 55 gal drum. Full waste disposal baskets will be lowered through the export hatch and into a drum located on a bogie inside the drum transfer tunnel. System RWH provides the final packaging and export of the solid wastes generated in the filter cave.

4.1.4.10 Radioactive Solid Waste Handling (RWH) System

The HLW RWH system retrieves, transports, packages, and removes secondary solid waste from the HLW melter and filter caves. The primary functions are to:

- Provide waste disposal drums and shielded casks for removal of miscellaneous secondary solid waste from the HLW melter caves and filter cave.
- Transport filled and empty waste disposal drums and shielded casks.
- Provide external radiological monitoring of waste disposal drums and shielded casks.
- Decontaminate waste drums as required.
- Load waste drums into transport casks.

The RWH system consists of three major operational areas: the drum transfer tunnel, the swabbing and monitoring area, and the cask handling area. Mixed waste is generated in melter caves 1 and 2, the canister handling cave, and the filter cave. Mixed waste generated in the canister handling cave is transferred to either melter cave via the pour tunnels and then exported from the melter caves to the drum transfer tunnel. The drum transfer tunnel runs beneath these areas and provides a common area for receipt of waste to consolidate the separate waste streams into a single export path. The RWH system receives waste from the HSH system (melter caves 1 and 2) and the HFH system (filter cave) contained in lidded waste baskets that are lowered through the transfer ports in the ceiling of the drum transfer tunnel.

The RWH system introduces empty 55-gallon drums into the HLW facility for packaging radioactive solid waste for disposal. Empty 55-gallon drums are placed into shielded casks in the canister export truck bay. The cask is transferred on the cask transport vehicle into the cask import/export area for ultimate transfer from the facility.

The cask is positioned under the monorail hoist. It is then lifted, transferred to, and positioned onto the cask transfer bogie. A shield door is opened and the bogie is moved to the cask lidding station. The cask lid pintle is aligned with the lifting claw of the cask lidding machine and the cask lid is removed. The cask is then positioned under the cask transfer hatch. The drum, lid, and clamping ring are imported into the swabbing and monitoring area and manually staged on a stand in front of the shield window.

The drum transfer bogie rolls to position beneath a transfer hatch of either melter cave 1, melter cave 2, or the filter cave. With the drum positioned under the selected cave transfer port, a loaded waste disposal basket is lowered into the drum by the interfacing cave system's crane and grapple. With the waste disposal basket located in the drum, the grapple is detached and raised by the system crane. The full 55-gallon drum is relocated back to the position under the drum transfer hatch to the swab and monitoring area. The drum is lifted into the swab and monitoring area using the overhead crane and drum grapple.

The RWH system transports loaded drums into the lidding, swabbing, and monitoring area for lidding, swabbing, external monitoring, and decontamination (if required). The system then exports the filled 55-gallon drums through the import/export area.

The following drum swabbing, monitoring, and export operations are performed:

- The crane lifts the drum to the swabbing and monitoring station. Two master-slave manipulators will be mounted on the wall of the swabbing and monitoring area and will provide the operator interface for installation of the drum outer lid and clamping ring while the drum is positioned on the drum turntable.
- The robotic swabbing arm and turntable swab the surface of the drum. The swabs are placed in the shielded posting port of the swab analyzing station. Following preliminary measurement of the swab, the posting port is actuated to move the swab into the swabbing and monitoring glovebox where the sample is analyzed and bagged out for disposal.
- If the swabs are within acceptable limits, the crane lifts the drum from the drum swabbing turntable and positions the drum over the cask transfer hatch and places it in the shielded cask on the cask transport bogie.
- If the drum requires decontamination, additional swabbing of the drum will be performed to remove the contamination. Remote-handled decontamination equipment is available in the cave to be used if additional swabbing is insufficient to meet disposal requirements.
- The cask transfer bogie moves to the cask lidding station where the cask lid is replaced onto the cask. The bogie then moves to a gamma monitor where radiation levels are verified before the import/export shield door is opened and the cask transfer bogie moves into the import/export area. Once the cask is in the import/export area and the import/export shield door is closed, operators enter to bolt the lid onto the cask. The monorail then moves the cask to the cask handling truck. The cask handling truck positions the cask under the truck bay crane. From the cask import/export area, the crane positions the cask on a vehicle for transfer from the facility.

4.1.4.11 HLW Facility Ventilation

The HLW facility will be divided into four numbered zones listed and defined below, with the higher number indicating greater radiological hazard potential and, therefore, a requirement for a greater degree of control or restriction. The zoning of the ventilation system will be based on the classifications assigned to building areas for potential radiological contamination. Zones classified as C5 are potentially the most contaminated and include the pour caves, buffer storage area, and process cells. Zones classified as C1 are uncontaminated areas.

Containment will be achieved by maintaining C5 areas at the greatest negative pressure, with airflows cascaded through engineered routes from C2 areas to C3 areas and on to the C5 areas. The cascade system, in which air passes through more than one area, will reduce the number of separate ventilation streams and, hence, the amount of air requiring treatment. Adherence to this concept in the design and operation of the HLW facility will ensure that the facility air does not become a significant source of exposure to operators, and that the air emissions do not endanger human health or the environment.

An exhaust air radiation monitoring system, consisting of sensors to monitor radiation in the exhaust air stream, or a representative sampling system is provided in the discharge header downstream of the exhaust fans. A monitoring system would consist of probe assemblies, vacuum pumps, a stack flow sensor, temperature sensor, and radiation sensors. A temperature transmitter is also provided in the discharge header downstream of the exhaust fans for continuous monitoring of exhaust air temperature.

C1 Ventilation (C1V) System

C1 areas will typically consist of offices, workshops, control rooms, and equipment rooms. They will be slightly pressurized if they are adjacent to areas with higher contamination potential to eliminate backflow from those areas.

C2 Ventilation (C2V) System

C2 areas will typically consist of operating areas, equipment rooms, stores, access corridors, and facility rooms adjacent to areas with higher contamination potential. The C2V is served by dedicated exhaust fans. Air supplied to the C2 areas that is not cascaded to the C3 or C5 areas is discharged to the atmosphere by the exhaust fans. Both exhaust fans are provided with variable frequency drives. A manual isolation damper is provided upstream of each exhaust fan, and a pneumatically actuated isolation damper is provided downstream. Each damper is provided with local/remote position monitoring.

C3 Ventilation (C3V) System

C3 areas are normally unoccupied, but allow operator access, for instance during maintenance. C3 areas will typically consist of filter facility rooms, workshops, maintenance areas, and monitoring areas. Air will generally be drawn from C2 areas and, wherever possible, cascaded through the C3 areas into C5 areas, or alternatively exhausted from the C3 areas by the C3 exhaust system. In general, air cascaded into the C3 areas will be from adjacent C2/C3 subchange rooms. When sufficient air cannot be cascaded into C3 areas, a dedicated C2 supply equipped with appropriate backflow prevention will be used.

C5 Ventilation (C5V) System

Where there is in-bleed air from the C3 to C5 system, fan cascade trip interlocks protect the system from backflow.

The C5 areas in the HLW facility will be composed of the following:

- Pour tunnels 1 and 2
- Drum transfer tunnel
- Canister handling cave
- Melter caves 1 and 2
- Filter cave
- Wet process cell
- SBS drain collection cells 1 and 2
- Active services cell 1 and 2

Air will be cascaded into the C5 areas and exhausted by the C5 exhaust system. Engineered duct entries (air in-bleeds) through the C5 confinement boundary will be protected by backflow filter isolation dampers, with penetrations through the boundary sealed.

4.1.5 Analytical Laboratory

The analytical laboratory is designed to incorporate the features and capability necessary to ensure efficient WTP operations and meet permitting, process control, authorization basis, and waste form qualification requirements. The analytical laboratory is designed for “24/7” - 365 days per year operation to support peak throughput for each WTP facility. The Analytical Laboratory is a process support facility.

The RCRA permitted portion of the Lab include the RLD tank system (tank and ancillary equipment) and the container storage areas. Each laboratory will also include Satellite Accumulation Areas for the accumulation of secondary wastes generated by laboratory activities.

The workstations will be logically segregated to provide a degree of isolation from possible cross contamination that could reduce the validity of the analytical results. This isolation will be a design consideration. Isolation is also provided to enhance the ability of the laboratory to function even when a room or workstation is nonfunctioning. Redundant capabilities will be provided, as appropriate, to mitigate contamination incidents to maintain required support to the processes when one system fails.

A sample prepared in either the Hotcell or Rad Lab may be delivered to off-site facility. The sample is packaged according to the dose rate and destination in “strong tight containers” or shielded shipping containers. The day the shipment is scheduled to be made, the packaged sample will be surveyed for final Radiological release, shipping papers including Chain of Custody will be verified for completion, and transfer with the shipment package.

The Laboratory design will be validated with information from tank utilization modeling of the process tanks and operational research modeling of the treatment process, as appropriate. General arrangement drawings 24590-LAB-P1-60-00007 and 00008 in Appendix 11.4 DWP Operating Group 10 provides a general layout of the 0’-0” and -19’-2” elevations of the WTP analytical laboratory where analytical, maintenance, administrative, and waste management activities take place. The following attributes are outlined in the facility design figures described above:

- Workstations have been defined as required by the sampling and analysis plan for WTP process control and waste form qualification.
- Capability to provide limited process technology will be provided.
- Contamination controls have been incorporated for reliability of laboratory service to the WTP processes.
- Management of samples for off-site analysis by an outsource laboratory including feed receipt samples.

Drawings and other documents, found in DWP Operating Group10, Appendix 11.0 provide additional detail for the analytical laboratory:

- General arrangement drawings showing locations tank systems, secondary waste management and analytical laboratory activities.
- Process flow diagrams for process information.
- P&IDs, Mechanical Drawings, Typical system figures depicting the analytical laboratory tank system and ancillary equipment.

The WTP analytical laboratory contains both high-activity and low-activity laboratories. High-activity samples will be managed in the analytical hotcell laboratory (AHL). Low-activity samples will be managed and analyzed in the analytical radiological laboratory (ARL) also known as the Rad Labs. The ARL also includes a sample receiving/shipping area designed to manage the inflow of manually transported samples. The facility is also being designed to coordinate the management of samples that will be outsourced and analyzed at offsite laboratories. Outsource laboratories will be used to analyze the majority of very low-activity samples such as water quality and air emission samples. Outsource laboratories will also be used to analyze DST system unit characterization samples. Analytical methods and equipment selected to support laboratory analyses will be in accordance with applicable requirements. A laboratory information management system (LIMS) network is provided to track and maintain an inventory of samples, reagents, and materials in the WTP Laboratory area including sample analyses and data collection. In addition, the analytical laboratory includes waste drum management, maintenance, and support areas for facility operation.

The second floor of the analytical laboratory will be dedicated to the mechanical room, which will contain the C1 and C2 air handling units.

The Radioactive Liquid Waste Disposal (RLD) System vessels are located at approximately 19 ft below grade. Regulated analytical laboratory tank system process and leak detection system instruments and parameters are provided in Table C-9.

Samples will be transported to the analytical laboratory in two ways. The majority of samples will be collected and transported from the processing facilities via the autosampling (ASX) system. Samples will be collected in a sample bottle or vial and transferred into a sample carrier. High-activity samples from the pretreatment and HLW vitrification facilities will be pneumatically transferred to the hotcell sample receipt area through a dedicated transfer system for high-activity samples. Low-activity samples from the LAW vitrification facility will be transferred directly to the sample receipt laboratory area through a dedicated low-activity transfer system. A small percentage of samples will be transported to the laboratory manually in appropriately shielded transportation casks or containers.

4.1.5.1 General Description of the Analytical Radiological Laboratory

The Analytical Radiological Laboratory is one of the two analytical areas contained within the WTP Laboratory. The ARL will consist of thirteen laboratories commonly referred to a Rad Labs. The other area is the Analytical Hotcell Laboratory (AHL).

The Rad Labs (designation RL) are designed to support the preparation and analysis of low activity mixed waste samples. The Rad Labs also support the analyses of samples diluted, digested, and prepared in the hotcell facility. Samples will be manually transferred from the hotcell facility to the Rad Labs. The Rad Labs will be capable of receiving these low activity samples transferred from the process facilities via the ASX system as well as manually transported low activity samples from the process facilities. Equipment used in the preparation of samples for analyses will be located inside the fume hoods vented to the C3 ventilation system. All analyses except counting will be completed with equipment located in ventilation hoods. Barcode readers and computer workstations are provided in designated areas to input and retrieve data from the LIMS.

The Rad Labs include utilities and equipment required to support activities such as:

- Sample receipt and (manual) transport
- Dissolution/dilution
- Distillation/titration
- Standard/reagent preparation
- X-ray Fluorescence spectrometry (XRF)
- Fourier transformation Infrared spectrometry (FT-IR)
- Total Inorganic Carbon/Total Organic Carbon analyses (TIC/TOC)
- Analyses of elements and anions
- Ultraviolet and visible spectroscopy
- Preparation of samples for elemental analysis
- General physical properties analysis
- Radionuclide separation and counting
- Management of outsourced samples
- Satellite accumulation areas for secondary wastes

Sample Receipt Laboratory (RL-1)

The Sample Receipt Laboratory will serve as the sample receipt and staging area for the ARL. This Lab will be provided with hoods for sample receipt, inspection /evaluation, sample staging and transfers. RL 1 will also contain four shielded cabinets each ventilated to the C3V system, and refrigerators for storage of samples requiring sample preservation. Sample preparations are completed with equipment located in hoods vented to the C3 ventilation system. Satellite Accumulation Area(s) (SAAs) will be available in the lab to accumulate solid wastes generated during the sample receipt, evaluation, and dispatch. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Dissolution/Dilution Lab (RL-2)

The Dissolution/Dilution Lab supports general wet chemistry activities including the preparation of samples for analyses that will be performed in the other Rad Labs. RL-2 will house instrumentation and supplies to support a variety of sample preparation techniques. The two primary sample preparation methods to be performed in RL-2 are microwave-assisted acid dissolution and fusion dissolution. Sample preparations are completed with equipment located in hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Distillation/Titration (RL-3)

The Distillation/Titration Lab provides sample preparation including distillation, titration, and physical measurements of samples. Sample preparation performed in this lab involves determining the aliquot or sub-sample weight, measurement of the specific gravity/density of sample solutions, and acid and base titrations. Sample preparations are completed with equipment located in hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Standard/Reagent Preparation Laboratory (RL-4)

The Standards/Reagent Preparation Laboratory provides for prepared standards and reagents prior to their distribution to the other laboratories. Sources used for infrequent calibration of counting equipment will be stored in this laboratory. Sample preparations are completed with equipment located in hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

X-ray Laboratory (RL-5)

The X-ray Laboratory is used for quantifying elemental concentrations utilizing the X-Ray Fluorescence (XRF) system. Optical microscopes are used for qualitatively identifying crystals as needed during process troubleshooting. Analyses are completed with equipments located in hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Instrument Laboratory (RL-6)

The Instrument Laboratory supports unique functions associated with non-routine analyses.

These functions include sample preparation and analysis functions such as the preparation of KBr pellets, preparation of dilutions and reagents for UV/VIS spectrophotometry, FT-IR Spectrometry for the quantitation of compounds in liquid, gas, or solid phases, and UV/Vis Spectrometry for quantitation of compounds in liquids. Analyses and sample preparations are completed with equipments located in hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Process Technology Laboratory (RL-7)

The Process Technology Laboratory provides non-routine measurement of physical characteristics of low activity process samples and process tests. This lab is used for differential scanning calorimeter/thermal gravimetric analysis (DSC/TGA), particle size analysis, and rheology and pH measurements. Analysis and testing are completed with equipment located in hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Process Technology Laboratory (RL-8)

The Process Technology Laboratory provides testing on laboratory scale equipment to observe the behavior of low activity materials during processing through a process unit operation and to define anomalies to routine processing. All analyses are completed with equipment located in hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Elemental Analysis Laboratory (RL- 9 and 9-A)

The Elemental Analysis Laboratory is used for the preparation and analysis of medium level radioactive samples using an ICP/AES instrument for the analysis of elements, ICP/MS instrument for the analysis of elements and specific radionuclides, and mercury analyzer for the analysis of mercury. The Elemental Analysis Laboratory 9A is a duplicate of Elemental Analysis Laboratory, RL-9 and is a backup to RL-9. The space is available for the setup of process development evaluations. SAA(s) will be available in the labs to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

General Chemistry Lab (RL-10)

The General Chemistry Lab is used to prepare and analyze samples using Ion Chromotography (IC) for analysis of selected anions and organic acids, and Total Carbon analyzer (TC) for total inorganic carbon, and total organic carbon (TIC/TOC) analysis. RL-10 equipment is split such that instrument electronics are on benches adjacent to fume hoods and the components for sample contact are inside hoods vented to the C3 ventilation system. SAA(s) will be available in the lab to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Rad Preparation Laboratories (RL-11 and RL-12)

The Rad Preparation Laboratories are used for sample preparation and separation of various radionuclides for analysis by nuclear spectroscopy (counting).

Both of the Rad Prep Labs will be identical in size and will have the capability to provide limited redundancy or both labs can be used to provide additional capacity. SAA(s) will be available in the labs to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

Rad Counting Laboratory (RL-13)

The Rad Counting Laboratory is used for analyzing prepared samples, standards, and control sources. This lab will accommodate instrumentation for measurement of alpha, beta, and gamma radiation in samples transferred from the Rad Prep Laboratories 11 and 12. There will be no hoods, water distribution, or sinks in this room. Samples will be manually transported on a cart from the Rad Prep Labs. Shielded storage areas will be provided for temporary staging of samples, calibration and control check sources. Analyses will be completed using gamma spectrometer systems, gas-flow proportional counters for gross alpha/beta analysis, alpha spectoscopy multi-detector systems, and liquid scintillation counting systems for beta analysis. SAA(s) will be available in the room to accumulate solid waste generated during the receiving and packaging operations.

Sample Shipping and Receiving Area (Rm A-0141F)

The Sample Shipping and Receiving Laboratory is located adjacent to the primary airlock and is used for receiving manually delivered samples. This room will also provide space for loading casks for off-site transport of samples as required. This will provides an area with low contamination potential and reduces the need for decontamination of casks and containers for off-site radiological release. This area provides equipment to receive and transfer samples, chain of custody, staging for shipment to off-site facilities, and transfer to RL-1 or into the Sample Receipt Hotcell (HC-1) if the radioactivity level is determined to require shielding.

If the sample is to be shipped to another facility, the sample will be placed on shelving or in the refrigerator awaiting shipping. If a sample originating in the WTP Laboratory is to be shipped to another laboratory, the exterior of the sample container will be decontaminated and brought to this location for staging for shipment. SAA(s) will be available in the room to accumulate solid waste generated during the receiving and packaging operations. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the Rad Lab sink drains (RLD system) and recycled back into the WTP process.

4.1.5.2 General Description of Analytical Hotcell Laboratory Equipment (AHL)

Process samples from the WTP PT and HLW facilities taken by the ASX system are delivered to the Hotcell Receipt Station (HCRS) by a pneumatic transfer system. Samples from outside the WTP that require shielding are delivered to the hotcell in shielded sample carriers called pigs. Barcode readers are provided in each hotcell and a computer workstation is provided to input and retrieve data from the LIMS. A trolley is provided for inter-cell transfers of samples and smaller equipment items. A monorail is provided to move large equipment. Each hotcell is provided with an appropriate number of master slave manipulators (MSMs) to accomplish in-cell tasks remotely. The equipment used to perform the functions described in the following sections is representative of typical activities for safely performing operations on highly radioactive samples.

The AHL consists of 14 hotcells (HC), one hood assembly, and three glovebox assemblies adjoining the hotcell structure. The facility includes equipment in Hotcells 1 through 14 with the Hotcell 14 functioning as the secondary waste management area, and a more detailed description of Hotcell 14 waste management activities is provided in 4.1.5.4, Solid Waste Management. Gloveboxes adjoining HC-12 and HC-13 will house the inductively coupled plasma/atomic emission spectrometer (ICP/AES) and inductively coupled plasma/mass spectrometer (ICP/MS) instruments.

Samples will be moved into and between the hotcells using the trolley or monorail. Ventilation flow from the hot cell area, including the waste cell, will be routed to the C5 HEPA filtration system.

Sample Receipt (HC-1)

The Sample Receipt Hotcell is located at the north end of the series of analytical hotcells. One glovebox assembly on HC-1 will be used to transfer samples and material out of the hotcells. One hood assembly on HC-1 will be used to introduce manually drawn samples into HC-1. This hotcell is outfitted with four master slave manipulator (MSM) arms (two pairs) on the east and west sides to provide full floor coverage. The HCRS on top of HC-1 provides for the delivery of samples from the ASX system. The mechanical de-capping of sample bottles, transferring samples to transparent container, and capping with a screw-type lid is performed in HC-1. Hotcell 1 also provides radiation dose rate probe and meter to estimate the radiation level of both incoming and outgoing samples, pH meter for measurement of samples, and a barcode reader (or similar device) to identify and track sample containers.

The ASX HCRS is located on top of HC-1. The sample carrier will be delivered from an HLW or PT facility ASX sampler to the HCRS. The HCRS will remove the sample bottle from the carrier utilizing robotics and place it in a chute attached to HC-1. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

Sample Preparation (HC-2 and HC-3)

The Sample Preparation Hotcells are located south of the sample receiving hotcell and each hotcell will be outfitted with two MSMs. Activities carried out in these hotcells include the generation of individual sample aliquots using sample homogenizer, electronic scales, centrifuge, filtration, stirring, and desiccators. Individual sample aliquots are then transferred to other hotcells for further analysis. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

Limited Process Technology (HC-4)

The limited process technology hotcell provides space for the evaluation of anomolies occurring in the processing facilities such as potential plugging of ultra filters, ion exchange malfunction and material foaming, etc. This hotcell may also be used to prepare coupons for analyses in hotcells 12 and 13. This cell has one pair of MSMs and necessary sample preparation equipment (furnaces, drying ovens, balances, etc.) to complete process testing. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

Physical Properties (HC-5)

The physical properties hotcell provides space for measurements such as rheology, solids, and particle size measurements to support process operations. This hotcell is provided with a pair of MSM's, and necessary sample preparation equipment (furnaces, drying ovens, balances, etc.) to complete process testing. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

Dissolution and Dilution Hotcells (HC-6 and HC-7)

The dissolution and dilution hotcells will be used to perform thermal-assisted acid digestion and alkali fusion dissolutions of WTP process samples. Each hotcell contains a pair of MSMs and work surface for dissolving slurry feed samples (such as from the melter feed preparation vessels) and glass shards.

The equipment used to prepare samples in the dissolution/dilution hotcells includes microwave and/or convection ovens and accessories for heating and testing sample mixtures such as furnaces, drying ovens, balances, pH meters. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

Radionuclide Preparation Hotcells (HC-8 and HC-9)

The radionuclide preparation hotcells will be used to separate radionuclides for further isolation and also to reduce the radiological dose rate of samples for export from the hotcells for counting and analyses in ARL. The equipment required to prepare samples consists of small pre-packed ion exchange columns and other support equipment such as balances and glassware. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

Ion Chromatography and Total Inorganic Carbon/Total Organic Carbon Preparation (HC-10)

The Ion Chromatography and Total Inorganic and Organic Carbon Preparation hotcell is used to prepare samples for IC or TIC/TOC analyses in the Analytical Radiological Laboratories. Liquid samples for anion and TIC/TOC analyses are diluted and transferred to the Rad Lab. Solids are digested, diluted and transferred to the Rad Lab for analyses. This preparation is needed to reduce dose rates to an acceptable level for analysis in Rad Labs. The equipment required to prepare samples consists of containers for performing water digestions, volumetric flasks and pipettes for diluting the samples and addition of control reagents, and filtration apparatus and vacuums for assisting in sample filtration. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

Boildown and Physical Properties (HC-11)

This hotcell will provide the capability to determine the volume reduction of sample material achievable before solids form, to test the compatibility of different waste types and to develop analytical methods. The hotcell will be outfitted with the general equipment capabilities. Equipment required to prepare and/or test samples will include stirrers to homogenize sample materials, vessels to composite samples, and filtration systems to separate solids from liquids. SAA(s) will be available in the hotcell to accumulate solid wastes generated during the sample preparation and analyses. Organic liquids will be segregated and managed as Lab Packs; other liquid wastes will be disposed in the hotcell floor drain (RLD system) and recycled back into the WTP process.

ICP Preparation and Analyses (HC-12 and HC-13)

The ICP Preparation and Analysis Hotcell receives samples prepared in hotcells 2, 3, 4, 6 & 7. These hotcells will receive samples previously diluted in the sample preparation hotcells (HC-2 and HC-3) or made into coupons in Limited Process Technology Hot Cell (HC-4) or from the dissolution/dilution hotcells (HC-6 and HC-7). A glovebox approximately 4 ft by 4 ft will be attached perpendicular to the exterior of each hotcell. An ICP/AES and an ICP/MS will be integrated with the gloveboxes at hotcells 13 and 14. Equipment necessary to prepare and/or analyze samples in HC-12 and HC-13 will include:

- Volumetric glassware to perform sample dilutions.
- Pipettes to add spikes and reagents to samples.
- Stirrers to homogenize solutions.
- Analytical balance to perform dilutions by weight.

- Attached glovebox exterior to the hotcell.
- ICP/AES instrument integrated with the glovebox.
- ICP/MS instrument integrated with the glovebox.
- Laser system to ablate particulates from the surface of a prepared glass coupon.
- Sample positioning and focusing system to properly ablate glass particulates.
- Optical viewing system to observe and align area of the glass coupon for ablation.

Hotcell Solid Waste Management (HC-14)

Mixed and dangerous solid waste will be accumulated in hot cells and periodically placed in waste drums. Solid waste management in the hotcell will require remote handling. Details about secondary waste management in the Hotcell Solid Waste Management area is provided in section 4.1.5.4.1.

4.1.5.3 Autosampling (ASX) System

The ASX is considered one of the laboratory systems; however, it includes components in the other WTP facilities. The ASX system includes the autosampling assemblies in each of the WTP chemical process facilities and the Pneumatic Transfer System (PTS) that transports samples between those facilities and the Laboratory. The ASX is a support system that collects and manages samples from each of the process facilities. The DWP regulates the secondary containment of sample feed and sample return process piping and sample line flush piping internal to the PTF, HLW and LAW sampler as described in 4.1.5.3.1 Autosampler Secondary Containment and Leak Detection Functions.

Four ASX samplers are located in the Pretreatment facility, three are located in the High Level Waste facility, and two are located in the Low Activity Waste facility. Each sampler interfaces with the process systems that require sampling of their contents via a process sample pipe loop. The loop will deliver process waste for sample collection to the sampler and return the pumped fluid, minus the collected sample, to the vessel from which it originated.

The PTS is a network of transport tubes, diverters, exhausters, HEPA filters, and controlled arrival stations that work concurrently to transfer the carriers and sample bottles to and from the analytical laboratory. Low activity samples are delivered to the Fumehood Receipt Station in the analytical laboratory. The Hot Cell Receipt Station is the analytical laboratory receipt station for HLW and PT samples. The Autosampling Control System (ASJ) will control and monitor the ASX process.

For high-frequency sampling and for highly radioactive, medium activity and transuranic-bearing streams, the sampling process is automated. Manual sampling techniques are primarily reserved for low activity, low frequency, and large volume sample applications, or where needle-sampling techniques are inappropriate.

The WTP sampling systems for high activity (HA) and low activity (LA) sampling are independent and segregated because of the requirements for handling the HA samples when they reach the Laboratory. Both the HA and LA sample lines will transfer only one sample carrier at a time. The HA sampling system collects and pneumatically transfers samples from the PTF and HLW facilities to the Lab Hotcell 1. The LA sample line transfers samples collected from the LAW facility directly to the radiological laboratory. Diverters will provide junction points that enable the sample carriers to be routed to and from destinations on the transfer line. Tracking switches along the transfer lines will be used to track sample carrier movement. In addition to the primary HA and LA sample lines, samples from the tank farms or other locations, and grab samples taken from WTP facilities, will be manually delivered to the WTP Laboratory in shielded sample carriers.

Process liquids will be circulated through pipe lines into and out of the autosampler enclosures. Samples are collected by the ISOLOK samplers located in these recirculation loops. A supply line isolation valve will secure the recirculation process upon completion of sampling.

The mechanical process for ASX sample collection will commence by dispatching a carrier and sample bottle from the storage/dispatch magazine in the Lab and receiving it at the sampler docking station. The robotic arm will interface with the carrier at the glovebox docking port to retrieve the empty sample bottle from the carrier. The robotic arm will drive the sample bottle on to the ISOLOK sample injection needle. The ISOLOK captures, retains, and injects a specific volume of process material into the sample bottle. The ISOLOK sampler uses a pneumatically driven plunger to "grab" a measured sample volume of flowing material with each extension and retraction. The quantity collected for a sample, then, will be determined by the number of strokes set for the sample drawn.

The robotic arm replaces the filled sample bottle into the carrier, at the glovebox docking port, and the carrier is then flown through the PTS flight tube back to the HA or LA Lab receipt station where the sample will be retrieved for analysis. The carrier will also contain any potential leakage in the event of sample bottle damage or malfunction.

In conjunction with this sample collection sequence, two seal tests are performed. The Arm Interspace Seal Test (AIST) occurs at the initiation of a sample sequence. It confirms that the robotic arm has an effective seal on the docking port. The Carrier Interspace Seal Test (CIST) is performed when the carrier has been sealed against the docking port. It confirms that both the robotic arm and the carrier are sealed against the docking port. The CIST occurs prior to lifting the robotic arm off the docking port. The seal tests are performed to ensure that air from the glovebox confinement cannot be drawn into the pneumatic transfer system.

The ISOLOK sampler is flushed after sample collection to prevent needle plugging and to prevent cross contamination of subsequent samples. To flush the ISOLOK sampler, the sample vial with a triple septum cap will be repositioned with respect to the discharge needle so that water can be applied at a port that allows flow through the vent needle opening. The septum is punctured by the sample collection needles, and the vial is held in place while activating the flush valve. The sample plunger will be partially extended to align the ISOLOK port for this flush operation, which will continue until water runs clear, generating approximately 250 ml of secondary waste.

4.1.5.3.1 Autosampler Secondary Containment and Leak Detection Functions

The ASX samplers in the PTF, HLW and LAW facilities contain both upper and lower secondary containment liners and leak detection systems. The upper containment area is designed to collect a potential leak from the incoming sample feed and return lines where they connect to the ISOLOK sampling device. If a leak occurs in the upper containment area, the leak flows to the sloped liner which diverts the leak to the annular space of the coaxial sample return lines. Leaks flow down the secondary containment pipe and discharge to secondary containment with leak detection, typically a sump with a radar level detector. The ASX sample feed and sample return lines, and the routing of potential leaks in the annular space of the return lines are shown on the associated process system P&IDs provided in Operating Unit Group 10, Appendix 8.2, 9.2, and 10.2.

The sloped stainless steel liner in the lower containment area is designed to divert liquids to a sloped collection trough. The trough contains a removable weir that allows liquids to collect and activate the thermal level detection switch and alarms to indicate that a leak has occurred. Effluent from a leak flows to the same drain line that manages ISOLOK flush solutions. The ISOLOK flush lines terminate below the top of the trough drain to ensure that the leak detection system is not activated when flushing the ISOLOK. The ASX lower containment area drain lines are shown on the associated process system P&IDs provided in Operating Unit Group 10, Appendix 8.2, 9.2, and 10.2. Typical Autosampler secondary containment design details are provided in the Secondary Containment Design permit document provided in Operating Unit Group 10, Appendix 7.5.

The ASX secondary containment liner, liner trough, weir, leak detection instruments, coaxial sample feed and sample return piping make up the secondary containment and leak detection systems for the PTF, HLW and LAW ASX samplers. The balance of the ASX sampler equipment in each facility; the ASX pneumatic sample transfer lines between facilities, and the ASX sample receipt system in the Analytical Laboratory are not part of the ASX secondary containment system, and are excluded from the WTP permit by the sample exclusion [WAC 173-303-071(l)]. ASX upper and lower secondary containment liner dimensions are provided in Table C-6. Drain line and leak detection instrument design details are provided in Table C-9.

If a spill occurs in either the upper and lower containment area, these areas can be rinsed. In the upper containment area a wash wand will be provided to allow for localized wash if required. In the lower containment area a spray ring and spray wands are provided to rinse this containment area. Wash solutions will be directed to the required location by the operator. Valves mounted externally to the autosampler allow the operator to deliver a wash stream to targeted areas that may require decontamination.

4.1.5.4 Solid Waste Management

Mixed and dangerous solid waste will be accumulated in hot cells and periodically placed in waste drums. Waste from the individual hot cells will be transferred to a waste management cell where waste management, consolidation, and packaging activities are conducted. The waste cell contains tools and equipment to complete size reduction. These solid mixed and dangerous wastes as well as organic lab pack wastes will be transferred into waste drums prior to being transferred to the laboratory waste drum management area. Mixed and dangerous solid waste and organic lab pack wastes from the Rad Labs and maintenance areas will be accumulated in the individual labs and shops until they are transferred to the laboratory waste management area for waste consolidation and volume reduction. Waste consolidation will be completed in the volume reduction and lab pack rooms in the waste drum management area.

Laboratory secondary solid wastes will be transferred to Hanford site and offsite treatment facilities for treatment as needed. Treated secondary wastes will be transferred to Hanford site TSD site (IDF or Low Level Burial Grounds) for disposal. Low level radioactive wastes will be transferred to a Hanford site low level radioactive disposal facility.

4.1.5.4.1 Hotcell Solid Waste Management

Mixed and dangerous solid waste will be accumulated in hot cells and periodically placed in waste drums. Solid waste management in the hotcell will require remote handling. Waste from the individual hotcells will be transferred to HC-14 where waste management, consolidation, and packaging activities are conducted. The waste cell contains tools and equipment to complete size reduction. These wastes will be transferred into waste drums prior to being transferred to the laboratory waste drum management area.

Wastes generated in the hotcell area of the Analytical Laboratory are not packaged in the Waste Drum Management Area. Packaging and volume reduction of hotcell wastes, including high activity wastes is completed in HC-14 prior to being transferred to the Waste Drum Management Area for storage.

4.1.5.4.2 Container Storage Area for the Analytical Laboratory

The Lab Container Storage Area is located at the 0’-0” elevation and is referred to as the Waste Drum Management Area on laboratory facility drawings, and in laboratory system description documents. The Waste Drum Management Area includes five waste management rooms (139, 139A, B, C &D) located inside of the Analytical Laboratory facility. Room A-0139, the Waste Drum Management Room is the primary dangerous and mixed secondary waste storage room, and is used to provide segregation of wastes. Separation of wastes will be provided to meet the separation distances provided in Uniform Fire Code and applicable sections of WAC 173-303.

The potential for precipitation inflow into the area is mitigated by a dry sump located inside the roll-up door on the south side of the airlock/clean drum export area.

Segregation and secondary containment for waste drums containing liquids will be provided by commercially available portable spill containment pallets/devices designed to contain 10 percent of the volume of all of the containers within the containment system or the volume of the largest container, whichever is greater. The exterior walls of the waste drum storage area are constructed of reinforced concrete and the entire floor area of the waste drum storage area is coated with a special protective coating. This coating is not designed to provide secondary containment. Coatings are provided to support the clean-up and decontamination of a potential spill.

Room A-0139A is equipped with a walk-in fume hood to support the packaging of organic liquids and lab pack wastes. The room will be used to package and add absorbent to waste packages to comply with Hanford Site Solid Waste Acceptance Criteria (HSSWAC) and/or off-site disposal facility waste acceptance criteria for liquid and lab pack wastes. Room A-0139B is an airlock separating the main waste drum area and the lab pack and volume reduction areas. Room A-0139C is an equipped with an in-drum compaction unit design to reduce the volume of low activity wastes generated in the Rad Lab areas. Because volume reduction and the packaging of wastes to meet transportation and/or disposal facility waste acceptance criteria is not a permitted activity, manufacturer cut sheets for support equipment in these rooms is not included in the package. The fifth room is Room A-139D, the airlock/clean drum export area. This area is used to provide additional storage, segregation, and management of waste containers prior to transfer to WTP, Hanford Site, or off-site waste disposal facilities.

4.1.5.5 Radioactive Dangerous Liquid Waste Disposal (RLD) System

The analytical laboratory RLD system is primarily composed of the following:

- Floor Drain Collection Vessel (RLD-VSL-00163)
- Laboratory Area Sink Collection Vessel (RLD-VSL-00164)
- Hotcell Drain Collection Vessel (RLD-VSL-00165)
- Associated ancillary equipment

The Floor Drain Collection Vessel (RLD-VSL-00163) collects, contains, and transfers noncontaminated liquid effluent. The floor drain collection vessel is identified as part of the RLD system.It is not designed or permitted to manage mixed or dangerous wastes. If a spill or release were to occur that contaminated this vessel, the vessel will be discharged to the Laboratory Area Sink Collection Vessel (RLD-VSL-00164) or the Hotcell Drain Collection Vessel (RLD-VSL-00165) and rinsed with water prior to being returned to service. This vessel collects effluent from radiological laboratory floor drains, eyewash, and safety shower equipment. The vessel also collects effluent from the C2 area floor drains located in areas such as the laboratory area corridors, hotcell bay area, and the filter room.

Liquid waste management in the hotcell will require remote handling prior to disposal to the Hotcell Drain Collection Vessel (RLD-VSL-00165) from low point drains. Aqueous liquid waste consists of samples (unused and residues), dilutions, and dissolution aliquots prepared for analysis. Liquids will be partially neutralized to reduce corrosivity before they are discharged to the liquid waste system. Containers of aqueous liquids for disposal are moved to and poured down low-point drain using the MSMs along with a minimum of 0.5 gallons flush water for each 20 mL of waste. Liquid waste information (including quantity of liquid waste per disposal and identification of the sample that generated the waste) is updated in LIMS using the computer workstation.

4.1.5.6 Laboratory Maintenance

The analytical laboratory maintenance shop provides space for performing preventive and corrective maintenance on laboratory equipment. There will be two shops, located in different potential contamination areas. The C3 shop allows decontamination, maintenance, and storage of contaminated equipment such as hotcell manipulators. The C3 maintenance shop will be ventilated to the C3 ventilation system, and effluent from the C3 maintenance shop discharges to the Laboratory Area Sink Collection Vessel (RLD-VSL-00164). The C2 shop will provide space for the maintenance of equipment that is not expected to be radioactively contaminated such as electrical components, utilities systems components, and instruments, and will be ventilated to the C2 ventilation system. A list of proposed maintenance activities that will be performed in the analytical laboratory maintenance shops is provided below.

Analytical Laboratory Maintenance and Waste Management Activity Summary		
Task Description	**Lab C3 Shop**	**In Situ Activities**
Filter change out [a]		X
Manipulator maintenance and repair [b]	X	X
Valve maintenance and repair		X
Pump maintenance and repair	X	X
Exhaust fan maintenance and repair		X
Repair and maintenance of fabricated equipment	X	X
Instrument maintenance and calibration	X	X

a Spent filters will be disposed of following filter change out using approved maintenance, waste management, and radiological procedures.

b Manipulators requiring extensive repairs will be pulled and transferred to the C3 workshop for decontamination. Once the contamination levels are reduced to within acceptable limits for hands-on maintenance, the manipulator will be repaired using approved maintenance and radiological procedures.

4.1.5.7 Laboratory Ventilation Systems

The analytical laboratory ventilation systems include C1V, C2V, C3V, and C5V systems that aid in the containment and confinement of radiological and hazardous chemical constituents. Clean occupied areas without contamination potential are classified as C1 and will be isolated from areas with the potential for contamination (C2) and from areas with restricted occupancy, normal radiological hazards and higher contamination potential (C3 and C5).

C3 areas are restricted occupied areas and allow operator access under administrative controls as required for scheduled maintenance and operations. C5 areas have the highest contamination potential and will normally be unoccupied. These areas have, by virtue of their location and the activities performed within them, an increased potential for the release of contamination. The design objectives of the analytical laboratory HVAC system, and therefore the C5 area ventilation system, will be as follows:

- Aid in the confinement and containment of radiological and hazardous chemical contamination sources.
- Remove airborne particulates from the discharge air to ensure that emissions are within prescribed limits.
- Maintain space temperatures within the indoor design conditions.

- Satisfy safety requirements and codes and standards that are a part of the Safety Requirements Document.

The C5 area ventilation system is being designed to maintain a negative pressure in the C5 areas with respect to the surrounding areas. Hotcell ventilation, the Hotcell Drain Collection Vessel (RLD-VSL-00165), and the C3 maintenance shop glovebox will be exhausted to the C5 ventilation system. Fume hoods within the Rad Labs, the waste reduction and lab pack room, and the C3 maintenance shop will be exhausted to the C3 ventilation system. The ventilation from C2, and C3 areas will be filtered through a single stage of HEPA filters and exhausted through the analytical laboratory stacks. Air cascading into the C5 areas from the adjacent C2 and/or C3 areas will be exhausted through the analytical laboratory building stack by the C5 exhaust fans after passing through two stages of HEPA Filter banks.

4.1.6 Balance of Facilities (BOF)

The balance of facilities will provide support systems and utilities required for the waste treatment processes within the pretreatment facility, LAW vitrification facility, HLW vitrification facility, and analytical laboratory. These will include, but will not be limited to, heating and cooling, process steam, process ventilation, chilled water, primary and secondary power supplies, and compressed air. The primary BOF process support facilities are described below. These support and utility systems do not manage dangerous waste and are described below for information only.

4.1.6.1 Plant Service Air (PSA) Systems

The BOF plant service air (PSA) system will provide a continuous supply of clean, dry air for the process systems in the pretreatment facility, analytical laboratory, LAW vitrification facility, and HLW vitrification facility. Each facility will maintain a reservoir of PSA to accommodate load fluctuations and distributes the compressed air to the designated end users. The air distributed from the BOF PSA system to each facility is the source of the PSA and the Instrument Service Air (ISA) within each facility. The pretreatment facility PSA/ISA system is the source of back-up PSA and ISA for certain applications at the PT and HLW facilities when normal BOF PSA supply is not available.

The PSA system components consist of compressors, dryers, air receiver vessels, distribution piping, pressure control stations, air amplifiers, valves, filters and monitoring instruments.

The air supplied by PSA and ISA systems within each facility supports operation of tanks and miscellaneous unit systems, instruments and ancillary equipment.

4.1.6.2 Plant Cooling Water System (PCW)

The BOF plantcooling water system (PCW provides a continuous supply of cooling water to selected plantequipment for heat removal. The PCW system supplies cooling water to the air and chiller compressors, steam plant and process areas. In PT facility the PCW is used in the waste feed evaporation process (FEP), treated LAW evaporation process (TLP), cesium nitric acid recovery process (CNP), and pretreatment vessel vent process (PVP) systems.

Cooling water for the HLW facility supports the HLW concentrate receipt process (HCP), HLW melter feed process (HFP), HLW melter process (HMP), and the HLW melter offgas treatment system (HOP). For the LAW facility the major user is the LAW melter process system (LMP).

The cooling water system is designed with primary and secondary loops to remain uncontaminated by mixed waste constituents. The primary loop circulates cooling waste through heat exchangers within the HLW, LAW, and PT facilities and through equipment in the BOF chiller compressor plant. The system also provides cooling water to quench the steam plant blow down. The HLW, LAW and PT facilities also have closed secondary loops that distribute cooling water to process equipment. Cooling water will be chemically treated to promote system operability and service life of 40 years.

4.1.6.3 Low-Pressure Steam System (LPS)

This system will provide a continuous supply of low-pressure steam for various users in the pretreatment facility, LAW vitrification facility, and HLW vitrification facility. The process facilities main use of steam will be for tank heating for the evaporation process, and for HVAC heating coils.

The low-pressure steam system will be supplied from the high-pressure steam system through pressure-reducing stations. The steam condensate and feed system will collect condensate from the low-pressure steam users, monitor for mixed waste contamination, and return it to the steam plant for re-use.

4.1.6.4 High-Pressure Steam System (HPS)

The system will provide a continuous supply of high-pressure steam for ejectors used for fluid transfers, and hot water heaters in the PT, LAW, Lab, and HLW facilities.

The BOF steam plant facility (SPF) house the boilers that produce the steam.

4.1.6.5 Demineralized Water System (DIW)

This system treats process service waste to produce and distribute demineralized water to users in PT, HLW, LAW, Lab, and BOF facilities. Demineralized water is produced by pumping process service water through 5-micron, 2-micron and 1-micron cartridge filters. Water is further treated by one of two reverse osmosis units. Demineralized water is stored in the BOF demineralized storage tank. Prior to distribution to process facilities DIW is treated using a UV sterilization and an additional 2-micron filter.

The primary systems that utilize demineralized water include:

- Fresh ion exchange resin addition
- Chemical reagent makeup
- Wet electrostatic pecipitator misting
- Wash rings
- Decontamination
- Melters
- Analytical laboratory
- Process and transfer piping and tank system flushes
- Boiler make-up

4.1.6.6 Process Service Water System (PSW)

This system will supply filtered water to end users. This water will serve processes such as offgas treatment, plant wash systems, and make-up to chilled water systems. The BOF process service water system receives water directly from the Hanford site domestic (potable) water system (DOW). The water is stored and distributed to the PT, LAW, HLW, and Lab facilities, the chiller compressor plant (CCP), the demineralized water system (DIW), and water treatment building (WTB).

4.1.6.7 Chilled Water (CHW) System

This closed-loop system will supply chilled water to various HVAC unit cooling coils and plant equipment coolers for the WTP. Chilled water will be used in various systems throughout the WTP. The chilled water system is designed to remain uncontaminated by mixed waste constituents. The chilled water will be chemically treated to promote system operability and provide a service life of 40 years.

4.1.6.8 Glass Former Reagent (GFR) System

The glass former reagent system provides glass former reagents and sucrose to the LAW and HLW vitrification facilities. The system also provides silica to the LAW container finishing handling system (LFH) for inert void fill for ILAW containers. The GFR system is comprised of the equipment needed to receive, store, blend and transport glass formers to the vitrification facilities. The GFR system includes the glass former handling equipment in BOF, the glass former mixers located in HLW and LAW and the inert fill day hoppers in LAW.

4.2 Waste Management Units

The following sections provide information on the waste management units at the WTP:

- Containers, including management and storage areas - Section 4.2.1
- Tanks systems for storage and treatment - Section 4.2.2
- Miscellaneous units - Section 4.2.3
- Containment buildings - Section 4.2.4

4.2.1 Containers [D-1]

This section of the permit identifies the containers and container management practices that will be followed at the WTP. The term "container" is used as defined in Washington Administrative Code (WAC) 173-303-040. Note that in the permit, terms other than containers may be used, such as canisters, boxes, bins, flasks, casks, and overpacks.

The container storage areas located in the HLW vitrification plant consists of:

- IHLW canister storage cave (immobilized glass) (H-0132)
- HLW east corridor El. 0 ft (secondary waste) (HC-0108/09/10)
- HLW loading area (secondary waste) (H-0130)

The container storage area (secondary waste) located within the analytical laboratory consists of the following rooms:

- Waste Drum Management Room (A-0139)
- Lab Pack Room (A-0139A)
- Airlock (A-0139B)
- Volume Reduction Room (A-0139C)
- Airlock/Clean Drum Export Room (A-0139D)

The container storage areas (secondary waste) located within the balance of facilities consists of:

- Nonradioactive dangerous waste storage area
- Failed melter storage facility

Container storage area dimensions at the WTP are summarized in Table C-1.

The following sections address waste management containers:

- Description of Containers - section 4.2.1.1
- Container Management Practices - section 4.2.1.2
- Container Labeling - section 4.2.1.3
- Containment Requirements for Storing Waste - section 4.2.1.4
- Prevention of Ignitable, Reactive, and Incompatible Wastes in Containers - section 4.2.1.5

4.2.1.1 Description of Containers [D-1a]

Four types of waste will be managed in containers:

- IHLW (immobilized glass)
- ILAW (immobilized glass)
- Miscellaneous mixed waste (secondary waste)
- Miscellaneous nonradioactive dangerous waste (secondary waste)

The waste form dictates the type of containers used for waste management. The following paragraphs describe these four types of containerized waste that are managed by the WTP.

Immobilized Glass Waste

The immobilized glass waste is a mixed waste that will be managed in ILAW containers and IHLW canisters specially designed to remain stable during receipt of glass waste, and which are capable of remote handling. The Permittees are developing a petition to delist IHLW.

The ILAW containers will be approximately 90 in. high and 48 in. in diameter, with a wall thickness of approximately 0.187 in. and a nominal capacity of 90 ft^3. ILAW containers will be constructed of austenitic (304L) stainless steel.

The IHLW canisters will be approximately 177 in. high and 24 in. in diameter, with a wall thickness of approximately 0.1345 in. and a nominal capacity of 43 ft^3. The IHLW canisters will be constructed of austenitic (304L) stainless steel.

Based on results from the programs at the Oak Ridge National Laboratory and Savannah River Technology Center, the 304L stainless steel is physically and chemically compatible with the IHLW glass waste.

Miscellaneous Mixed Waste

Generally, miscellaneous mixed wastes are secondary wastes that may include, but are not limited to, the following items:

- Spent or failed equipment
- Spent, dewatered ion exchange resins in the pretreatment facility
- Offgas HEPA filters
- Melter consumables
- Analytical laboratory waste
- Spent melters

Spent equipment and offgas filters will typically be managed in commercially-available containers such as steel drums or steel boxes, of varying size. The containers for miscellaneous mixed waste will comply with transportation requirements, with receiving TSD waste acceptance criteria, and will be compatible with the miscellaneous mixed waste. These containers may or may not include a liner. Final container selection, container and waste compatibility, and the need for liners, will be based on the physical, chemical, and radiological properties of the waste being managed.

Spent ion exchange resins will be dewatered and managed in high integrity containers (HICs). This waste will be generated and managed in the pretreatmentfacility, until it is transferred to a suitable TSD unit for further management.

Melter consumables are routinely generated wastes and include spent feed tubes, pressure transducers, bubblers, thermocouples, and discharge risers. LAW melter consumables will be placed into approved disposal containers of varying size.

HLW melter consumables will be remotely size reduced, if necessary, and placed into steel baskets with lids. The baskets will be placed into drums and the drums placed into shielded casks for export from the facility.

The LAW Locally Shielded Melter (LSM) will be classified as hazardous debris for land disposal restrictions purposes. After a spent HLW Melter is deemed to meet criteria and regulations for onsite disposal, it will be placed in a welded carbon steel container (overpack) or other acceptable packaging in accordance with waste acceptance criteria for the receiving TSD. Regulatory issues and permitting actions associated with onsite disposal of spent and/or failed melters will be addressed in the future.

Each miscellaneous mixed waste container will have associated documentation that describes the contents, such as waste type, physical and chemical characterization, and radiological characterization. This information will be retained within the plant information network.

Most miscellaneous secondary mixed wastes will be spent equipment and consumables such as pumps, air lances, HEPA filters, etc., and are not expected to contain liquids. If wastes are generated that contain liquids, these wastes may be treated to remove or absorb liquids, to comply with the receiving TSD waste acceptance criteria. In addition, the analytical laboratory will generate containerized liquid waste (lab packs).

Miscellaneous Nonradioactive Dangerous Waste

Each nonradioactive dangerous waste container will have associated documentation that describes the contents, such as waste type and physical and chemical characterization. Typically, commercially available containers will be used. The types of containers used for packaging nonradioactive dangerous waste will comply with the receiving TSD waste acceptance criteria and transportation requirements. However, final container selection, container and waste compatibility, and the need for liners will be based on the physical and chemical properties of the waste being managed.

4.2.1.2 Container Management Practices [D-1b]

The following paragraphs describe how each of the containers used at the WTP are managed.

4.2.1.2.1 Immobilized Glass Waste Containers

Immobilized glass waste ILAW containers and IHLW canisters will be moved remotely due to the high radiation content of the waste. A brief discussion of how the containers move through the WTP is presented below.

ILAW Containers

An empty container will be transported to a LAW glass pour cave and placed on a turntable designed to hold three containers. There are two ILAW pour caves at each melter, each with the capacity to manage three containers at a time. The container will be sealed to the Melter discharge with a pour head connection. The glass waste will fill the container during the course of approximately 10 hours.

The filled ILAW container will be lowered back onto the turntable. The filled container will cool for 10 to 30 hours to reach glass transition temperature (approximately 400 °C to 500 °C), which characterizes the transformation from an equilibrated melt to a “frozen” glass structure. At this stage, the waste glass does not contain liquid and is in a viscous state that ultimately stabilizes to a solid. Once the container has cooled, it will be rotated to the transfer position. The container will then be lifted by a remotely operated monorail hoist, moved to the transfer tunnel, lowered onto a container transfer bogie, and transported to a position within the transfer tunnel below the finishing line. In the event the finishing line becomes backed up, the container may be transported to the ILAW container buffer storage containment building. The containers will not be stacked. Storage area dimensions are summarized in Table C-1.

The container will be transported to the ILAW container finishing line (see Section 4.2.4), where the level of waste glass will be measured and additional inert filler will be added, if needed.

A sample of the glass may also be collected in this location prior to inert filling. Glass within the neck of the container will be removed by abrasion and the lid will be attached to the container. The debris generated from residual glass removal will be collected with a vacuum system and disposed of as a secondary waste.

After the lid is mechanically sealed, the container will be moved to the decontamination cell where contamination will be removed. Using a turntable, the container will revolve while a power manipulator tracks the entire surface with decontamination equipment. The dry decontamination process will use carbon dioxide pellets. The container will then be transported to of the swabbing cell, where its surface will be swabbed. The radiation levels of the swab will be remotely monitored, and the results will determine whether the ILAW container will be ready for transportation to the disposal site, or go through decontamination again.

IHLW Canisters

The empty canister will be remotely transported to the IHLW pour station located in Pour Tunnel 1 and 2. The canister will be sealed to the melter pour spout with a pour head. After filling, the canister will be allowed to cool to glass transition temperature (approximately 400 °C to 500 °C), which characterizes the transformation from an equilibrated melt to a “frozen” glass structure, prior to transportation to the IHLW canister weld containment building unit (see Section 4.2.4).

The IHLW canister will be transferred to the IHLW canister handling cave containment building unit by means of bogie. Here it will be stored on an open rack for up to three days, until it cools to normal operating temperature. Normal operating temperature is the temperature at which the canister can be lidded. This temperature range is 70 °F to 350 °F. In addition to providing a cooling area, the IHLW canister handling cave containment building unit can be used as a buffer to hold canisters awaiting lid welding or decontamination.

After it has cooled, the volume of glass in the canister will be determined. The canister will then be inspected for glass spatter on its exterior. If glass is found, it will be removed using a needle gun, and the debris generated will be collected with a vacuum system and disposed of as a secondary waste. The lid will be attached by welding, to seal the canister completely and permanently.

The sealed canister will be transported inside the bogie rinse vessel HDH-VSL-00001 to the canister decon cave (H-B035). The canisters, placed in canister decon vessel 1 or 2 (HDH-VSL-00002/4), are first rinsed with de-ionized water and then decontaminated using a cerium nitrate and nitric acid bath. It will then be rinsed with nitric acid, followed by a de-ionized water rinse, and then wiped or swabbed with a soft absorbent material in the canister swabbing and monitoring containment building (H-0133). The radiation levels of the swab will be monitored.

The canister will then be moved to the IHLW canister storage cave (H-0132) where it will be stored until transported off-site inside a shielded shipping cask. The canisters will not be stacked. Storage area dimensions and maximum waste storage volumes are summarized in Table C-1.

Other IHLW Canister Storage Requirements

As stated in WAC 173-303-630(5)(c), a 30 in. separation is required between aisles of containers holding dangerous waste. In addition, WAC 173-303-340(3) requires a 30 in. separation to allow unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment in an emergency.

Evaluation of the 30-in. aisle spacing requirement by the United States Department of Energy (DOE), WTP, the United States Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) for IHLW canisters concluded that aisle spacing in the range of 4 to 16 in. was adequate based on the following factors:

- Personnel access into the immobilized glass canister storage cave will be restricted. High radiation dose rates from immobilized glass waste canisters will preclude personnel entry into the process and storage areas, and inspection of the ILAW containers and IHLW canisters will be performed remotely. (See Operating Unit Group 10, Chapter 6.0 for the inspection approach.)
- Water-based fire suppression systems will not be used in the HLW canister storage cave. Because of its inert nature, the glass waste will present a low fire hazard, and a minimal amount of combustible material will be present. The only potentially combustible material that may be present in the immobilized glass waste canister storage cave is insulation on crane motors and associated cables. To ensure no water is introduced into the canister storage cave, a dry chemical fire suppressant system may be installed.
- Spill control equipment will not be necessary within the IHLW canister storage cave. Spills or leaks from the stored canisters will not occur because the glass waste will be in a solid form and will not contain free liquid. The glass transition temperature characterizes the transformation from an equilibrated melt to a "frozen" glass structure.

The IHLW canisters will be stored in a storage rack to allow airflow. No stacking of the HLW canisters and ILAW containers will occur. Closed circuit television cameras will enable general viewing of both areas.

Miscellaneous Mixed Waste Containers

Miscellaneous mixed waste (secondary waste) will be managed in:

- HLW East corridor (HC-0108/09/10)
- HLW loading area (H-0130)
- Failed melter storage facility (balance of facilities)
- Laboratory waste management area (A-0139A/B/C/D)

Containers will be kept closed unless waste is being added, removed, or sampled while in the containment storage areas. Containers stored in these areas will be placed on pallets, or otherwise elevated to prevent contact with liquid, if present. Table C-1 summarizes the dimensions and maximum capacity of miscellaneous mixed waste storage areas. Containers will be managed in designated areas throughout the WTP, and then transferred to a suitable TSD facility.

The HLW East corridor (HC-0108/09/10) will be located in the eastern portion of the main floor (0 ft elevation) of the HLW vitrification facility. This unit will be used as a storage location prior to export of secondary waste containers out of the facility. Aisle space will be 30 in, and waste containers may or may not be stacked. This units' storage capacity is listed in Table C-1.

The HLW loading area (H-0130) will be located in the eastern portion on the 0 ft elevation of the HLW vitrification facility. The unit will be used for storage of the miscellaneous waste containers prior to shipment to a suitable TSD facility. The aisle space will be 30 in. and waste containers may or may not be stacked. This units' storage capacity is listed in Table C-1.

The failed melter storage facility will be a stand-alone building. It will be used primarily to manage HLW melters that have completed their useful service life. The failed melters storage facility may also receive containerized miscellaneous mixed waste, if needed.

The laboratory waste management area (A-0139) will be located in the southern portion on the 0 ft elevation of the analytical laboratory. The unit will be used for storage of miscellaneous waste containers prior to disposition to a receiving TSD facility. The aisle space will be 30 in. and waste containers may or may not be stacked. This unit's storage capacity is listed in Table C-1.

Miscellaneous Nonradioactive Dangerous Waste Containers

Miscellaneous dangerous waste containers will typically be managed in the nonradioactive dangerous waste container storage area, or in non-permitted waste management units (satellite accumulation areas and less-than-90-day storage areas) located throughout the WTP. The nonradioactive dangerous waste container storage area will consist of a concrete pad approximately 25 ft by 30 ft. The area may include a metal roof or portable storage buildings such as cargo containers or storage lockers. Containers will be kept closed unless waste is being added, removed, or sampled. They will routinely be moved by forklift or drum cart, and will be managed in a manner that prevents ruptures and leaks. The storage capacity for the nonradioactive dangerous waste container storage area is listed in Table C-1. The containers in that area may be stacked two high and aisle spacing will be at least 30 in. between rows of containers. Containers stored in this area will be placed on pallets, or otherwise elevated to prevent contact with liquid, if present.

4.2.1.2.2 Waste Tracking

The plant information network interfaces with the integrated control network and is designed to collect and maintain plant information. The plant information network is currently planned to the following systems:

- Plant data warehouse and reporting system
- Laboratory information management system
- Waste tracking and inventory system

Inventory and Batch Tracking

The waste tracking and inventory system will interface with the information system data historian to provide reporting information such as tank volumes, waste characteristics, and facility inventories of process waste. The waste tracking system will also be used to query operations parameters at any time information is needed, as specified by operations, to manage the process system. IHLW canisters and ILAW containers will be tracked within the facility using an operations developed system: for example, manually recording on a board, manually inputting into the information network, or if available automated through the integrated control network.

Secondary Waste Stream Tracking

Containerized secondary waste streams and equipment will be tracked and managed through commercially available database management software. Containers will be mapped in each plant and updated during the inspection process using a commercially available drawing software application.

Laboratory Information Management System

The laboratory information management system (LIMS) will be an integral feature of the plant information network. The LIMS will serve as an essential tool for providing data management of regulatory and processing samples. The chosen LIMS will be a commercial off-the-shelf software package designed for performing laboratory information management tasks as described in ASTM E1578-93, *Standard Guide for Laboratory Information Management Systems (LIMS).*

The LIMS will track the flow of samples through the laboratory. Samples received in the laboratory will be identified with a unique identification label. The identification label provides details of the sample process stream. Baseline analyses are defined by the requesting plant. Additional analyses, as required, will be input into LIMS by laboratory analysts. Data will be input into LIMS manually or by data transfer using LIMS/instrument interface. Analyses will be performed using approved and validated analytical procedures.

Analytical results will be compiled by the LIMS and held pending checking and approval by appropriate staff. Approved results will be reported to the requesting plant.

4.2.1.3 Container Labeling [D-1c]

Immobilized Waste Glass Containers

Due to the radioactivity and handling requirements of the immobilized waste containers, conventional labeling of the immobilized waste containers will not be feasible and an alternative to the standard labeling requirements will be used. This alternative labeling approach will use a unique alphanumeric identifier for the IHLW canister and a unique numeric identifier for the ILAW container that will be welded onto each immobilized glass waste container. The welded "identifier" will ensure that the number is always legible, will not be removed or damaged during container handling, will not be damaged by heat or radiation, emits no gas upon heating when waste glass enters the container, and will not degrade over time.

The identifier will be welded onto the shoulder and side wall of each immobilized glass container at two locations approximately 180 degrees apart. Characters will be approximately 2 in. high by 1.5 in. wide. The identifier will be formed by welding on stainless steel filler material at the time of container fabrication. This identifier will be used to track the container from receipt at the WTP, throughout its subsequent path at the WTP, until it leaves the plant to be disposed or stored.

Each identifier will be unique. This unique number will be maintained within the plant information network and will list data pertaining to the waste container including waste numbers and the major risk(s) associated with the waste.

Personnel access into the immobilized glass waste container storage areas will be limited and controlled administratively. Signs designating the hazards associated with the immobilized waste glass will be posted at appropriate locations outside the container storage areas.

Miscellaneous Mixed Waste Containers

The miscellaneous mixed waste containers will be labeled with the accumulation or generation start date, as appropriate, the major risk(s) associated with the waste, and the words "hazardous waste" or "dangerous waste." A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that required information is visible. The label will meet the WAC 173-303-630(3) requirements, and the dangerous waste number will be clearly identified.

The labels on the overpack for the spent melters will carry the accumulation or generation start date, the major risk(s) associated with the waste, and the words "hazardous waste" or "dangerous waste". A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that required information is visible, and the dangerous waste number will be clearly identified.

Miscellaneous Dangerous Waste Containers

The miscellaneous dangerous waste drums will be labeled with the accumulation or generation start date, as appropriate, the major risk(s) associated with the waste, and the words "hazardous waste" or "dangerous waste". A waste tracking and inventory system will be implemented. Labels and markings will be positioned so that required information is visible. The label will meet the WAC 173-303-630(3) requirements, and the dangerous waste number will be clearly identified.

4.2.1.4 Containment Requirements for Storing Waste [D-1d]

Secondary containment requirements for the waste managed in the immobilized waste container storage areas and the limited amount of other materials present are discussed below.

4.2.1.4.1 Secondary Containment System Design [D-1d(1)]

Secondary containment is required for areas in which containers hold free liquids. It is also required for areas managing wastes exhibiting the characteristics of ignitability or reactivity as defined in WAC 173-303-090(5) and (7).

IHLW

Secondary containment requirements do not pertain to the IHLW canister storage cave, as these canisters will not contain free liquids or wastes that are designated ignitable or reactive.

Miscellaneous Mixed Waste

Miscellaneous mixed waste storage areas may contain waste requiring secondary containment. If wastes containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated, portable secondary containment that meets the requirements of WAC 173-303-630(7) will be provided.

Miscellaneous Dangerous Waste

The nonradioactive dangerous waste storage area may contain waste requiring secondary containment. If wastes containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated, portable secondary containment that meets the requirements of WAC 173-303-630(7) will be provided.

4.2.1.4.2 System Design [D-1d(1)(a)]

IHLW

There will be one container storage area for the IHLW canisters in the HLW vitrification facility, as follows:

- IHLW canister storage cave (H-0132)

The IHLW canister storage cave will be located in the HLW vitrification facility, which is designed to be seismically qualified, as outlined in DWP Operating Unit Group 10, Supplement 1. A secondary containment system will not be needed because the immobilized glass waste will not contain liquid. In addition, because liquid will not be present in the IHLW container storage area, the floor will not be sloped and will not contain drains or sumps.

Liquid will not be present within the IHLW container storage area for the following reasons:

- Administrative controls will ensure that liquid does not enter inside filled IHLW canisters.
- The IHLW canister storage cave will be completely enclosed with a metal roof.
- Penetrations to the storage area will be sealed to prevent water ingress.
- Rainwater will be directed away using roof drains.

The location of the IHLW canister storage cave are shown on general arrangement drawings in DWP Operating Unit Group 10, Appendix 10.4.

Miscellaneous Mixed Waste

There will be four miscellaneous mixed waste (secondary waste) container storage areas at the WTP, as follows:

- HLW east corridor El. 0 ft (HC-0108/09/10)
- HLW loading area (H-0130)
- Failed melter storage facility
- Laboratory waste management area (A-0139 and A-0139A)

The HLW waste container storage areas will be located within the HLW vitrification facility. The laboratory waste management area will be located within the analytical laboratory. Therefore, these units will be completely enclosed within the plants, which will have metal roofing, roof insulation, and a vapor barrier. Penetrations to the storage areas will be sealed to prevent water ingress, and rainwater will be directed away using roof drains.

The failed melter storage facility will be used primarily to manage HLW Melters that have completed their useful service life. These units will be received in carbon steel overpack containers allowing limited hands-on contact. These overpacks will not be opened while the waste melters are located in this storage facility. The facility is capable of storing up to three waste melters at any given time. The spent HLW Melters will not be stacked.

The failed melter storage facility may also receive containerized miscellaneous mixed waste, if needed. These waste containers will be sealed prior to transport to the failed melter storage facility. The containers will not be opened while at this storage facility. The waste containers will not be stacked more than two containers high. The failed melter storage facility will be a stand-alone building located in the southern portion of the WTP.

Miscellaneous Dangerous Waste

Waste containing liquid may be present in the nonradioactive dangerous waste storage area. Containers with liquids will be provided with portable secondary containment meeting the requirements of WAC 173-303-630(7).

4.2.1.4.3 Structural Integrity of the Base [D-1d(1)(b)]

The storage areas will be constructed to support storage and transportation of containers within the container storage areas and will be designed with the following:

- Containment system capable of collecting and holding spills and leaks.
- Base will be free of cracks and gaps and sufficiently impervious to contain leaks.
- Positive drainage control.
- Sufficient containment volume.
- Sloped to drain or remove liquid, as necessary.

4.2.1.4.4 Containment System Capacity [D-1d(1)(c)]

IHLW

Because liquids will not be present in the IHLW canister storage cave, a containment system capacity demonstration is not required.

Miscellaneous Mixed Waste

The HLW container storage areas do not require secondary containment because storage of liquids in these units is not anticipated. If the waste is found to contain liquid, portable secondary containment will be provided that meets the requirements of WAC 173-303-630(7). The waste container will function as the primary containment while the portable containment device will function as the secondary containment. Each portable secondary containment will have the capacity to contain 10% of the volume of all containers within the containment area, or the volume of the largest container, whichever is greater.

Liquid waste may be stored in the laboratory and waste management area. Each container holding liquid dangerous waste will be placed into portable secondary containment that meets the requirements of WAC 173-303-630(7). The waste container will function as the primary containment while the portable containment device will function as the secondary containment.

Each portable secondary containment will have the capacity to contain 10% of the volume of all containers within the containment area, or the volume of the largest container, whichever is greater.

Miscellaneous Dangerous Waste

Waste containing liquid may be present in the nonradioactive dangerous waste container storage area. Each container holding liquid nonradioactive dangerous waste will be placed into portable secondary containment. The waste container will function as the primary containment while the portable sump will function as the secondary containment. Each portable secondary containment will have the capacity to contain 10% of the volume of all containers within the containment area, or the volume of the largest container, whichever is greater. Typically, the waste containers will be steel drums.

4.2.1.4.5 Control of Run-On [D-1d(1)(d)]

IHLW

The IHLW container storage cave will be located inside the HLW vitrification facility. The requirements for this section do not apply because the immobilized glass waste canister storage cave is within the HLW vitrification facility and therefore will not be exposed to run-on.

Miscellaneous Mixed Waste

Run-on will not reach the interior of the miscellaneous mixed waste storage areas, because they will be located within buildings, which will have roof gutters to remove precipitation.

Miscellaneous Dangerous Waste

Run-on will not reach the interior of the nonradioactive dangerous waste container storage area, because waste will be managed in buildings with walls and roof to remove precipitation.

4.2.1.4.6 Removal of Liquids from Containment System [D-1d(2)]

IHLW

No liquids will be present in the IHLW canister storage cave, therefore, the requirements of this section do not apply to the immobilized waste glass container storage area.

Miscellaneous Mixed Waste

Portable secondary containment sumps will be provided for individual containers that contain liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary containments.

Miscellaneous Dangerous Waste

Portable secondary containment sumps will be provided for individual containers that contain liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary containments.

4.2.1.4.7 Demonstration that Containment is not Required because Containers do not Contain Free Liquids, Wastes that Exhibit Ignitability or Reactivity, or Wastes Designated F020-023, F026 or F027 [D-1e]

IHLW

The IHLW glass canister storage cave will not contain liquids. The vitrification process volatilizes water or other liquid materials existing at ambient conditions in the waste slurry feed that enters the melter.

The waste numbers for ignitability (D001) and reactivity (D003) will not be managed in the immobilized glass canister storage cave. Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system unit. Therefore, these waste numbers will not be present at the WTP.

Miscellaneous Mixed Waste

Liquids may be present in wastes in the laboratory waste management area and the HLW secondary mixed waste storage areas. Secondary containment will be provided for individual containers that manage liquids. The laboratory waste management area may manage D001 and D003 waste. Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system. Therefore, these waste numbers will not be present at the WTP.

Miscellaneous Dangerous Waste

The nonradioactive dangerous waste container storage area may manage liquids and D001 and D003 waste; therefore, secondary containment will be provided. Wastes with the F020-F023, F026, and F027 numbers are not identified for the DST system unit. Therefore, these waste numbers will not be present at the WTP.

4.2.1.5 Prevention of Reaction of Ignitable, Reactive, and Incompatible Wastes in Containers [D-1f]

Ignitable, Reactive, or Incompatible IHLW

Immobilized glass waste will not be ignitable, reactive, or incompatible with the wastes managed in the IHLW canister storage cave. The requirements of this section are not applicable to the immobilized glass waste canisters, including spent melters.

Ignitable, Reactive, or Incompatible Miscellaneous Mixed Waste and Miscellaneous Dangerous Waste

Potentially incompatible wastes are not expected to be managed in the miscellaneous mixed waste storage areas, except for the laboratory waste management area and the nonradioactive dangerous waste container storage area. If such wastes are managed in one of these areas, the containers of incompatible waste or chemicals will not be stored in close proximity to each other. Acids and bases will be stored on separate portable secondary containment sumps; oxidizers will be stored in areas separate from combustible materials; and corrosive chemicals will be stored on a separate secondary containment sump. These separate storage areas within the unit will be clearly marked with signs indicating the appropriate waste to be stored in each area. Potentially incompatible waste will be stored at least one aisle width apart.

4.2.2 Tank Systems [D-2]

This section contains descriptive information for each tank system used for managing mixed waste. The term “tank systems” refers to mixed waste storage or treatment tanks, including primary containment sumps, and their associated ancillary equipment and containment systems. Figures and permit drawings depicting design features of tank systems are found in DWP Operating Unit Group 10.

The following text uses the terms “vessel” and “tank”. The term “vessel” is an engineering term and denotes more robust construction than a typical mixed waste storage or treatment tank. The term “vessel” is included due to the use of the term in the American Society of Mechanical Engineers (ASME) codes and specifications, which will be followed for most tank construction at the WTP.

4.2.2.1 Design, Installation, and Assessment of Tank Systems [D-2a]

This section describes the attributes of tank systems that will contain mixed waste. Tanks and ancillary equipment containing only additives or reagents, such as glass-forming chemicals, precipitation reagents, or unused resin, are not regulated under RCRA or the Washington State Dangerous Waste Program, and are therefore not included.

Tank systems that will contain mixed waste are designed to comply with worst-case scenarios, such as extreme pH, temperature, and pressure conditions. The WTP will be entirely new construction, and there will be no “existing tanks” in the plant.

Tank systems, with the exception of the two outside tanks at the pretreatment facility, will be located indoors and within process cells, process rooms, or caves with controlled access.

4.2.2.1.1 Design Requirements [D-2a(1)]

Tanks

Most of the tanks that come in contact with the waste will be operated under atmospheric pressure conditions at the WTP. The mixed waste tanks will be designed, at a minimum, to *Boiler and Pressure Vessel Code* (ASME 2000), the American Petroleum Institute (API) codes, or other appropriate design codes. Tank integrity will be reinforced by additional requirements of the tank group and seismic category assignment to each tank.

The vessels will be designed for seismic loading in accordance with the *Uniform Building Code* (UBC) standard for Zone 2B (UBC 1997).

The codes and standards that will be followed for design, construction, and inspection for the tanks are identified below, as applicable:

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society of Non-Destructive Testing
ASTM	American Society for Testing and Materials
EPA	US Environmental Protection Agency
NBBPVI	The National Board of Boilers and Pressure Vessel Inspectors
OSHA	Occupational Safety and Health Administration
PFI	Pipe Fabrication Institute
UBC	*Uniform Building Code*
WRC	Welding Research Council

Permit documents describing tank design requirements are located in DWP Operating Unit Group 10, Appendix 7.7:

- *Specification for Pressure Vessel Design and Fabrication*, 24590-WTP-3PS-MV00-T0001
- *Seismic Qualification Criteria for Pressure Vessels*, 24590-WTP-3PS-MV00-T0002
- *Specification for Pressure Vessel Fatigue Analysis*, 24590-WTP-3PS-MV00-T0003

Piping and Pipe Support Design

The design code of the WTP piping and pipe supports is ASME B31.3 Code (ASME 1996), as well as the DOE seismic requirements. In compliance with DOE seismic requirements (DOE 1996), response spectrum method or UBC (UBC 1997) static method is used for the seismic analysis of the piping systems.

Additional information for piping and pipe support design is included in the following documents, which are included in DWP Operating Unit Group 10 Appendices as indicated:

- *Material for Ancillary Equipment*, 24590-WTP-PER-M-02-002 (Appendix 7.9)
- *Piping Material Class Description*, 24590-WTP-PER-PL-02-001 (Appendix 4)
- *Ancillary Equipment Pipe Support Design*, 24590-WTP-PER-PS-02-001 (Appendix 7.5)

4.2.2.1.2 Physical Information for Tanks

Table C-2 through Table C-5 list current tank design information (capacity, materials of construction, and dimensions). The tank systems are grouped by plant and process system.

Tank operation is generally automated. However, operator intervention can be used when human decisions or approval are required for initiation and termination of a process operation. Descriptions of tank system operation for major WTP process systems are identified in sections 4.1 and 4.2.2.

4.2.2.2 Ancillary Equipment Requirements [D-2a(1)]

Information concerning ancillary equipment is provided in the following subsections.

4.2.2.2.1 Transfer or Pressure Control Devices

Several fluid transfer devices will be used in the WTP. These devices include mechanical pumps, reverse flow diverters, and steam ejectors. Breakpots and seal pots, although not fluid transfer devices, are an important component of vessel operations. These components are discussed in the following sections.

Mechanical Pumps

Mechanical pumps will be used for operations that require high-flow pumps (such as through the evaporator circuits) or high-pressure head pumps (such as for pumping a waste stream through ultrafiltration circuits). Mechanical pumps will be located in process cells, process rooms, or caves. In general, mechanical pumps will be repaired in place, or removed to a maintenance area. However, remotely maintained pumps will be used in areas where maintenance activities would result in a significant radiation dose to the operators.

For normal process operating sequences, mechanical pumps and associated valves will be controlled by the process control system. In systems where off-normal conditions would require pump shutdown, the design will include an alarm mechanism that will also trip the transfer device. The pump system is designed to allow for the drainage of liquid from the pump, and for the introduction of flush liquids at the end of transfers to reduce residual contamination.

Reverse Flow Diverters

Reverse flow diverters will provide for the maintenance-free pulsed or metered transfer of liquids or slurries throughout the treatment process. A reverse flow diverter does not need to be fully submerged in order to remove the contents of a vessel, and it maintains a small and predictable volume of tank contents following its use. Operation of the reverse flow diverter is cyclical, following timed phases: suction phase, drive phase, and blowdown. The following paragraphs describe a typical reverse flow diverter system arrangement.

Suction phase: In the suction phase, the secondary automatic valve A is open, admitting air to the suction jet pump. Valve B is shut and liquid is drawn from the supply tank through the reverse flow diverter and into the charge vessel. The suction ejector is designed so that it cannot produce a vacuum capable of lifting liquid higher than a certain valve known as the “suction lift”. After a short time, the liquid reaches this “suction lift” height and stops, then valve A is shut.

Drive phase: When valve A is shut, valve B is opened, admitting air to the drive nozzle. Air passes through the nozzle and pressurizes the charge vessel. Liquid is forced across the reverse flow diverter and into the delivery pipe. The delivery pipe is quickly filled with liquid that flows into the delivery vessel.

Blowdown phase: When the charge vessel is nearly empty, valve B is shut; no air is supplied to either jet pump. The compressed air in the charge vessel passes back through the paired jet pumps, down the vent pipe, and into vessel vent system.

Shortly after blowdown begins, the pressure in the charge vessel falls below the delivery head, and the flow of liquid into the delivery vessel is halted.

The liquid in the delivery vessel then falls back down the pipe, across the reverse flow diverter, and into the charge vessel. After a short time, the pressure in the charge vessel falls to zero (gauge). The cycle is now complete.

Steam Ejectors

Steam ejectors are used to transfer process liquids, or to reduce the operating pressure of a system by gas removal. They empty liquid from vessels by means of suction lift, using a simple control system.

An automated control valve supplies high-pressure steam to the steam ejector. This steam accelerates through a nozzle, creating a differential pressure along a submerged suction leg within the vessel. The pressure than forces the liquid up the suction pipe. This effect is known as *striking*. The steam then conveys the liquid to the destination vessel, normally via a breakpot. Control is established using liquid level instrumentation in the vessel being emptied, and using a temperature indicator, such as a thermocouple, within the breakpot.

Seal Pots

A seal pot is a type of hydraulic seal. A hydraulic seal is used primarily to maintain a separation between vessel vent or offgas systems for feed and receipt vessels. This separation is necessary to prevent migration of airborne contamination between the vessels. Without the seal, airflow could occur due to the different pressures in the vent systems. The seal is a slug of liquid in the interconnecting pipe work that remains after each liquid transfer is completed, blocking airflow between vessels.

The seal can be provided by constructing a simple “U” shape in the piping. Different piping arrangements are used for different purposes. A seal pot is a small vessel with one (inlet or outlet) pipe submerged in the liquid slug in the lower part of the pot, while the other pipe terminates in the top of the pot, above the static liquid level. The pot may be provided with a level indicator or alarm, if necessary, to ensure adequate liquid level. Periodic liquid additions may be needed to maintain the seal, especially if the pipeline is infrequently used.

Breakpots

The main function of the breakpot is to reduce the amount of mixed waste material entrained into the vessel ventilation system. Breakpots are provided on transfer lines that use steam ejectors for moving liquids by pressure flow. These types of transfers create the potential for air entrainment of mixed waste contamination. Breakpots function to convert steam from pressure flow to liquid gravity flow, thereby reducing both the effluent loading on the downstream vessel ventilation treatment system and the mixed waste contamination levels in the vessel vent ductwork. Breakpots also serve a secondary purpose by providing a siphon break for other transfer systems where siphoning could occur.

Breakpots are typically placed at a high point in the discharge line from the steam ejector. Liquid will be pumped into the breakpot through an inlet nozzle in its wall. The incoming liquid will be directed towards a baffle. Within the baffle, noncondensed steam and gases will disengage. The breakpot will be self-draining; the liquid will drain through the breakpot discharge pipe to the destination vessel.

Above the inlet nozzle(s) will be a packed bed where disentrainment of the gas stream will occur. The exiting gas from the packed section will pass into the vessel ventilation system. The packed bed can be washed periodically using a wash ring permanently installed above the packed bed.

4.2.2.2.2 Bulges

Bulges are intended to allow hands-on maintenance of equipment after process fluids are flushed from the bulge piping and components. Bulges provide shielding to personnel during process operation and allow vulnerable or failure prone components to be located outside the process environment. The cell wall provides shielding between the cell and the bulge interior. The bulge includes shielding and contamination control as needed, depending on the process fluid within the bulge piping.

A typical bulge consists of a metal frame attached to the outside wall of a process cell; the frame is used to support the piping and components as well as the shielding plates (usually steel), which are bolted to the frame. Bulges provide secondary containment for DWP ancillary equipment inside the bulge. The ancillary equipment located inside the bulges will be provided with leak detection or the bulge is provided with a drain line that flows to a sump equipped with leak detection. Leak detection can be provided internal to the bulge or in the sump associated with bulge drain line.

There are two classifications of bulges used at the WTP. One is a "process" bulge; the other is a "service" bulge. The process bulge contains valves, pumps, piping, etc. The service bulge contains valves used to transfer reagents, steam, etc., to the in-cell process equipment. The design of the two bulges is similar.

Bulges are equipped with several wash systems, facilitating washing both internal and external piping, components, and bulge confinement surfaces. Decontamination of the equipment internals and associated piping is achieved by externally connecting a flushing system located on the outside of the bulge. Wash fluids could be water or more aggressive media such as nitric acid, provided compatibility with the bulge materials is ensured.

Additional information on process bulges may be found in *Process Bulge Design and Fabrication* (24590-WTP-3PS-MX00-TP001), located in DWP Operating Unit Group 10, Appendix 7.7 and Addendum 4A, Figure 4A-127.

4.2.2.2.3 Description of WTP Piping System

Detailed information on piping is included in *Piping Material Class Description* (24590-WTP-PER-PL-02-001), located in DWP Operating Unit Group 10, Appendix 4.

Interplant Piping Transfer Lines

Waste feed from the DST system will be transported to the WTP via the waste transfer lines.

The waste feed transfer lines will be double-walled pipe. The inner pipe will be constructed of stainless steel, while the outer pipe will be constructed of carbon steel. The carbon steel outer pipe will be coated with a corrosion-resistant material. In addition, the coated outer pipe for the waste transfer lines from the DST to the pretreatment facility will be surrounded by insulation and a seamless high-density polyethylene outer shell. This extra layer of protective material will isolate the waste transfer lines from soil. The waste transfer lines between the pretreatment facility and the other WTP process plants will not have this extra barrier from the soil, but will be cathodically protected as described later in this section.

A leak detection system will be provided for the entire length of the waste transfer line. Pumping will be terminated, and reception of waste feed from the DST system unit will stop, when a leak is identified by the leak detection system.

The inner pipe will be supported by guides, saddles, support keys, or anchors within the outer pipe. The inner pipe will transport waste and maintain the pressure boundary, while the outer pipe will provide secondary containment for the inner pipe. The piping system will be buried under a minimum depth of soil for radiation shielding. The minimum depth of soil will be finalized at the detail design phase and will be not less than the 2 ft freeze depth. A heat trace system is not required for pipes buried below freeze depth.

The piping system will have a continuous slope down toward the pretreatment facility. Released liquids resulting from leaks to the outer pipe can be removed as required by WAC 173-303-640(4)(b). The piping system will be designed to allow water flushing to occur in both directions.

Liquid Effluent Transfer Lines

Liquid effluent generated at the WTP will be routed to the pretreatment facility for recycling through the WTP or disposal to the LERF and ETF.

An effluent line will be routed from the pretreatment facility to the LERF and ETF. This line is a buried pipe, constructed of materials that are compatible with the waste, under a minimum 2 ft of soil serving as freeze protection. The pipes will have a continuous downwards slope towards the LERF and ETF, and will be designed to maintain structural integrity. A leak detection system will be provided for the LERF/ETF waste transfer lines.

Intraplant Piping

Within plants, the pipelines associated with the tank system will be single-walled. Secondary containment will be provided for piping within the plants by double-walled pipe or partially lined process cells, process rooms, or caves. If needed, other containment methods such as a bulge or concrete ducts with liners will be provided at appropriate locations. The bulge or concrete ducts will be provided with a low point which will drain to process cells, process rooms, or caves. The leak detection equipment located within the process cells, process rooms, and caves will warn of a piping leak through alarms.

Piping between plants and the two outdoor tanks at the pretreatment facility will be double-walled below grade and below the freeze line, similar to the waste transfer line.

Cathodic Protection

An impressed current cathodic protection system will be used for eliminating or mitigating corrosion on underground piping. The cathodic protection system will maintain a negative polarized potential between the protected pipe and a saturated copper/copper sulfate reference electrode.

The impressed current cathodic protection system uses direct current provided by a rectifier that is powered from the plant's normal 480 Vac power system. The direct current from the rectifier is connected across the buried anode wire and the protected pipe. The current flows from the anode wire, which is positive, through the electrolyte, to the protected pipe, which is negative, and back to the rectifier completing the electrical circuit.

An annual survey, recommended by NACE International (formerly the National Association of Corrosion Engineers), will be performed on the overall system. Test stations will be provided to permit potential measurements. Additional information on inspections is provided in Operating Unit Group 10, Chapter 6.0.

The following waste transfer lines are provided with cathodic protection at the WTP. The waste transfer lines are double encased and constructed of materials that are compatible with the waste:

- Mixed waste transfer lines between the Pretreatment Facility and the HLW Vitrification Facility
- Mixed waste transfer lines between the Pretreatment Facility and the LAW Vitrification Facility
- Mixed waste transfer line between the Analytical Laboratory and the Pretreatment Facility

Corrosion Protection

The following waste transfer and effluent transfer lines are isolated from soil moisture with an external waterproof barrier to provide corrosion protection:

- DOE waste feed pipelines from the Tank Farm interface point to the PTF
- Radioactive/dangerous waste effluent transfer lines from the PTF to the ETF/LERF interface point

The incoming DOE waste feed pipelines that interface with the WTP pipelines are intentionally not cathodically protected. Consistent with the existing Tank Farm waste transfer design, transfer lines from the WTP interface point, the Waste Feed Receipt Process (FRP) transfer lines and the LERF/ETF effluent coaxial transfer lines are furnished with additional corrosion protection by the addition of a external waterproof barrier. This barrier isolates the lines from moisture in the surrounding soils and provides corrosion protection in lieu of cathodic protection.

The barrier consists of a 2 inch later of sprayed of injected closed-cell polyurethane foam with an external jacket of extruded high density polyethylene (HDPE) jacket with a minimum thickness of 150 mils. This barrier is located over the fusion bonded epoxy coated carbon steel outer encasement pipe which provides secondary containment for the inner stainless steel process line.

The incoming waste transfer lines are also bonded at the crossing of the plant service air piping between the PTF and the HLW Vitrification Facility on the opposite end (which is perpendicular protected piping). The waste feed lines, therefore, may receive some amount of protective cathodic protection current in the area where they are bonded. This area is defined as the "zone of influence." Bonding is provided to minimize stray electrical currents that may occur in the zone of influence and thereby eliminate the possible corrosion process. The waste feed lines are also provided with the test stations at both ends to allow potential tests that will indicat if corrosion is a concern.

4.2.2.2.4 Description of Foundations

Tank systems containing mixed waste will be located indoors in process cells or caves, which will be integral parts of the pretreatment facility, analytical laboratory, the LAW vitrification facility, and the HLW vitrification facility with the exception of two outdoor tanks. Therefore, the design requirements of the tank systems will be met by the structural integrity of the plants. WTP compliance with UBC seismic design requirements, found in DWP Operating Unit Group 10, Supplement 1, provides the seismic design requirements for the WTP. The outdoor tanks will be located outside of the pretreatment facility on a protectively-coated concrete pad and concrete berm. The concrete pad for these tanks will be sufficient to support the tanks.

Additional information on the design criteria, load definitions, load combinations, and methodology for the structural design and analysis may be found in *Secondary Containment Design* (24590-WTP-PER-CSA-02-001), located in DWP Operating Unit Group 10, Appendix 7.5.

4.2.2.3 Integrity Assessments [D-2a(2)]

A written assessment of the adequacy of the design of tank systems, and miscellaneous treatment systems will be prepared on a system-by-system basis. Separate reports are prepared for tanks, tank system ancillary equipment, and associated secondary containment systems. Each assessment will be reviewed and certified by an independent, qualified, registered professional engineer to attest that the tank and miscellaneous treatment systems are adequately designed for managing dangerous waste. Each assessment will include an evaluation of the foundation, structural support, seams, connections, pressure controls, compatibility of the waste with the materials of construction, and corrosion controls for each mixed waste management system, as appropriate. Assessment reports are located in DWP Operating Unit Group 10, Appendix 8.11 for the pretreatment facility, Appendix 9.11 for the LAW vitrification facility, Appendix 10.11 for the HLW vitrification facility, and Appendix 11.11 for the Lab.

4.2.2.4 Additional Requirements for Existing Tanks [D-2a(3)]

Tanks and vessels to be permitted in the WTP will be newly constructed; pre-existing tanks will not be used. Therefore, the requirements of this section do not apply.

4.2.2.5 Additional Requirements for New Tanks [D-2a(4)]

Installation of tank systems will be performed in a manner designed to prevent damage to the tank system. The WTP uses an independent, qualified installation inspector, or an independent qualified registered professional engineer to perform tank system installation inspections. Inspection activities will include testing tanks for tightness, verifying protection of ancillary equipment against physical damage and stress, and evaluating evidence of corrosion. The inspections will document weld breaks, punctures, coating scrapes, cracks, corrosion, and other structural defects. Installation inspections will conform to permit requirements and consensus-recognized standards. Inspection findings and corrective actions, as appropriate, will be documented in post-inspection reports.

Additional information describing the installation of tank systems and associated inspections are provided in *Installation of Tank Systems and Miscellaneous Unit Systems*, 24590-WTP-PER-CON-02-001.

4.2.2.5.1 Additional Requirements for New On-Ground or Underground Tanks [D-2a(5)]

The majority of the tanks and vessels to be constructed in the WTP will be located within the pretreatment facility, the analytical laboratory, the LAW vitrification plant, and the HLW vitrification facility. Therefore, the requirements of this section do not apply to the indoor tanks.

The two outdoor Process Condensate Tanks located at the pretreatment facility (RLD-TK-00006A/B) will be located within a bermed and lined secondary containment system and will not be in direct contact with soil. The design of the outdoor tanks' concrete pad will address backfill, soil saturation, seismic forces, and freeze thaw effects. A portion of the ancillary piping for the unit will be in contact with the soil, and the effects of corrosion on the piping will be addressed in the final design.

4.2.2.6 Secondary Containment and Release Detection for Tank Systems [D-2b]

This section provides information about the secondary containment for tank systems that will contain mixed waste in the WTP. Descriptions of equipment and procedures used for detecting and managing releases or spills from tank systems are also provided.

A number of documents are provided in appendices to DWP Operating Unit Group 10 that provide detailed information regarding the design of the secondary containment system. These documents include the following:

- *Secondary Containment Design*, 24590-WTP-PER-CSA-02-001, located in Appendix 7.5
- *Material Selection for Building Secondary Containment/Leak Detection*, 24590-WTP-PER-M-02-001, located in Appendix 7.9
- *Leak Detection in Secondary Containment Systems*, 24590-WTP-PER-J-02-002, located in Appendix 7.5
- *Flooding Volume for PT Facility*, 24590-PTF-PER-M-02-005, located in Appendix 8.8
- *Flooding Volume for 28 Ft Level in PT Facility*, 24590-PTF-PER-M-03-001, located in Appendix 8.8
- *Flooding Volume for 56 Ft Level in PT Facility*, 24590-PTF-PER-M-04-001, located in Appendix 8.8
- *Flooding Volume for 77 Ft Level in PT Facility*, 24590-PTF-PER-M-04-0003, located in Appendix 8.8
- *Flooding Volume for Room P-0150 in the PT Facility*, 24590-PTF-PER-M-04-0008, located in Appendix 8.8.
- *Flooding Volume for Room P-0119 in the PT Facility*, 24590-PTF-PER-M-04-0005, located in Appendix 8.8.
- *Flooding Volume for Room P-0123A in the PT Facility*, 24590-PTF-PER-M-04-0007, located in Appendix 8.8.
- *Dangerous Waste Permit (DWP) Liner Heights in the LAW Facility*, 24590-LAW-PER-M-02-002, located in Appendix 9.8
- *Flooding Volume for the HLW Facility*, 24590-HLW-PER-M-02-003, located in Appendix 10.8
- *Dangerous Waste Permit Liner Heights in the LAB Facility*, 24590-LAB-PER-M-02-001, located in Appendix 11.8
- *Leak Detection Capability in the Pretreatment Facility*, 24590-PTF-PER-M-04-0010, located in Appendix 8.18

- *Waste Removal Capability for the Pretreatment Facility*, 24590-PTF-PER-M-04-0011, located in Appendix 8.18
- *Leak Detection Capability in the Low Activity Waste Facility*, 24590-LAW-PER-M-05-002, located in Appendix 9.18
- *Waste Removal Capability for LAW Vitrification*, 24590-LAW-PER-M-05-001, located in Appendix 9.18
- *Leak Detection Capability in the HLW Facility*, 24590-HLW-PER-M-04-002, located in Appendix 10.18
- *HLW Facility Waste Removal Capability*, 24590-HLW-PER-M-04-0001, located in Appendix 10.18
- *Lab Minimum Leak Rate Detection Capabilities for Leak Detection Boxes, Cell Sumps, and Pit Sumps*, 24590-LAB-PER-M-04-0001, located in Appendix 11.8
- *LAB Waste Removal Capability for the Effluent Vessels Cells*, 24590-LAB-PER-M-04-0002, located in Appendix 11.18

4.2.2.6.1 Secondary Containment System Requirements [D-2b(1)]

Most of the tank systems containing mixed waste will be located within the plants, although two tanks will be located outside the pretreatment facility. Tank systems containing mixed waste that are located within the plants will be arranged within process cells, process rooms, caves, or other areas provided with secondary containment liners or coatings. The outside tanks will be located on a coated, bermed, concrete pad within concrete berms that will provide secondary containment.

The secondary containment systems will be designed, installed, and operated to prevent migration of waste or accumulated liquid to soil, groundwater, or surface water. The piping associated with the tank systems will be located in the process cells, process rooms, caves, berms, or bulges. Secondary containment for piping systems will be incorporated into the design.

Tank systems and wet miscellaneous treatment systems will be provided with secondary containment that can contain 100 % of the volume from the largest tank within the containment area. In the pretreatment facility, the 15 black cells and the hot cell at the 0’ (foot) elevation are inter connected through hydraulic connections (open penetrations that interconnect adjacent cells) such that the combined secondary containment volume is available, if necessary, to contain a 100% leak from the largest tank. A leak to the hot cell floor, if large enough, will drain to the overflow vessels in the pit at -45’ (foot) elevation and ultimately to the -45’ (foot) pit secondary containment if the volume of the overflow vessel(s) is exceeded. Secondary containment areas lined with stainless steel will have a gradient (minimum 1%) designed to channel fluids to a sump. In some cases, there may be more than a single sump. For example, the hot cell in the pretreatment facility has three instrumented sumps for leak detection. Fire suppression water is included as appropriate in determining the height of the secondary containment. Table C-6 summarizes the calculated minimum liner height at the four process plants. The flooding volume documents identified above present the secondary containment height for each plant.

A concrete berm with protective coating will be used for the pretreatment facility outdoor tanks. This secondary containment area will be capable of holding 100% of the volume from the largest tank within the berm, plus the precipitation from a 25-year, 24-hour rainfall event, as required under WAC 173-303-640(4)(e)(i)(B).

The WTP uses selected industry standards to ensure secondary containment systems have sufficient strength, thickness, and compatibility with waste. The design includes an engineered structural base to protect against failure resulting both from excess force applied during catastrophic events or settlement, and from the stress of daily operation.

In the event of a spill or release, the secondary containment design will prevent released mixed waste from reaching the environment, and will safely contain the waste until it can be transferred to an appropriate collection tank.

The following subsections provide detailed descriptions of typical secondary containment systems that will be used at the WTP.

Process Cells

Process cells will be located within process plants. Process cells will typically be constructed of concrete walls to protect plant operators and the environment from radiological exposure and to prevent migration of waste or accumulated liquid to soil, groundwater, or surface water. Operator access to the process cells will not be allowed during normal operations.

Black Cells

A black cell is a type of process cell that may contain vessels, evaporators, and piping systems that are used to support process waste stream storage and blending functions. No active equipment (i.e., equipment with moving parts) components are located in the black cell. The design for the vessels and piping is all welded construction. Some instrumentation (e.g., thermocouples, radiation detectors) are remotely replaceable by insertion into sealed pipe wells. The black cell vessels and design do not possess design features for remote replacement. The black cell concept is used in areas where the risk of vessel or piping failure due to corrosion or erosion is low. The WTP pretreatment facility contains fifteen black cells and the HLW Vitrification facility contains three black cells.

Hot Cell

Alternatively, a hot cell is a type of process cell that contains active equipment and will periodically need to be remotely accessed for equipment maintenance or replacement.

All process cells will be provided with secondary containment as required. The floor will be sloped to a collection sump to allow for collection and removal of accumulated liquid within the sump.

Process Rooms

Process rooms will be located in the LAW vitrification facility and will be very similar to process caves. Access to process rooms will not be allowed during normal operations. However, access will be allowed for certain areas within WTP for nonroutine operations such as equipment replacement or maintenance. Process rooms will be provided with secondary containment as required. Systems within process rooms that manage mixed waste will have secondary containment (for example, the locally shielded melter and piping).

Caves

Caves will be located within process plants. Caves will typically be constructed with concrete walls thick enough to protect personnel from exposure to mixed waste. Caves will house mechanical handling equipment designed for remote operation and maintenance. They will generally have viewing windows and closed circuit television to allow observation of the cave operations and for overseeing remote maintenance. The cave floors and portions of the walls will be provided with secondary containment as required. The floor of the cave will be sloped to a collection sump to allow for collection and removal of accumulated liquid within the sump.

Berms

Concrete berms will be used at the LAW plant for the Caustic Collection Tank (LVP-TK-00001) and the two outdoor Process Condensate Tanks (RLD-TK-00006A/B) at the pretreatment facility.

The berms will be of sufficient structural strength and height to contain the 100 % of the volume of the largest tank plus, for the outdoor Process Condensate Tanks, the amount of precipitation that results from the 24-hour, 25-year storm event. A protective coating will be applied to the concrete pad and a portion of the berms to prevent contaminant penetration into the concrete. The containment system will be designed to allow for the discharge of storm water after visual or other testing.

Drip Pan

The ancillary equipment/piping may be provided with a drip pan, sloped, or otherwise designed to perform the secondary containment functions, including leak detection. One such drip pan is located in the HLW vitrification facility Drum Transfer Tunnel (H-B015). Design details of the HLW drip pan are provided in the *Secondary Containment Design*, 24590-WTP-PER-CSA-02-001, located in Operating Unit Group 10 Appendix 7.5.

LAW Melter Feed Line Encasement Assembly

The feed lines that transfer wastes from the LFP system the melters are housed in the LAW Melter Feed Line Encasement Assemblies (LMP-LDB-00001/00002). The encasement assemblies are a sloped bellows encasement that contains the feed line where they travel between the process cells and the melter gallery. The encasement assemblies are equipped with leak detection cables that run under the feed lines and into the bellows. The assemblies are equipped with drain lines to flow to sumps in the LAW process cells.

ASX Samplers

The ASX samplers in the PTF, HLW, and LAW facilities contain both upper and lower secondary containment liners and leak detection systems. The upper containment area is designed to collect a potential leak from the incoming sample feed and return lines where they connect to the ISOLOK sampling device. If a leak occurs in the upper containment area, the leak flows to the sloped liner which diverts the leak to the annular space of the coaxial sample return lines. Leaks flow down the secondary containment pipe and discharge to secondary containment with leak detection, typically a sump with a radar level detector. The ASX sample feed and sample return lines, and the routing of potential leaks in the annular space of the return lines are shown on the associated process system P&IDs provided in Operating Unit Group 10, Appendix 8.2, 9.2, and 10.2.

The sloped stainless steel liner in the lower containment area is designed to divert liquids to a sloped collection trough. The trough contains a removable weir that allows liquids to collect and activate the thermal level detection switch and alarms to indicate that a leak has occurred. Effluent from a leak flows to the same drain line that manages ISOLOK flush solutions. The ISOLOK flush lines terminate below the top of the trough drain to ensure that the leak detection system is not activated when flushing the ISOLOK. The ASX lower containment area drain lines are shown on the associated process system P&IDs provided in Operating Unit Group 10, Appendix 8.2, 9.2, and 10.2.

Sump and Leak Detection Boxes and Secondary Containment Drain Systems

Sumps, leak detection boxes, and secondary containment drain systems for the three process plants and the analytical laboratory are listed in Table C-9 and described in the following sections. Systems will monitor and collect liquids managed in the system. Sumps, leak detection boxes, and secondary containment drains will be provided with a stainless steel liner or equivalent to act as the secondary containment. The sumps and leak detection boxes within the process areas will provide a low point for each secondary containment. The sumps and leak detection boxes will serve the following functions:

- Low point containment.
- Removal of material by means of sump emptying ejectors or pumps.
- Sampling of of sump contents by means of sump sampling ejectors.

The following sections describe the type of sump used at the WTP and the secondary containment drains.

Sumps and Leak Detection Boxes

Sumps and leak detection boxes are part of the secondary containment system provided for tank systems and wet miscellaneous treatment systems. Sumps and leak detction boxes are located at a low point in the secondary containment systems, and are equipped with leak detection instrumentation and corresponding alarm. Mechanical or fluidic pumps are used to remove liquid that may accumulate in asump or leak detection box.

A typical sump design is shown in *Secondary Containment Design*, 24590-WTP-PER-CSA-02-001, located in Operating Unit Group 10 Appendix 7.5. Design details of each sump and leak detetction box, such as the sump size, capacity, level detection instrumentation and pumps or ejectors are included in Table C-9 and shown on the P&IDs for the RLD and/or PWD systems, located in Operating Unit Group 10 Appendices 8.2, 9.2, 10.2, and 11.2.

Four sumps located in the HLW vitrification facility Melter Cave 1 and 2 (HSH-SUMP-00003/7/8/9) will be equipped with stainless steel Sump Baskets. Sump Baskets will capture and retain small objects which may be inadvertently dropped into the sump, and prevent them from entering the piping. The baskets will be provided with a lifting bail for the crane to remove from the sump and handles for the power manipulator to empty into a waste bucket. A typical Sump Basket design is shown in *Secondary Containment Design*, 24590-WTP-PER-CSA-02-001, Figure 10, located in Operating Unit Group 10 Appendix 7.5. Sump Baskets are also identified on the P&IDs for the HLW RLD system, located in Operating Unit Group 10 Appendix 10.2.

Secondary Containment Drains

Many of the bulges, the autosamplers, and some process areas will have secondary containment drains. This type of liquid collection system will be located in a low spot in the cell formed by the sloping floor. Liquid detection instrumentation will be provided for the secondary containment drains. Liquid collected will gravity-drain to a collection vessel with a tank level indicator. The liquid managed could be waste released from a tank system, including ancillary equipment, or water used to wash the exterior of tanks or the walls of the containment area. Design details of each secondary containment drain/drain line are included in Table C-9 and shown on the P&IDs for the RLD and/or PWD systems, located in Operating Unit Group 10 Appendices 8.2, 9.2, 10.2, and 11.2.

Design Requirements

The process cells, process rooms, or caves with mixed waste vessel or tank systems will be partially lined with stainless steel or special protective coating, which will cover the floor and extend up the sides of the process cell or cave to a height that can contain 100 percent of the volume from the largest tank within the process cell or cave. Table C-6 presents the calculated minimum secondary containment liner height at the four process plants.

A concrete berm with protective coating will be used for the pretreatment facility outdoor tanks. This secondary containment area will be capable of holding 100 % of the volume from the largest tank within the berm, plus the precipitation from a 25-year, 24-hour rainfall event, as required under WAC 173-303-640(4)(e)(i)(B).

The WTP uses consensus-recognized standards to ensure that the process cells, process rooms, caves, or berms provide secondary containment with sufficient strength, thickness, and compatibility with waste. The design includes an engineered structural base to protect the cells, caves, berms and tank systems against failure resulting both from excess force applied during catastrophic events or settlement, and from the stress of daily operation. In the event of a spill or release, the structural and foundation design for tank and process cells, process rooms, caves and berms will prevent released mixed waste from reaching the environment, and will safely contain the waste until it can be transferred to an appropriate collection tank.

4.2.2.6.2 Management of Release or Spill to Sump and Secondary Containment Drain Systems [D-2B(1)]

The WTP uses dry sumps and leak detection boxes as part of the secondary containment and leak detection systems.

Sumps and leak detection boxes are instrumented to inform the operator to investigate the cause of the liquid detected in the sump or leak detection box. Secondary containment systems are sloped to direct flow of leaks or spills to the sump or leak detection box. To remove liquid from the sumps or leak detection boxes in a timely fashion, sumps and leak detection boxes will be equipped with mechanical or fluidic pumps.

A detection alarm indicating the there is liquid in the sump or leak detection box will be investigated to determine if the alarm is valid. If the alarm is valid, the incident will be corrected. Mixed waste released from the primary system and collected in a sump or leak detection box will be removed within 24 hours, or in as timely a manner as possible. If the released material cannot be removed within 24 hours, Ecology will be notified.

4.2.2.6.3 Additional Requirements for Secondary Containment [D-2b(2)]

The WTP dangerous waste storage tanks have vault-type secondary containments that have either of the following configurations that the Department of Ecology has approved as equivalent to a coating/water stop system:

- An impermeable interior coating that is compatible with the stored waste and a polymeric filler material at interior corners and construction joints that performs a function equivalent to a water stop.
- A welded stainless steel liner attached to walls and floors.

Ancillary equipment such as piping is addressed within section 4.2.2. Other types of ancillary equipment such as pumps, seal pots, and reverse flow diverters are provided with secondary containment. Inspection of ancillary equipment is addressed in Operating Unit Group 10, Chapter 6.0.

4.2.2.7 Variances from Secondary Containment Requirements [D-2c]

No variances from secondary containment requirements are sought for the WTP tank systems. Tank systems will be provided with secondary containment as identified in the flooding volume documents described in the previous sections.

4.2.2.8 Tank Management Practices [D-2d]

The following provides the basic philosophy for the WTP vessel overflow systems. Three types of barriers exist to prevent overfill of process equipment: preventive controls, detectors, and regulators. Preventive controls promote controlled filling within normal process ranges. Detectors recognize if a vessel is being overfilled and alert an operator. Lastly, if preventive controls and detectors fail to stop overfill from occurring, regulators trip a control sequence that stops inflow and/or initiates outflow. The principal design concept to control vessel overflow is to prevent an overflow from occurring. The engineering design will minimize the likelihood of tank, ancillary equipment, and containment system overflows, and over-pressurization, ruptures, leaks, corrosion, and other failures.

In general, overflows will be prevented by inventory control in conjunction with level monitoring. The fluid levels in a vessel will be maintained within low- and high-level ranges. Appropriate alarm settings will be used to note deviations from the designed settings. Automatic trip action will be designed to shut down feed to the vessel when the high-level settings are exceeded. These automatic trip actions will be provided for vessels with the potential for high operational and environmental impact in case of an accident or release.

Most of the WTP tank systems will be designed to incorporate minimal or zero maintenance requirements and will be based on a design life of approximately 40 years. The design emphasis of zero maintenance will minimize the likelihood of spills and overflows in the tank systems. In the event that the process controls fail to prohibit vessel overfilling, engineered overflows will be provided to prevent liquid from entering the vessel ventilation systems. Vessels that are nominally operating at atmospheric pressure will have a suitable gravity or engineered overflow system, unless an overflow can be shown not to be possible. Vessels or systems that normally operate at above atmospheric pressures will not be provided with overflows.

The following principles apply when designing an engineered overflow system:

- The overflow system for vessels must be instantaneously and continuously available for use.
- Overflowed process streams must be returned to the waste treatment process.
- Overflow systems must meet the requirements of WAC 173-303, *Dangerous Waste Regulations*, Section 640, Tank Systems. In meeting these requirements, overflowing direct to the cell floor will only be considered as the last overflow in a cascaded system. Where an overflow is from a vessel to the cell, the overflow system will maintain segregation of the cell and vessel ventilation systems. The compatibility of the overflowing liquid and the recipient vessel will be considered.
- A vessel overflow line is sized to handle the maximum inflow to the vessel without the liquid level in the overflowing tank reaching an unacceptably high level. No valves or other restrictions are permitted in the overflow line. This line is also designed to prevent the buildup of material that could cause blockages.
- The overflow receiver is sufficiently sized to contain the overflow.
- Inspections will be performed on the various tank and overflow systems, using the example schedules described in DWP Operating Unit Group 10, Chapter 6.0.

4.2.2.9 Labels or Signs [D-2e]

Tanks managing mixed or dangerous waste will be labeled according to the requirements of DWP permit conditions DWP III.10.E.5.e, for routinely non-accessible tanks, and DWP III.10.E.5.f, for tanks not addressed in DWP III.10.E.5.e. They will inform employees and emergency personnel of the types of waste present, warn of the identified risks, and provide other pertinent information.

4.2.2.10 Air Emissions [D-2f] and [D-8]

This section describes air emissions from vessel ventilation systems and reverse flow diverter exhausts. Organic emissions from vents associated with evaporator or distillation units are also discussed.

4.2.2.10.1 Tank System Emissions [D-2f]

Most of the tanks will be connected to a vessel ventilation system to collect vapors. Vessel vents will be located on major tanks, breakpots, and other small vessels. Exhaust from reverse flow diverters and pulse jet mixers will also be collected.

4.2.2.10.2 Process Vents [D-8a]

The air emission regulations, specified under WAC 173-303-690 and 40 CFR 264 Subpart AA, apply to process vents associated with distillation, fractionation, thin-film evaporation, and air or steam stripping operations that manage mixed waste with total organic carbon concentrations of at least 10 parts per million by weight. The WTP does not use these regulated processes; therefore, this regulation does not apply to the WTP.

4.2.2.10.3 Equipment Leaks [D-8b]

Regulations provided in WAC 173-303-691 and 40 CFR 264 Subpart BB contain the "Air Emission Standards for Equipment Leaks". These air emission standards do not apply to the WTP because waste feed entering the WTP contains less than 10% total organic carbon by weight and is excluded under 40 CFR 264.1050(b).

4.2.2.10.4 Tanks and Containers [D-8c]

The regulations specified under WAC 173-303-692 and 40 CFR 264 Subpart CC do not apply to the WTP mixed waste tank systems and containers. These tanks and containers qualify as waste management units that are "used solely for the management of radioactive dangerous waste in accordance with applicable regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act" and are excluded under 40 CFR 264.1080(b)(6). Containers bearing nonradioactive, dangerous waste, such as maintenance and laboratory waste, that is not excluded under 40 CFR 264.1080 (b)(2) or 40 CFR 264.1080(b)(8), will comply with the tank and container standards specified under 40 CFR 264 Subpart CC.

4.2.2.11 Management of Ignitable, Reactive and Incompatible Waste in Tanks [D-2g] and [D-2h]

Mixed waste from the DST system unit will initially be designated as both ignitable (D001) and reactive (D003). The D001 and D003 waste numbers will be as described in the waste analysis plan in DWP Operating Unit Group 10, Appendix 3A. The vessels will be located in a manner that meets the National Fire Protection Association (NFPA) buffer zone requirements for vessels, as contained in Tables 2-1 through 2-6 of the *NFPA-30 Flammable and Combustible Liquids Code* (NFPA 1981). The vessels will be designed to store the waste in such a way that it will be protected from materials or conditions that could cause the contents to ignite or react. Vessel contents will be constantly mixed and will be actively vented to process stacks, which will be equipped with vapor collection and treatment systems that will manage emissions. Further information on waste numbers is contained in DWP Operating Unit Group 10, Appendix 3A.

Ignitable or reactive waste may be generated from laboratory or maintenance activities. This waste will be accumulated and managed in compliance with regulatory requirements, in approved containers. Potentially incompatible waste generated from laboratory or maintenance activities will not be stored in the tank systems.

A potential for incompatibility may exist, for example when nitric acid is used to elute waste components from ion-exchange column resins that were previously regenerated with sodium hydroxide. To minimize a reaction, water flushes will be performed between batches.

Process reagents that could react with waste in the tank systems will be stored in areas that are separated by physical barriers from process tanks. Potentially incompatible wastes generated from laboratory or maintenance activities will not be stored in proximity to each other in the tank systems.

4.2.3 LAW and HLW Miscellaneous Treatment Sub-Systems [WAC 173-303-680 and WAC 173-303-806(4)(i)]

The LAW vitrification system and HLW vitrification system consist of the vitrification melters, offgas treatment equipment, and associated equipment. The melters immobilize mixed waste in a glass matrix. The LAW vitrification system and the HLW vitrification system contain two melters each. The following sections provide additional information on the vitrification systems.

Other miscellaneous treatment sub-systems, and their associated process control features, are described in section 4.2.2.

4.2.3.1 Melter Capacity and Production

For the melters, throughput is defined on the basis of quantity of glass waste produced. In turn, the quantity of glass waste produced depends on the degree to which the feed can be incorporated into the glass matrix. The maximum design throughput of the LAW Melter systems will be approximately 15 metric tons per day of glass waste for each melter and approximately 30 metric tons per day. The production rate of the HLW Melters is approximately 3 metric tons per day for each melter and approximately melter 6 metric tons per day throughput.

4.2.3.2 Description of Melter Units [WAC 173-303-806(4)(i)(i)]

The LAW Melter systems are located in the melter galleries and the HLW Melters are housed within the melter caves as depicted in the general arrangement plan and section permit drawings, which are found in DWP Operating Unit Group 10, Appendix 9.4 for the LAW vitrification facility and Appendix 10.4 for the HLW vitrification facility. The following subsections provide detailed descriptions of the melter units.

Low-Activity Waste Melter Units

Figure 4A-48 provides a sketch of an LAW Melter. Each LAW Melter (LMP-MLTR-00001/2) is a rectangular shell, lined with refractory material. An additional outer steel casing with access panels will be provided to enclose the LAW Melter. This outer steel casing is designed to provide local shielding and containment. Each LAW Melter has a nominal design capacity of approximately 15 metric tons of glass waste per day. Each will have a molten glass surface area of approximately 108 ft^2. Each of the two LAW melters has external dimensions of approximately 26 × 21 × 16 ft high, and weighs approximately 270 metric tons empty and 290 metric tons with glass. The operating temperature of the melter is between 950 °C and 1250 °C.

The locally shielded LAW Melter (LMP-MLTR-00001/2) will be operated and maintained in a personnel access area. The melter will be maintained at a lower pressure than the surrounding room to prevent escape of contaminants. Consumable melter parts will be replaced through access panels. The melters will be transported in and out of the gallery on a rail system. A transporter will move the melters to and from the LAW vitrification facility.

The melter refractory package is designed to serve as a mechanical, thermal, and electrical barrier between the molten glass residing in the melter and the melter shell.

The refractory package is housed in a steel shell and provides containment for the molten glass. Active cooling on the outside of the refractory package is provided by water jackets. The water jackets will be in the intermediate loop of a two-loop system that will transfer heat from the LAW Melter through heat exchangers to cooling towers. The intermediate loop containing the water jacket will be a closed system that isolates the water circulating through the water jacket from the water in the cooling water loop circulating to the cooling tower. Mixed waste material leaking into the intermediate loop cooling water will be prevented from becoming an inadvertent discharge via the cooling tower. The refractory package will provide adequate containment if there is a temporary loss of cooling. Penetrations in the melter system are sealed using appropriate gaskets and flanges. This system is designed for plenum temperatures of up to 1,100 °C. The LAW melter lid is composed of steel and refractory material layers.

Each LAW Melter (LMP-MLTR-00001/2) will use two independent discharge chambers. An air lift pumps molten glass from the bottom of the melter pool, through a riser, into a discharge chamber, and pours it into an ILAW container. The ILAW is then allowed to cool, forming a highly durable borosilicate glass waste form within the container.

Spent LAW Melters will initially be managed within the LAW melter gallery containment building unit.

Spent LAW Melters will be removed from the melter gallery and transported using a transport and rail system. If necessary, the melter exterior surfaces will be decontaminated prior to transfer to a Hanford Site TSD unit.

High-Level Waste Melter Units

Figure 4A-54 provides a sketch of an HLW Melter. In addition, the HLW melter mechanical assembly drawings (24590-HLW-MF-HMP-00001/2/3) are located in Operating Unit Group 10 Appendix 10.2. Each HLW Melter (HMP-MLTR-00001/2) is a rectangular shell, lined with refractory material. They have four compartments: a glass tank, two discharge chambers, and a plenum just above the glass tank. The tanks are lined with refractory material designed to withstand corrosion by molten glass.

The HLW Melter systems consist of two melters. Each HLW Melter (HMP-MLTR-00001/2) is designed for glass production rates up to 3 metric tons per day (MTG/d). The normal operating temperature of the melter is between 950 °C and 1250 °C. The HLW Melters have a molten glass surface area of approximately 40 ft^2. The HLW Melters have external dimensions of approximately 11 ft high × 14 ft deep × 14 ft wide. The glass contained in a full HLW Melter has a volume of approximately 145 ft^3 and weighs approximately 9.1 metric tons. An entire melter, including the supporting structure and transport mechanism, weighs approximately 90 metric tons empty and approximately 99 metric tons full.

The HLW Melters (HMP-MLTR-00001/2) have been designed to be remotely operated and maintained. Remote maintenance will be performed by a power manipulator, overhead crane, and auxiliary hoist, or by through-wall master-slave manipulators. The melter will be positioned within the HLW vitrification facility for ease of access and viewing of both discharge chambers during operations, and for viewing access to the melter lid to facilitate removal and replacement of subcomponents, if needed. A rail and bogie transport system will facilitate remote removal and replacement of the entire melter structure.

The HLW Melters (HMP-MLTR-00001/2) will use a refractory package similar to the LAW melter to contain the molten glass. The refractory package is designed to serve as a mechanical, thermal, and electrical barrier between the molten glass inside the melter and the melter shell.

The HLW Melters will also use an outer shell, which, with the refractory package, will contain the molten glass and melter offgas. Active cooling on the exterior of the melter will be provided by a water jacket, which will be in a two-loop system that will transfer heat from the HLW Melter through heat exchangers to cooling towers. The loop containing the water jacket will be a closed system that isolates the water circulating through the water jacket from the water in the cooling water loop circulating to the cooling tower. Mixed waste material leaking into the intermediate loop cooling water will be prevented from becoming an inadvertent discharge through the cooling tower. The refractory package will provide adequate containment should there be a loss of cooling. The HLW Melter lid will be constructed of a steel outer shell and insulated from the melter plenum by refractory material.

The HLW Melter will use two independent discharge chambers. Discharge will be achieved by transferring the molten glass from the bottom of the melter pool, through a riser, from which it will be poured into a stainless steel IHLW canister. Glass waste transfer will be accomplished through air lifting. The IHLW will then be allowed to cool, forming a highly durable borosilicate glass waste form.

Spent HLW Melters will be removed from the melter cave and placed in an overpack. The spent melter will be treated as newly generated waste, and will initially be managed within the HLW melter containment buildings. If necessary, the overpack will be decontaminated using a dry process. Failed HLW Melters will be stored in the failed melter storage building.

4.2.3.3 Automatic Waste Feed Cut-Off System

The LAW and HLW Melters will be equipped with the ability to cut off waste feed. Automatic waste feed cut-off systems terminate feed to the Melter if a specified operating condition is exceeded. This design approach is consistent with the WAC 173-303-680 regulatory requirements.

The LAW (LMP-MLTR-00001/2) and HLW (HMP-MLTR-00001/2) Melters are fed via air displacement slurry pumps that utilize pressurized air as the motive force. These pumps supply feed to the melters in slugs that act to keep lines from plugging. The feed is injected into the melters through the feed nozzles on top of the Melter creating a "cold cap", where waste feed undergoes several physical and chemical changes. The glass product in the melter is then "air lifted" through the discharge chamber and into the glass container. Melter offgas is generated from the vitrification of LAW and HLW of which the rate of generation is dynamic and not steady state. The offgas is then carried away and treated via a dedicated offgas system.

The melter systems are designed to minimize the need for automatic waste feed cut-off functions. Control of melter level and plenum pressure, process alarming, and optimized operating procedures will be in place to reduce the occurrences of interlocking. Given the processing speeds and the relatively slow rates of change in the operating states of the melter, operators should have adequate time to react to upset conditions. An example of the slow rate of change can be seen in the volume of feed per air displacement slurry pump feed cycle when increasing melter level. Each pump cycle adds approximately 1 gallon of slurry into the melter. At 1 gallon of volume, the liquid level rises no greater than 0.01 in. inside the melter. This provides ample time for operator response.

Previous operating experience with similar melter systems has shown the following operating conditions warrant automatic waste feed cut off:

- Maximum melter chamber pressure
- Minimum off-gas temperature at the thermo catalytic oxidizer bed inlet
- Maximum carbon bed adsorber bed temperature
- Maximum stack gas flow rate
- Maximum stack gas carbon monoxide

These interlocks have been sufficient to allow continued melter operations without inadvertent feed cut off signals, yet provide a sufficient safety margin.

4.2.3.4 Offgas Treatment System

The offgas treatment system will remove steam, aerosols, entrained particulates, decomposition products, and volatile contaminants that are generated from the vitrification processes and the vessel ventilation systems. The typical constituents contained in the melter offgas stream are as follows:

- Nitrogen oxides from decomposition of metal nitrates in the melter feed.
- Chloride, fluoride, and sulfur as oxides, acid gases, and salts.
- Entrained feed material and glass.

A detailed description of the current offgas treatment trains for the LAW (LMP-MLTR-00001/2) and HLW (HMP-MLTR-00001/2) Melters is provided in sections 4.1.4 and 4.1.5, respectively.

4.2.3.5 Miscellaneous Unit Emissions Performance

The WTP melter systems are thermal treatment units classified as miscellaneous units in Washington Administrative Code (WAC 173-303-680. The dangerous waste regulations require that permits for miscellaneous units include such terms, conditions, and provisions that are necessary to protect human health and the environment and are appropriate for the miscellaneous unit being permitted. Ecology has determined that regulations that are most appropriate to apply to the melters and offgas systems (melter systems) are found in the tank requirements (WAC 173-303-640) and applicable sections of the incinerator requirements (WAC 173-303-670) and 40 CFR Section 63.1203. As applied to the melter systems, the tank regulations primarily provide requirements for structural integrity, material compatibility, secondary containments, etc.

The incinerator regulations primarily provide operational requirements for parameters such as temperature, pressure, feed rate, demonstration testing, and performance standards. etc. Ecology determined and incorporated into the final WTP Dangerous Waste Permit issued in September 2002 the standards specified in 40 CFR Section 63.1203 in the following table apply to the WTP melter system miscellaneous units.

Miscellaneous Unit Emissions Performance Standards	
Pollutant	**Ecology-directed requirement**
PODC	99.99% DRE
Dioxins and Furans	0.20 ng TEQ/dscm
Mercury	45 μg/dscm
Lead and Cadmium	120 μg/dscm, combined emissions
Arsenic, Beryllium, Chromium	97 μg/dscm, combined emissions
Carbon Monoxide and Hydrocarbons	Carbon monoxide not in excess of 100 ppmv over an hourly rolling average, dry basis, and hydrocarbons not in excess of 10 ppmv over an hourly rolling average, dry basis, and reported as propane, at any time during the DRE test runs or their equivalent, or hydrocarbons not in excess of 10 ppmv, over an hourly rolling average, dry basis, and reported as propane
Hydrochloric Acid and Chlorine Gas	21 ppmv, combined emissions, expressed as hydrochloric acid equivalents, dry basis
Particulate Matter	34 mg/dscm
• TEQ is dioxin/furan toxicity equivalence defined in 40 CFR 63.1201(a) • dscm is dry standard cubic meter • ppmv is parts per million by volume • Rolling average is the average of all 1- minute averages over the averaging period [40 CFR 63.1201(a)]	

DOE intends that the melter systems be designed and constructed so that they operate in compliance with the appropriate and applicable standards. Environmental performance demonstrations during cold commissioning of the HLW and LAW vitrification facilities will be used to verify compliance with the DRE and other as applicable air emission standards. The final WTP Dangerous Waste Permit issued in September 2002 also requires periodic demonstration testing will be performed after the WTP has begun processing radioactive wastes (Ecology, 2001).

4.2.3.6 Physical and Chemical Characteristics of Waste [WAC 173-303-680(2)(a)(i)]

A description of the waste characteristics of the LAW and HLW feeds is presented in DWP Operating Unit Group 10, Chapter 3.0 (see Appendix 3A). The immobilized waste generated by the vitrification processes will be in the form of glass that maintains its chemical and physical integrity during long-term storage. The waste analysis plan (Appendix 3A) describes the types and frequency of analysis that will be performed on the glass waste.

4.2.3.7 Treatment Effectiveness Report [WAC 173-303-806(4)(i)(iv)]

A treatment effectiveness report evaluating the performance of the miscellaneous treatment sub-systems, and their effectiveness in treating the LAW and HLW, will be located in DWP Operating Unit Group 10, Appendix 9 for LAW and Appendix 10 for HLW. The report will use the results of the environmental performance demonstration and the risk assessment activities to document treatment effectiveness of miscellaneous treatment sub-systems.

4.2.3.8 Environmental Performance Standards for Melter Systems [WAC 173-303-680(2)]

An environmental performance demonstration will be conducted to demonstrate the efficiency of the LAW and HLW Melter systems and their respective air pollution control systems. Emissions from the LAW and HLW systems will be sampled and analyzed during an environmental demonstration performed during cold commissioning. The data developed during the environmental performance demonstration will support the screening-level risk assessment, which will support the development of environmental performance standards for the LAW and HLW Melter systems.

The operational activities of the WTP include methods intended to ensure proper performance of equipment and processes. These methods include sampling of materials, use of direct process controls, development of equipment life specifications and ongoing maintenance.

4.2.3.8.1 Protection of Groundwater, Subsurface Environment, Surface Water, Wetlands and Soil Surface [WAC 173-303-680(2)(a) and (b)]

The LAW Melters will be located in the LAW melter gallery (L-0112) within the LAW vitrification facility. The HLW Melters will be located in the HLW melter caves (H-0117, H-0106) within the HLW vitrification facility. Both plants are designed to comply with standards that ensure protection of the surface and subsurface environments. The vitrification plants will be completely enclosed and are designed to have sufficient structural strength and corrosion protection to prevent collapse or other structural failure. In addition, the melter systems, melter feed systems, and related piping will be provided with secondary containment, to minimize the potential for release. The LAW melter gallery (L-0112) and the HLW melter caves (H-0117, H-0106) will be permitted as containment buildings and are described in section 4.2.4.

Floors within the vitrification plants will be protected in a manner consistent with the intended usage of the space. The floor and portions of the walls of HLW Melter cave will be partially lined with stainless steel. Nonradioactive materials usage areas requiring heavy equipment will have concrete floors with hardener and sealer finishes.

The *Hanford Facility Dangerous Waste Permit Application General Information Portion*, section 5.4 (DOE-RL 1998), provides climatological data, topography, hydrogeological and geological characteristics, groundwater flow quantity and direction, groundwater quality data, and surface water quantity and quality data for the area around the WTP.

4.2.3.8.2 Protection of the Atmosphere [WAC 173-303-680(2)(c)]

A risk assessment will be performed to evaluate the impacts of the WTP emissions on human and ecological receptors. Actual offgas emissions will be measured during an environmental performance demonstration that will be performed as part of the WTP commissioning activities. The data will be used during a screening-level risk assessment that will be performed to determine ecological and human health risk.

The emissions data and the results of the screening level risk assessment will be used to establish operating conditions for the melters that do not endanger human health and the environment.

4.2.3.9 Approach to Risk Assessment [WAC 173-303-680(2)(c)(i) through (vii)]

A screening level risk assessment is being conducted to evaluate any possible human health and ecological risk posed by the thermal treatment of mixed wastes. The risk assessment will provide information about the potential terrestrial, aquatic, and food pathways for exposure of human and ecological receptors to dangerous waste constituents. This risk assessment will present the quantitative methods, detailed assumptions, and numerical parameters that will be used to estimate the nature, extent, and magnitude of potential risks from operation of the WTP. The primary regulatory guidance followed for this risk assessment is found in the *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1998a) and the *Screening-Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 1999a)

Treated air emissions through the stack will be the only planned direct releases into the environment from the WTP. Other waste streams will be transferred to a permitted facility and will not be released directly into the environment. Thus, the overall risk assessment process will focus primarily on air emissions.

Major components of the human health and ecological risk assessment process for evaluating airborne emissions will be as follows:

- Risk assessment work plan
- Pre-demonstration test risk assessment
- Final risk assessment

The overall approach for the risk assessment will be to identify potential risks associated with various receptors, their locations, exposure pathways, and activity patterns in two broad exposure scenarios, as follows:

- Plausible exposure scenario
- Worst-case exposure scenario

The plausible exposure scenarios will be based on where potential receptors currently exist or may reasonably be expected to exist within the foreseeable future. The worst-case assumptions will be based on locations of maximum concentration even though it is not expected that such receptors will ever actually exist at these locations. Both scenarios will reflect current uses of the surrounding land and habitat and reasonable assumptions about future uses of the land and habitat.

During the environmental performance demonstration, emission samples will be collected and analyzed, and the data will be used to evaluate risk to the human population and ecological (such as wildlife) receptors. Operating conditions will be established for the WTP, which limit risks to human health and the environment to acceptable levels.

4.2.4 Containment Buildings

This section describes how these units are designed and operated, in accordance with the requirements of WAC 173-303-695, which incorporates 40 CFR 264 Subpart DD, “Containment Buildings”, by reference. Regulatory citations in this section list the applicable section of the CFR to make it easier for readers to find the requirement. A typical containment building is illustrated in Appendix 4A, Figure 4A-59.

There are twenty one containment buildings at the WTP: five located within the pretreatment facility; six in the LAW vitrification facility; and ten in the HLW vitrification facility. The regulated units are:

- Pretreatment hot cell containment building (P-0123)

- Pretreatment maintenance containment building (PM0124, P-0121A, P-0122A, P-0123A, P-0124, P-0124A, P-0125, P-0125A, P-0128, P-0128A)
- Pretreatment spent filter drum handling area containment building (P-0223)
- Pretreatment filter cave containment building (P-0335)
- Pretreatment PJV secondary HEPA filter room containment building (P-0431A)
- LAW LSM gallery containment building (L-0112)
- ILAW container finishing containment building (L-0109B, L-0109C, L-0109D, L-0109E, L-0115B, L-0115C, L-0115D, L-0115E, L0116A)
- LAW vitrification facility consumable import/export containment building (L-0119B)
- LAW vitrification facility C3 workshop containment building (L-226A)
- LAW pour cave containment building (L-B015A, L-B013C, L-B013B, L-B011C, L-B011B, and L-B009B)
- LAW container buffer storage containment building (L-B025C, L-B025D)
- HLW melter cave 1 containment building (H-0117, H-0116B, H-0310A)
- HLW melter cave 2 containment building (H-0106, H-0105B, and H-0304A)
- IHLW canister handling cave containment building (H-0136)
- IHLW canister swabbing and monitoring cave containment building (H-0133)
- HLW C3 workshop containment building (H-0311A, H-0311B)
- HLW filter cave containment building (H-0104)
- HLW pour tunnel 1 containment building (H-B032)
- HLW pour tunnel 2 containment building (H-B005A)
- HLW drum swabbing and monitoring area containment building (H-0126A, H-0126B, H-B028)
- HLW waste handling area containment building (H-410B, and H-411)

Table C-7 summarizes the units within the WTP. The following figures and drawings found in DWP Operating Unit Group 10 provide further detail for the WTP containment buildings:

- Figure 4A-59 depicting common features of containment buildings.
- General arrangement figures and drawings showing locations of containment buildings.
- Waste management area figures showing containment building locations to be permitted.

Control of fugitive emissions from containment buildings is described in *Fugitive Emissions Control Description* (24590-WTP-PER-HV-02-001) located in Operating Unit Group 10 Appendix 7.15.

The following sections address each of the containment buildings.

4.2.4.1 Pretreatment Hot Cell Containment Building (P-0123)

The Pretreatment Hot Cell Containment Building is situated between Feed Receipt Cell (Room P-0108B) and Remote Decontamination Maintenance Cave (Room P-0123A), in the central portion of the PTF. The room contains process equipment, which may require remote maintenance over the life of the plant. Typical waste management activities performed in the containment building include waste storage, the removal and staging of remote-handled process equipment prior to decontamination, repair, and/or packaging of waste for disposal. Equipment located in the Hot Cell Containment Building can be moved, using an overhead crane and a power manipulator, into the Remote Decontamination Maintenance Cave for decontamination and size reduction for waste packaging, or decontamination for maintenance.

Due to the radiation and contamination levels, personnel are prohibited from entering and working in Room P-0123. All activities within the room will be remotely controlled. The hot cell provides secondary containment for tank systems located in the room, and for tank systems located in adjacent black cells. The hot cell floor provides primary containment for spills that occur during associated maintenance activities.

The Pretreatment Hot Cell Containment Building contains two tank systems, three primary containment sumps and three miscellaneous units.

Cesium Ion Exchange Process System

Cesium Exchange Columns CXP-IXC-00001/2/3/4 remove cesium from permeate produced by the ultrafiltration system and are regulated as dangerous waste tanks.

Ultrafilter Process System

Ultrafilters UFP-FILT-00001A-5A and UFP-FILT-00001B-5B concentrate the waste feed for the HLW vitrification process and are regulated as dangerous waste tanks.

Primary Containment Sumps

The hot cell floor slopes to three primary containment sumps; PWD System Sumps PWD-SUMP-00026, PWD-SUMP-00028, and PWD-SUMP-00029. Design, construction, and operating requirements applicable to primary containment sumps are detailed in section 4.2.2 and section III.10.E. Each primary containment sump will have a steam ejector for transferring liquids to PWD System Vessel PWD-VSL-00044. The sumps will be covered with stainless steel grating and/or screen mesh to protect the ejectors from debris. Figure 4A-128 contains a conceptual design for a typical, primary containment sump.

LAW Evaporator Reboiler Miscellaneous Unit

Waste is pumped through LAW Evaporator Reboiler TLP-RBLR-00001 and concentrated by flash evaporation. The concentrated waste is transferred to the Treated LAW Evaporator Separator Vessel TLP-SEP-00001.

Cesium Evaporator Concentrate Reboiler

Dilute acidic solution from Cesium Evaporator Separator Vessel CNP-EVAP-00001 is recirculated through Reboiler CNP-HX-00001 and concentrated by flash evaporation.

Waste Evaporator Reboilers Miscellaneous Unit

Dilute waste is pumped through Waste Feed Evaporator Reboilers FEP-RBLR-00001A/B and concentrated by flash evaporation. The concentrated waste is transferred to the Waste Feed Evaporator Separator Vessels FEP-VSL-00017A/B.

Hot Cell Floor Miscellaneous Unit

The Hot Cell Containment Building floor provides primary containment for spills that occur during maintenance activities. Remotely removable sections of flexible pipe called “jumpers” are used to connect equipment located in the Hot Cell Containment Building. A jumper may consist of a process, electrical or pneumatic line with remote connector heads at either end. As a precursor for maintenance or equipment change-out, jumpers (flexible pipes) may be used to transfer waste from one process component to another. After waste transfer, the jumper remains in place, and approximately three jumper-volumes of water will be flushed through the jumper to the receiving component. After the flush has been completed, the jumper will be disconnected from the upstream component. When the jumpers is disconnected, flush water from the jumper will spill onto the floor and flow into the room sump(s). The amount of flush water, which may spill onto the floor, depends on the length of the jumper and the location of the components involved in the transfer.

Maintenance activities, using jumpers, are expected to average two per week. The anticipated spill per maintenance activity will be approximately 30 to 150 gallons. About once in three years, an equipment change out is expected to result in a spill of approximately 200 to 300 gallons.

Spills from maintenance activities will be managed in the Hot Cell Floor Miscellaneous Unit. Spills will flow down the sloped floor into a primary containment sump, for transfer to a PWD system tank. The room floor is lined with stainless steel plate, which is fully grouted. Objects will not be placed directly on the floor liner. Objects will be staged on a platform to protect the stainless steel floor liner from damage.

Hot Cell Containment Building Dangerous Waste Management Units		
Equipment Number	**Description / System**	**Purpose**
Dangerous Waste Tank Systems		
CXP-IXC-00001/2/3/4	Cesium Ion Exchange Column / Cesium Ion Exchange Process	Remove cesium from permeate produced by the ultrafiltration system.
UFP-FILT-00001A-5A UFP-FILT-00001B-5B	Ultrafilter / Ultrafiltration Process	Concentrate the waste feed.
PWD-SUMP-00026	Primary Containment Sump / Plant Wash and Disposal System	Manage liquids.
PWD-SUMP-00028	Primary Containment Sump / Process Wash and Disposal System	Manage liquids.
PWD-SUMP-00029	Primary Containment Sump / Pretreatment In-Cell Handling System	Manage liquids.
Miscellaneous Units		
CNP-HX-00001	Evaporator Concentrate Reboiler / Cesium Nitric Acid Recovery Process System	Concentrate dilute acid solution for reuse.
TLP-RBLR-00001	LAW Evaporator Reboiler / Treated LAW Evaporation Process	Concentrate pretreated LAW feed prior to transfer from PTF to LAW.
FEP-RBLR-00001A/B	Waste Feed Evaporator Reboilers / Waste Feed Evaporation Process	Concentrate the dilute recycled waste streams.
Not Applicable	Hot Cell Floor / NA	Manage liquid waste.

Process equipment, such as pumps, valves, and jumpers, are located in the hot cell. Typical waste management activities performed in the hot cell include the removal and staging of remote-handled process equipment prior to decontamination, repair, and/or packaging of waste for disposal. Equipment located in the Hot Cell Containment Building can be moved, using an overhead crane and a power manipulator, into the Remote Decontamination Maintenance Cave for decontamination and size reduction for waste packaging, or decontamination for maintenance.

Pretreatment Hot Cell Containment Building Design

The pretreatment hot cell containment building is designed as a completely enclosed area within the pretreatment facility.

It is designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the hot cell and the pretreatment facility exterior will prevent water from running into the facility. The approximate dimensions of the unit are summarized in Table C-7.

Pretreatment Hot Cell Containment Building Structure

The pretreatment hot cell containment building will be a concrete-walled structure fully enclosed within the pretreatment facility. Therefore, structural requirements for the containment building will be met by the design standards of the pretreatment facility. The roof of the pretreatment facility will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the pretreatment facility meet or exceed the Uniform Building Code Seismic Design Requirements.

Pretreatment Hot Cell Containment Building Materials

The pretreatment hot cell containment building will be constructed of steel-reinforced concrete. The interior floor and portions of the lower walls will be lined with stainless steel plate. The balance of the walls will not have an impervious coating.

Use of Incompatible Materials in the Pretreatment Hot Cell Containment Building

A stainless steel liner will be provided on the floor and portions of the wall. Stainless steel will be compatible with the waste that will be generated and managed, in the room, such as failed pumps, ultrafilters, and valves. Activities in the unit may include, but are not be limited to, equipment change out and maintenance.

Primary Barrier Integrity in the Pretreatment Hot Cell Containment Building

The pretreatment hot cell containment building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria identified in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the Pretreatment Hot Cell Containment Building.

Prior to initial receipt of dangerous and mixed waste startup of operations, a certification by a qualified registered professional engineer that the pretreatment hot cell containment building meets the design requirements of 40 CFR 264.1101(a), and (c) will be obtained.

Operation of the Pretreatment Hot Cell Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the waste within the pretreatment hot cell containment building as required by 40 CFR 264.1101(c)(1).

Maintenance of the Pretreatment Hot Cell Containment Building

The partial stainless steel lining will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The partial stainless steel liner will remain free of corrosion or other deterioration because it is compatible with materials that will be managed in the containment building. The failed equipment and other objects that will be managed in the containment building unit will be staged on a platform to protect the floor from damage.

Measures to Prevent Tracking Wastes from the Pretreatment Hot Cell Containment Building

The pretreatment hot cell containment building is designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit. Personnel access to the unit, which is classified as a C5 contamination area, will be restricted. Waste leaving the unit may or may not be enclosed within containers. Equipment leaving the unit will be monitored for radioactive contamination and decontaminated if necessary, before being released for removal.

Procedures in the Event of Release or Potential for Release from the Pretreatment Hot Cell Containment Building

The design and operation of the unit makes it very unlikely that releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit. The ventilation system will also use negative air pressure to keep contamination from spreading to areas of lesser contamination. Offgas will be routed to the pretreatment facility C5 ventilation system.

Inspections will identify conditions that could lead to a release. Such conditions will be corrected on a schedule intended to preclude any releases that could be hazardous to public health or the environment. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. These methods will be followed to repair conditions that could lead to a release.

Inspections of the Pretreatment Hot Cell Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the pretreatment hot cell containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.2 Pretreatment Maintenance Containment Building (PM0124, P-0121A, P-0122A, P-0123A, P-0124, P-0124A, P-0125, P-0125A, P-0128, P-0128A)

The second area that meets the definition of a containment building is the pretreatment maintenance containment building, which comprises the majority of the east end of the building. Typical waste management activities performed in this containment building include waste storage, equipment maintenance, including decontamination, size reduction, and packaging of spent equipment. This unit consists of the interim storage, lag storage, manipulator decontamination and repair, resin handling, waste packaging, tool cribs, and cask lidding room. The unit will include hatches to import or export spent equipment. An overhead crane will facilitate movement of equipment and removal or placement of the spent equipment in the waste containers. The floor and lower wall of Room P-0123A provide secondary containment for Process In-Cell handling, Decontamination Soak Tank PIH-TK-00001 and primary containment for decontamination activities.

Pretreatment Maintenance Containment Building Design

The pretreatment maintenance containment building is designed as a completely enclosed area within the pretreatment facility. The unit is designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the pretreatment facility exterior will prevent water from running into the facility. The roof of the pretreatment facility will consist of metal roofing, roof insulation, and a vapor barrier. Rainwater run-off will be collected by roof drains and drainage system with overflow roof drains. The approximate dimensions of the unit are summarized in Table C-7.

Pretreatment Maintenance Containment Building Structure

The pretreatment maintenance containment building will consist of several rooms within the concrete-walled, fully enclosed pretreatment facility.

Therefore, structural requirements for the containment building will be met by the design standards of the pretreatment facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the pretreatment facility meet or exceed the Uniform Building Code Seismic Design Requirements.

Pretreatment Maintenance Containment Building Materials

The pretreatment maintenance containment building will be constructed of steel-reinforced concrete. In Room P-0123A, the floor and portions of the walls provide primary containment for decontamination activities. The floor and portions of the walls will be lined with stainless steel plate. The walls above the stainless steel liner to the bottom of the runway beam support (approximately 27 foot elevation) for the In-Cell Bridge Crane PIH-CRN-00004 will be coated during construction. Since the room is classified as a C5 area and is located in an unmanned portion of the facility, the wall coating will not be maintained.

Use of Incompatible Materials in the Pretreatment Maintenance Containment Building

In Room P-0123A, the floor and portions of the walls provide primary containment for decontamination activities. The floor and portions of the walls will be lined with stainless steel plate. The walls above the stainless steel liner to approximately 27 foot elevation will be coated during construction. The stainless steel liner and wall coating will be compatible with the wastes that will be managed and the decontamination solutions that will be used in the room. Activities in the Pretreatment Containment Building will be limited to decontamination, maintenance, size reduction, and waste packaging.

Primary Barrier Integrity in the Pretreatment Maintenance Containment Building

The pretreatment maintenance containment building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria identified in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the Pretreatment Maintenance Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the pretreatment maintenance containment building meets the design requirements of 40 CFR 264.1101(a), and (c) will be obtained.

Operation of the Pretreatment Maintenance Containment Building

Operational and maintenance controls and practices will be followed to ensure containment of the waste within the pretreatment maintenance containment building as required by 40 CFR 264.1101(c)(1).

Maintenance of the Pretreatment Maintenance Containment Building

The stainless steel lining and coatings in Room P-0123A that provides primary containment will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The stainless steel liner in Room P-0123A will remain free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building Since Room P-0123A is located in an unmanned portion of the facility, any wall coatings above the stainless steel liner will not be maintained. Only decontamination solutions that are compatible with the primary containment liner material will be used.

Measures to Prevent Tracking Wastes from the Pretreatment Maintenance Containment Building

The pretreatment maintenance containment building is designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials.

The containment building will be classified as a C3/C5 contamination area and, therefore, personnel access will be limited, and may be restricted. Wastes leaving the unit may be enclosed within containers. If necessary, these containers will be decontaminated in the unit prior to transportation to a permitted storage area. Equipment leaving the unit will be monitored for radioactive contamination and decontaminated, as necessary, before being released for removal from the containment building.

Procedures in the Event of a Release or Potential Release from the Pretreatment Maintenance Containment Building

The design and operation of the unit makes it very unlikely that releases will occur. The design and operational measures that will be used will minimize the generation of dust and contain it within the unit. The ventilation system will also use negative air pressure to keep contamination from spreading to areas of lesser contamination.

In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. These methods will be followed to repair condition that could lead to a release.

Inspections of the Pretreatment Maintenance Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the pretreatment maintenance containment building. Such conditions will be corrected on a schedule which prevents hazards to the public health and the environment. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.2.1 Remote Decontamination Maintenance Cave (Room P-0123A)

The Remote Decontamination Maintenance Cave (Room P-0123A) is situated between the hot cell (Room P-0123) and the hands-on, Crane Maintenance Area (Room P-0122A). Due to the radiation and contamination levels, personnel are prohibited from entering and working in Room P-0123A. All activities within the room will be remotely controlled. The entire floor and portions of the walls are lined with stainless steel. The stainless steel plate on the floor is 3/16 inch thick. On the west side of Room P-0123A, a stub wall, separates the Remote Decontamination Maintenance Cave from Room P-0123 hot cell. The stub wall is approximately 4 ft 8 in high on the north end of the room and approximately 10 ft high on the south end, adjacent to Spray Decontamination Turntable PIH-TTBL-00001. Typical waste management activities performed in the room includes waste storage, decontamination, sizing, and packaging. The Remote Decontamination Maintenance Cave contains four dangerous waste management units consisting of a tank system, two primary containment sumps and a miscellaneous unit.

Primary Containment Sumps

Room P-0123A floor slopes to primary containment sump PWD-SUMP-00032 located near Spray Decontamination Turntable PIH-TTBL-00001 and to primary containment sump PWD-SUMP-00033 located near Remote Repair Turntable PIH-TTBL-00002. The stainless steel sumps will manage spent decontamination solution resulting from activities performed in the maintenance cave. Design, construction, and operating requirements applicable to primary containment sumps are detailed in section 4.2.2 and section III.10.E. Each primary containment sump will have a steam ejector for transferring liquids to Plant Wash and Disposal System Vessel PWD-VSL-00044. The sumps will be covered with stainless steel grating and/or screen mesh to protect the ejectors from debris. Figure 4A-128 contains a typical, primary containment sump, conceptual design.

Decontamination Soak Tank PIH-TK-00001

For items that require a more robust decontamination process, the room is equipped with Decontamination Soak Tank PIH-TK-00001.

Using the overhead crane, items can be immersed in the soak tank before either being packaged or repaired. The decontamination solutions used in the soak tank will be non-combustible. Examples of decontamination solutions which maybe used in the soak tank, are nitric acid and plant water with a surfactant. The room provides secondary containment for the Decontamination Soak Tank. Secondary containment consists of the room floor and the wall several inches above the floor. The secondary containment area is lined with fully grouted, stainless steel plate.

Spray Decontamination and Sizing System Miscellaneous Unit

The Spray Decontamination and Sizing System Miscellaneous Unit is comprised of the following equipment: Spray Decontamination Turntable PIH-TTBL-00001, Remote Repair Turntable PIH-TTBL-00002, Size Reduction Table PIH-BENCH-00003, other platforms located in the room, and various tools consisting of decontamination spray lances, cutting tools and a hydraulic shear. The floor provides primary containment for the unit. Objects will not be placed or staged directly on the floor. Equipment and bulk waste too large for the size reduction table will be placed on platforms or support frames. Equipment repair, waste storage, decontamination, and sizing activities may be performed at each of these stations. Decontamination activities may consist of any combination of swabs and sprays. Decontamination sprays will be, but not limited to: high pressure steam in conjunction with nitric acid, CO2 pellets, and low pressure water or water and surfactant. Items are moved to and from room P-0123A via the in-cell bridge crane. Items can be moved to various locations within the room using the two overhead cranes.

Spray Decontamination Turntable PIH-TTBL-00001 will primarily be used to stage items for decontamination. The turntable is approximately 2.5 ft high by 5 ft wide, and will support up to 5 tons. Spent decontamination fluid and other liquids generated at the turntable will drain to primary containment sump PWD-SUMP-00032.

Remote Repair Turntable PIH-TTBL-00002 will primarily be used to stage items for remote disassembly and repair. Various holding fixtures and remote operated tools to support repair activities will be staged at the turntable. The turntable, approximately 2.5 ft high by 11 ft wide, will support up to 30 tons. Spent decontamination fluid and other liquid wastes generated at the turntable will drain to primary containment sump PWD-SUMP-00033.

Size Reduction Table PIH-BENCH-00003, is located in the central portion of the room. The table, approximately 25 ft long by 15 ft wide, will be used as a staging and work area for items too large for the turntables. The table will support 30 tons and will protect the floor from damage. Spent decontamination solutions and other liquid wastes generated at the table will drain to the primary containment sumps.

The floor and walls provide primary containment for decontamination activities. The walls above the stainless steel liner to 27 foot elevation, will be initially coated with an imperious coating, compatible with the decontamination solutions which will be used in the room. The room is a C5 area, located in an unmanned portion of the facility. The wall coatings above the stainless steel liner plate will not be maintained. Administrative controls will be in place to minimize the over spray of decontamination solution to the walls above the stainless steel liner. Procedurally, a pressurized liquid source will not be introduced until the lance is positioned for use and under the control of a manipulator grip. Positioning will be verified visually or via camera. If over spray of decontamination solution to the wall, above the stainless steel liner occurs, spray decontamination will be stopped until the cause of the over-spray has been identified and corrected. Possible corrective actions include but are not limited to: additional training for the equipment operator, replacing the spray lance, and revising the operating procedure.

Remote Decontamination Maintenance Cave Dangerous Waste Management Units		
Equipment Number	**Description / System**	**Purpose**
Dangerous Waste Tank Systems		
PWD-SUMP-00032	Primary Containment Sump / Plant Wash and Disposal System	Manage spent decontamination solution generated by room activities.
PWD-SUMP-00033	Primary Containment Sump / Plant Wash and Disposal System	Manage spent decontamination solution generated by room activities.
PIH-TK-00001	Decontamination Soak Tank / Plant Wash and Disposal System	Decontamination of items by soaking and spraying.
Spray Decontamination and Sizing System Miscellaneous Unit Equipment		
PIH-TTBL-00001	Spray Decontamination Turntable / Pretreatment In-Cell Handling System	Primarily for the decontamination of items prior to repair or sizing. Items maybe sized for packaging.
PIH-TTBL-00002	Remote Repair Turntable / Pretreatment In-Cell Handling System	Primarily for repair of items. Items may under go further decontamination or be sized for packaging.
PIH-BENCH-00003	Size Reduction Table / Pretreatment In-Cell Handling System	Primarily for the decontamination and size reduction of items too large to stage on a turntable.

4.2.4.3 Pretreatment Spent Filter Drum Handling Area Containment Building (P-0223)

The pretreatment spent filter drum handling area containment building is the third containment building within the pretreatment facility, located in the southeast portion of the facility. Typical waste management activities performed in this containment building include, waste storage, decontamination, and equipment repair. A crane transports spent HEPA and HEME filters and then places them inside a disposal container. The disposal container is then transported via cart, through an air lock and shield doors and to a load-out area for storage pending final disposal. The containment building also houses a hands-on crane decontamination and repair area.

Pretreatment Spent Filter Drum Handling Area Containment Building Design

The pretreatment spent filter drum handling area containment building will be completely enclosed within the pretreatment facility, and will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the pretreatment facility exterior will prevent water from running into the facility. The roof of the pretreatment facility will consist of metal roofing, roof insulation, and a vapor barrier. Run-off will be collected by roof drains and a drainage system with overflow drains. The interior floor and a portion of the walls will be covered with epoxy coating to protect the concrete and facilitate decontamination. The approximate dimensions of the containment building are summarized in Table C-7.

Pretreatment Spent Drum Handling Area Containment Building Structure

Because the pretreatment spent filter drum handling area containment building will be a concrete-walled structure fully enclosed within the pretreatment facility, its requirements will be met by the design standards of the pretreatment facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the pretreatment facility meet or exceed the Uniform Building Code Seismic Design Requirements.

Pretreatment Spent Drum Handling Area Containment Building Materials

The pretreatment spent filter drum handling area containment building will be constructed of steel-reinforced concrete. The containment building floor and partial walls be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the Pretreatment Spent Drum Handling Area Containment Building

A protective coating on the floor will be compatible with the wastes that will be managed in the unit, which will include spent HEPA and HEME filters. Activities in the unit will be limited to waste packaging.

Primary Barrier Integrity in the Pretreatment Spent Drum Handling Area Containment Building

The pretreatment spent filter drum handling area containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment.

The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the Pretreatment Spent Drum Handling Area Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the pretreatment spent filter drum handling area containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the Pretreatment Spent Drum Handling Area Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the pretreatment spent filter drum handling area containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the Pretreatment Spent Drum Handling Area Containment Building

The protectively-coated concrete floor and walls of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The epoxy coating will be compatible with materials that will be managed in the containment building, which will include spent HEPA and HEME filters. Only decontamination solutions that are compatible with the protective coating will be used.

Measures to Prevent Tracking Wastes from the Pretreatment Spent Drum Handling Area Containment Building

The pretreatment spent filter drum handling area containment building is designed to manage spent HEPA and HEME filters. Conducting these activities in a C5 contamination zone will prevent the spread of contaminated materials. Restricted personnel access and controlled movement of equipment into and out of the unit will decrease the possibility that waste will be tracked from the unit.

Personnel access to the pretreatment spent filter drum handling area containment building, which is classified as a C5 contamination area, will be restricted. Access to the unit will be allowed only under limited circumstances, thereby limiting the potential for contacting the waste and tracking it from the unit.

Procedures in the Event of Release or Potential for Release from the Pretreatment Spent Drum Handling Area Containment Building

Conditions that could lead to a release from the pretreatment spent filter drum handling area containment building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the Pretreatment Spent Drum Handling Area Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the pretreatment spent filter drum handling area containment building. Such conditions will be corrected on a schedule which prevents hazards to the public health and environment. The inspection and monitoring schedule, and methods that will be used to detect releases from the unit, are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.4 Pretreatment Filter Cave Containment Building (P-0335)

The Pretreatment Filter Cave Containment Building is the fourth containment building within the pretreatment facility, in the southeast portion of the facility.

Typical waste management activities performed in this containment building include waste storage, decontamination, and equipment repair. A crane transports the spent HEPA and HEME filters and places them inside a disposal container. The disposal container is then transported via cart through an air lock and shield doors to a load-out area for storage pending final disposal. The containment building also houses a dedicated crane maintenance area.

Pretreatment Filter Cave Containment Building Design

The Pretreatment Filter Cave Containment Building will be completely enclosed within the pretreatment facility, and will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the pretreatment facility exterior will prevent water from running into the facility. The roof of the pretreatment facility will consist of metal roofing, roof insulation, and a vapor barrier. Run-off will be collected by roof drains and a drainage system with overflow drains. The approximate dimensions of the containment building are summarized in Table C-7.

Pretreatment Filter Cave Containment Building Structure

Because the Pretreatment Filter Cave Containment Building will be a concrete-walled structure fully enclosed within the pretreatment facility, its requirements will be met by the design standards of the pretreatment facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the pretreatment facility meet or exceed the Uniform Building Code Seismic Design Requirements.

Pretreatment Filter Cave Containment Building Unit Materials

The Pretreatment Filter Cave Containment Building will be constructed of steel-reinforced concrete. The floor, wall, and berm surrounding the PJV demisters and PVP HEMEs will be covered with a stainless steel liner.

Use of Incompatible Materials for the Pretreatment Filter Cave Containment Building

The liner will be compatible with the wastes that will be managed in the unit, which will include spent HEPA and HEME filters. Activities in the unit will be limited to waste packaging. Decontamination solutions will be compatible with the liner on the floor.

Primary Barrier Integrity in the Pretreatment Filter Cave Containment Building

The Pretreatment Filter Cave Containment Building will be designed to withstand loads from the movement of wastes and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the Pretreatment Filter Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the Pretreatment Filter Cave Containment Building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operations of the Pretreatment Filter Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the Pretreatment Filter Cave Containment Building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the Pretreatment Filter Cave Containment Building

The stainless steel liner surrounding the demisters and HEMEs will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The liner on the floor will be compatible with materials that will be managed in the containment building, which will include spent HEPA and HEME filters. Only decontamination solutions that are compatible with the liner on the floor will be used.

Measures to Prevent Tracking Wastes from the Pretreatment Filter Cave Containment Building

The Pretreatment Filter Cave Containment Building is designed to manage spent HEPA and HEME filters. Conducting these activities in a C5 contamination zone will prevent the spread of contaminated materials. Restricted personnel access and controlled movement of equipment into and out of the unit will decrease the possibility that waste will be tracked from the unit.

Procedures in the Event of Release or Potential for Release from the Pretreatment Filter Cave Containment Building

Conditions that could lead to a release from the Pretreatment Filter Cave Containment Building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the Pretreatment Filter Cave Containment Building

An inspection program will be established to detect conditions that could lead to a release of waste from the Pretreatment Filter Cave Containment Building. Such conditions will be corrected on a schedule which prevents hazards to public health and the environment. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.5 Pretreatment PJV Secondary HEPA Filter Room Containment Building (P-0431A)

The pretreatment PJV secondary HEPA filter room containment building is the fifth containment building within the pretreatment facility, located in the center of the Pretreatment facility at El. 77 ft. Typical waste management activities performed in this containment building include packaging and storage of spent PJV system HEPA filters.

Pretreatment PJV Secondary HEPA Filter Room Containment Building Design

The pretreatment PJV secondary HEPA filter room containment building will be completely enclosed within the pretreatment facility, and will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the pretreatment facility exterior will prevent water from running into the facility. The roof of the pretreatment facility will consist of metal roofing, roof insulation, and a vapor barrier. Run-off will be collected by roof drains and a drainage system with overflow drains. The interior floor and a portion of the walls will be covered with epoxy coating to protect the concrete from contamination. The approximate dimensions of the containment building are summarized in Table C-7.

Pretreatment PJV Secondary HEPA Filter Room Containment Building Structure

Because the pretreatment PJV secondary HEPA filter room containment building will be a concrete-walled structure fully enclosed within the pretreatment facility, its requirements will be met by the design standards of the pretreatment facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure.

DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the pretreatment facility meet or exceed the Uniform Building Code Seismic Design Requirements.

Pretreatment PJV Secondary HEPA Filter Room Containment Building Materials

The pretreatment PJV secondary HEPA filter room containment building will be constructed of steel-reinforced concrete. The containment building floor and partial walls be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the Pretreatment PJV Secondary HEPA Filter Room Containment Building

The epoxy coating will be compatible with the wastes that will be managed in the unit, which will include spent HEPA filters. Activities in the unit will be limited to waste packaging and storage. Decontamination reagents that could cause the epoxy coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the Pretreatment PJV Secondary HEPA Filter Room Containment Building

The pretreatment PJV secondary HEPA filter room containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the Pretreatment PJV Secondary HEPA Filter Room Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the pretreatment PJV secondary HEPA filter room containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained.

The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the Pretreatment PJV Secondary HEPA Filter Room Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the pretreatment spent filter drum handling area containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the Pretreatment PJV Secondary HEPA Filter Room Containment Building

The epoxy-coated concrete floor and walls will be compatible with materials that will be managed in the containment building, which will include spent HEPA filters. No decontamination chemicals that are incompatible with the coated concrete will be used.

Measures to Prevent Tracking Wastes from the Pretreatment PJV Secondary HEPA Filter Room Containment Building

The pretreatment PJV secondary HEPA filter room containment building is designed to manage spent HEPA filters. Conducting these activities in a C3 contamination zone will prevent the spread of contaminated materials. Limited personnel access and controlled movement of equipment into and out of the unit will decrease the possibility that waste will be tracked from the unit.

Procedures in the Event of Release or Potential for Release from the Pretreatment PJV Secondary HEPA Filter Room Containment Building

Conditions that could lead to a release from the pretreatment PJV secondary HEPA filter room containment building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the Pretreatment PJV Secondary HEPA Filter Room Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the pretreatment PJV secondary HEPA filter room containment building. The inspection and monitoring schedule, and methods that will be used to detect releases from the unit, are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.6 LAW LSM Gallery Containment Building (L-0112)

There will be six containment buildings in the LAW vitrification facility. The first is the LAW locally shielded melter (LSM) gallery containment building, which will house the two LAW Melters. The LAW Melters are designed to include a roller or wheel assembly that travels on rails that will be used to move the melters in and out of the containment building. Spent LAW Melters will be disconnected from the offgas system, feed lines, electrical lines, and instrumentation. Open ports will be seal welded. The sealed exterior of the melter will be decontaminated, if needed, prior to removal from the containment building.

LAW LSM Gallery Containment Building Design

The LAW LSM gallery containment building will be completely enclosed within the LAW vitrification facility. The unit will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent water from running into the facility.

The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Rainwater run-off will be collected by roof drains and a drainage system with overflow drains. The approximate dimensions of the unit are summarized in Table C-7.

The melter feed slurry will be introduced to the LAW melters through stainless steel feed lines and specialized reinforced flex hoses. The feed lines in between the melter feed vessel and the melter will pass through the Melter Feed Encasement Assembly (LMP-LDB-00001/00002) that functions as secondary containment and provides leak detection. The encasement assembly and associate bellows are provided with a conductivity cable lead detection system. A drain within the assembly has also been incorporated into the design to allow drainage to a sump located in the adjacent process room.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because any dangerous wastes with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7). The only anticipated source of liquids in the LSM gallery are the waterlines to the two film cooler pipes, and the melter and melter lid cooling water piping systems. These clean water lines (isolated from contact with dangerous wastes) will be instrumented to detect leaks. The melter annulus and the gas barrier contain cooling lisuids within the locally shielded melter and are both provided with leak detection. The melter lid cooling system is also a clean water system that is provided with temperature indication, level transmitters and flow and pressure indicators to identify a potential leak. A rupture of either water line or a waste feed line would be an abnormal event and the liquid would be contained within the locally shielded melter or in the encasement assembly and corrective measures would be initiated. Corrective action would start with closure of the supply line and draining of remaining water outside the melter, and could require feed cutoff and melter idling or shut down.

LAW LSM Gallery Containment Building Structure

The LAW LSM gallery containment building will be fully enclosed within the LAW vitrification facility. Therefore, structural requirements for the containment building will be met by the design standards of the LAW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. Within the containment building will be partitions between the LSMs. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW LSM Gallery Containment Building Materials

The LAW LSM gallery containment building will be constructed of steel-reinforced concrete. The interior floor and the walls of the unit will be covered with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the LAW LSM Gallery Containment Building

The epoxy coating will be applied to the concrete floor and a portion of the walls of the unit. The coating will be compatible with the wastes that will be managed in the containment building. The wastes to be managed in this containment building will include LAW LSM melters and consumables, which may be metallic parts and failed equipment. Reagents that could impact the epoxy decontamination coating will not be used within the unit.

Primary Barrier Integrity in the LAW LSM Gallery Containment Building

The LAW LSM gallery containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the LAW LSM Gallery Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the LAW LSM gallery containment building meets the design requirements of 40 CFR 264.1101(a), and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste contiaining free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW LSM Gallery Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the waste within the LAW LSM gallery containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted.

Maintenance of the LAW LSM Gallery Containment Building

The epoxy decontamination coating will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The concrete coating will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, including the glass waste and containerized or uncontainerized waste and equipment.

Measures to Prevent Tracking Wastes from the LAW LSM Gallery Containment Building

The unit is designed to manage LAW melters. The melters will be disconnected from systems when determined to be waste. The ports where the melter was attached to systems will be sealed and glass waste will be contained within the melter. This design will prevent waste from entering the containment building and thus from being tracked from the unit.

The unit will be classified as a C3 contamination area, which allows only limited personnel access. Access will be required only for non routine events such as when melters are determined to be waste, approximately every 5 years, or when equipment must be dismantled. Dry decontamination methods will be used to decontaminate the melter and gallery areas.

Procedures in the Event of Release or Potential for Release from the LAW LSM Gallery Containment Building

Conditions that could lead to a release from the LAW LSM gallery containment building will be corrected on a schedule intended to preclude a release that could be hazardous to public health or the environment.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. The methods will be followed to repair conditions that could lead to a release.

Inspections of the LAW LSM Gallery Containment Building

An inspection program will be established to detect conditions that could lead to release of wastes from the LAW LSM gallery containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.7 ILAW Container Finishing Line Containment Building (L-0109B, L-0109C, L-0109D, L-0109E, L-0115B, L-0115C, L-0115D, L-0115E)

The ILAW container finishing line containment building will be located in the LAW vitrification facility. It will be used for managing ILAW containers that have cooled sufficiently to be closed and prepared for finishing. Typical waste management activities performed in this containment building include storage of open waste containers and container decontamination.

An ILAW container is transported from an inert filling and lidding room, to a decontamination room, and finally to a swab and monitor room, and then out of the containment building. This sequence of rooms is considered a finishing line. There are two finishing lines within the ILAW container finishing line containment building.

ILAW Container Finishing Containment Building Design

The ILAW container finishing containment building will be completely enclosed within the LAW vitrification facility. It will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent water from running into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Roof drains and drainage system with overflow drains will collect run-off. The approximate dimensions of the unit are summarized in Table C-7.

ILAW Container Finishing Containment Building Structure

Because the ILAW container finishing containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility, its structural requirements will be met by the design standards of the LAW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

ILAW Container Finishing Containment Building Materials

The ILAW container finishing containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the decontamination rooms will be coated with an epoxy coating to facilitate decontamination of the concrete.

Use of Incompatible Materials for the ILAW Container Finishing Containment Building

The primary concrete barrier will have an epoxy decontamination coating. This epoxy coating will be compatible with the waste managed in the unit. The waste to be managed includes vitrified waste glass within the stainless steel containers. This coating will be present in the two inert fill rooms, the fixative application room, and the two swab and monitor rooms.

The epoxy coating will be provided to protect the concrete and facilitate decontamination. The coating will be compatible with the wastes that will be managed, which will include filled ILAW containers. Glass waste is not expected to be present on the exterior of the containers, due to the design of the melter pour stations. The interior is the only portion of the container that will be exposed to the glass waste. Additionally, the removal of glass will occur in the inert fill and lidding rooms. Carbon dioxide pellets, compatible with the stainless steel container, will be used to remove contamination from the container surface. Reagents that could cause the decontamination coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the ILAW Container Finishing Containment Building

The ILAW containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the ILAW Container Finishing Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the ILAW containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained.

The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the ILAW Container Finishing Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the ILAW containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted.

Maintenance of the ILAW Container Finishing Containment Building

The epoxy decontamination coated concrete floor and walls of the of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The coated concrete will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, which will include ILAW containers, containerized secondary waste, and failed equipment. Waste containers managed in the containment building will not be stacked.

Measures to Prevent Tracking Wastes from the ILAW Container Finishing Containment Building

The ILAW containment building is designed to sample, mechanically seal, and decontaminate the filled ILAW containers. Conducting these activities in a C3 zone prevents the spread of contaminated materials from the unit as air flow is managed in the LAW vitrification facility ventilation system. The containment building is under negative pressure. Air flow through this containment building goes to a C5 air system, which passes through HEPA filters before exiting the facility stack.

A vacuum cleanup system, located in the two inert fill rooms, is expected to be infrequently used to collect dust from the inert filling activities, and thereby minimize the potential for dust to be tracked from the unit. The dust will be disposed of as secondary waste.

Additionally, personnel access to the containment building, which is classified as a C3 contamination area, will be allowed only under limited circumstances, reducing the potential for contacting the waste and tracking it from the unit.

Procedures in the Event of Release or Potential for Release from the ILAW Container Finishing Containment Building

Conditions that could lead to a release from the ILAW containment building will be corrected on a schedule intended to preclude a release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. The methods will be followed to repair conditions that could lead to a release.

Inspections of the ILAW Container Finishing Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the ILAW container finishing containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.8 LAW Consumable Import/Export Containment Building (L-0119B)

The LAW vitrification facility consumable import/export containment building will be located in the west end of the LAW vitrification facility on the 3 ft elevation. Typical waste management activities performed in this containment building include decontamination, size reduction, and packaging of spent equipment.

Simple dry wipe down decontamination of components will be performed to allow contact handling. Waste streams generated within the consumable import/export containment building will be transferred into a consumable change-out box (CCB) equipped with a internal bagging capabilities, and then packaged into a box for disposal. Waste typically generated in the consumable import/export area are managed in large waste boxes.

LAW Vitrification Facility Consumable Import/Export Containment Building Design

The LAW vitrification facility consumable import/export containment building will be designed as a completely enclosed area within the LAW vitrification facility. It is designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent water from running into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains. The approximate dimensions of the unit are summarized in Table C-7.

LAW Vitrification Facility Consumable Import/Export Containment Building Structure

The LAW vitrification facility consumable import/export containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility. Therefore, structural requirements for the containment building will be met by the design standards of the LAW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW Vitrification Facility Consumable Import/Export Containment Building Materials

The LAW vitrification facility consumable import/export containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be coated with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials in the LAW Vitrification Facility Consumable Import/Export Containment Building

An epoxy decontamination coating will be provided for the floor of this unit. The coating will be compatible with the wastes that will be managed. Activities in the unit will be limited to decontaminationand packaging the waste components into drums or waste boxes. Treatment reagents that could cause the coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the LAW Vitrification Facility Consumable Import/Export Containment Building

The LAW vitrification facility consumable import/export containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the LAW Vitrification Facility Consumable Import/Export Containment Building

Prior to receipt of dangerous and mixed waste, a certification by a qualified registered professional engineer that the LAW vitrification facility consumable import/export containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW Vitrification Facility Consumable Import/Export Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the LAW vitrification facility C3 containment building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the LAW Vitrification Facility Consumable Import/Export Containment Building

The epoxy decontaminationcoating of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The coating will remain free of corrosion or other deterioration because it is compatible with materials that will be managed in the containment building. The failed equipment that will be managed and packaged in the containment building unit will be compatible with the protective coating. Only decontamination chemicals that are compatible with the coating will be used.

Measures to Prevent Tracking Wastes from the LAW Vitrification Facility Consumable Import/ Export Containment Building

The LAW vitrification facility consumable import/export containment building will be designed to package failed equipment to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

The containment building will be classified as a C3 contamination area, which allows only limited access by personnel. Wastes leaving the unit will be enclosed within containers. If necessary, these containers will be decontaminated in the unit prior to release and transportation to a permitted treatment and disposal area.

Procedures in the Event of Release or Potential for Release from the LAW Vitrification Consumable Import/Export Containment Building

The design and operation of the unit makes it very unlikely that releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit.
The ventilation system will also use negative air pressure to keep contamination from spreading to areas of lesser contamination.

Inspections will identify conditions that could lead to a release. Such conditions will be corrected on a schedule intended to preclude a release that could be hazardous to public health or the environment. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. These methods will be followed to repair conditions that could lead to a release.

Inspections of the LAW Vitrification Facility Consumable Import/Export Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAW vitrification facility consumable import/export containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.9 LAW C3 Workshop Containment Building (L-0226A)

The C3 workshop containment building will be located in the west side of the LAW vitrification facility at elevation 28 ft.

Typical waste management activities performed in this containment building include decontamination, size reduction, and packaging of spent equipment. Equipment will be transported to the unit contained in shielded containers, drums, or in waste boxes. In the workshop, the equipment will be decontaminated to enable hands-on maintenance.

Spent equipment and parts will be bagged and placed in standard waste containers or boxes for disposal. Size reduction may be performed to facilitate packaging. Other spent equipment will be packaged in drums or waste boxes.

C3 Workshop Containment Building Design

The C3 workshop containment building will be a completely enclosed area within the LAW vitrification facility. It will be designed to prevent the release of dangerous waste and their exposure to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent water from running into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains. The approximate dimensions of the unit are summarized in Table C-7.

C3 Workshop Containment Building Structure

The C3 workshop containment building will be fully enclosed within the LAW vitrification facility. Therefore, structural requirements for the containment building will be met by the design standards of the LAW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

C3 Workshop Containment Building Materials

The C3 workshop containment building will be constructed of a steel-reinforced epoxy coated concrete floor and plasterboard partition walls. The floor will be coated with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials in the C3 Workshop Containment Building

Activities in the unit will be limited to decontamination, size reduction, and packaging the waste components into drums or waste boxes. Treatment reagents that could cause the epoxy coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the C3 Workshop Containment Building

The C3 workshop containment building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the C3 Workshop Containment Building

Prior to initial receipt of dangerous and mixed waste, a certification by a qualified registered professional engineer that the C3 workshop containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the C3 Workshop Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the C3 workshop containment building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the C3 Workshop Containment Building

The epoxy coated concrete will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration.

The concrete will remain free of corrosion or other deterioration because it is compatible with materials that will be managed in the containment building. The failed equipment that will be managed in the containment building unit will be compatible with the coated concrete. Only decontamination chemicals that are compatible with the concrete coating will be used.

Measures to Prevent Tracking Wastes from the C3 Workshop Containment Building

The C3 workshop containment building will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

The containment building classified as a C3 contamination area, which allows only limited access by personnel. Personnel access will be via a C2/C3 sub-change room. Equipment will enter and exit the workshop via a C2/C3 airlock. Repaired equipment leaving the unit will be decontaminated, when necessary, before being released for removal from the containment building. Wastes leaving the unit will be packaged in waste containers or waste boxes. If necessary, the containers will be decontaminated in the unit prior to transportation to a permitted treatment or disposal area.

Procedures in the Event of Release or Potential for Release from the C3 Workshop Containment Building

The design and operation of the unit makes it very unlikely that releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit. The ventilation system will also use negative air pressure to keep contamination from areas of lesser contamination. Offgas will be routed to the LAW offgas treatment system.

Inspections will identify conditions that could lead to a release. Such conditions will be corrected on a schedule intended to preclude a release that could be hazardous to public health or the environment. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. These methods will be followed to repair conditions that could lead to a release.

Inspections of the C3 Workshop Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the C3 workshop containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.10 LAW Pour Cave Containment Building (L-B009B, L-B011B, L-B011C, L-B013B, L-B013C, L-B015A)

The LAW pour cave containment building (rooms L-B009B, L-B011B, L-B011C, L-B013B, L-B013C, L-B015A) will be located in the LAW vitrification facility, elevation -21 ft. It will be used for managing ILAW containers as they are filled with glass from the LAW Melters (LAW-MLTR-00001/2). The filled ILAW containers will be allowed to cool with the lids off the container. Cooled ILAW containers will be transferred to the ILAW container finishing line containment building for lidding and preparation for export to a storage facility.

LAW Pour Cave Containment Building Design

The LAW pour cave containment building will be completely enclosed within the LAW vitrification facility, which will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent precipitation from entering into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Roof drains and drainage system with overflow drains will collect run-off. The approximate dimensions of the unit are summarized in Table C-7.

LAW Pour Cave Containment Building Structure

Because the LAW pour cave containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility, its structural requirements will be met by the design standards of the LAW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW Pour Cave Containment Building Materials

The LAW pour cave containment building will be constructed of steel-reinforced concrete that is provided with an insulated stainless steel liner to protect the concrete from thermal damage and support decontamination.

Use of Incompatible Materials for the LAW Pour Cave Containment Building

The waste to be managed includes vitrified waste glass within the stainless steel containers and insulated stainless cladding. No glass waste is expected to be present on the exterior of the containers, due to the design of the melter pour stations. The interior is the only portion of the container that will be exposed to the glass waste. Reagents that could cause corrosion or other failure will not be used within the unit.

Primary Barrier Integrity in the LAW Pour Cave Containment Building

The LAW pour cave containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in *RPP-WTP Compliance with Uniform Building Code Seismic Design Requirements*, DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the LAW Pour Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the LAW pour cave containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW Pour Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the LAW pour cave containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted during normal operation when ILAW containers are present.

Maintenance of the LAW Pour Cave Containment Building

The insulated stainless steel clad concrete will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, which will include containerized glass waste and equipment.

Measures to Prevent Tracking Wastes from the LAW Pour Cave Containment Building

The LAW pour cave containment building is designed to manage the filling and movement of ILAW containers. Conducting these activities in a C5 zone prevents the spread of contaminated materials from the unit as airflow is managed in the LAW vitrification facility ventilation system. The containment building is under negative pressure. Airflow through this containment building goes to a C5 air system, which passes through HEPA filters before exiting the facility stack. Personnel access will be restricted during normal operation since it is classified as a C5 contamination area. The containment building may be reclassified as a C3 area for equipment maintenance.

Procedures in the Event of Release or Potential for Release from the LAW Pour Cave Containment Building

Conditions that could lead to a release from the LAW pour cave containment building will be corrected on a schedule intended to preclude a release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. The methods will be developed to repair conditions that could lead to a release.

Inspections of the LAW Pour Cave Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAW pour cave containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.11 ILAW Container Buffer Storage Containment Building (L-B025C, L-B025D)

The LAW container buffer storage containment building (rooms L-B025C, L-B025D) will be located in the LAW vitrification facility, elevation -21 ft. It will be used for managing ILAW containers as after they are filled with glass from the LAW Melters (LAW-MLTR-00001/2). The filled ILAW containers will be allowed to cool with the lids off the container. Cooled ILAW containers will be transferred to the ILAW container finishing line containment building for lidding and preparation for export to a storage or disposal facility.

LAW Container Buffer Storage Containment Building Design

The LAW container buffer storage containment building will be completely enclosed within the LAW vitrification facility, which will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the LAW vitrification facility exterior will prevent precipitation from entering into the facility. The roof of the LAW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Roof drains and drainage system with overflow drains will collect run-off. The approximate dimensions of the unit are summarized in Table C-7.

LAW Container Buffer Storage Containment Building Structure

Because the LAW container buffer storage containment building will be a concrete-walled structure fully enclosed within the LAW vitrification facility, its structural requirements will be met by the design standards of the LAW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the LAW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

LAW Container Buffer Storage Containment Building Materials

The LAW container buffer storage containment building will be constructed of steel-reinforced concrete provided with an epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the LAW Container Buffer Storage Containment Building

The waste to be managed includes vitrified waste glass within the stainless steel containers. No glass waste is expected to be present on the exterior of the containers. The interior is the only portion of the container that will be exposed to the glass waste. Reagents that could cause corrosion or other failure of the epoxy coating will not be used within the unit.

Primary Barrier Integrity in the LAW Container Buffer Storage Containment Building

The LAW container buffer storage containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in *RPP-WTP Compliance with Uniform Building Code Seismic Design Requirements*, DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the LAW Container Buffer Storage Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the LAW container buffer storage containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containing free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the LAW Container Buffer Storage Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the LAW container buffer storage containment building, as required by 40 CFR 264.1101(c)(1). Activities in the building will be remotely conducted during normal operation when ILAW containers are present.

Maintenance of the LAW Container Buffer Storage Containment Building

The epoxy coated concrete will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, which will include containerized glass waste and equipment. Wastes containers managed in the containment building will not be stacked.

Measures to Prevent Tracking Wastes from the LAW Container Buffer Storage Containment Building

The LAW container buffer storage containment building is designed to manage the movement and storage of ILAW containers. Conducting these activities in a C5 zone prevents the spread of contaminated materials from the unit as airflow is managed in the LAW vitrification facility ventilation system. The containment building is under negative pressure. Airflow through this containment building goes to a C5 air system, which passes through HEPA filters before exiting the facility stack. Personnel access will be restricted during normal operation since it is classified as a C5 contamination area. The containment building may be reclassified as a C3 area for equipment maintenance.

Procedures in the Event of Release or Potential for Release from the LAW Container Buffer Storage Containment Building

Conditions that could lead to a release from the LAW container buffer storage containment building will be corrected on a schedule intended to preclude a release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. The methods will be developed to repair conditions that could lead to a release.

Inspections of the LAW Container Buffer Storage Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the LAW container buffer storage containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.12 HLW Melter Cave 1 Containment Building (H-0117, H-0116B, H-0310A) and HLW Melter Cave 2 Containment Buildings (H-0106, H-0105B, H-0304A)

The HLW melter cave 1 and HLW melter cave 2 containment buildings are located in the central portion of the HLW vitrification facility. Each of the containment buildings will house an HLW melter cave, an overpack C3/C5 airlock, and an equipment decontamination pit.

Typical waste management activities performed in these containment buildings include the dismantling and packaging of spent consumables and decontamination of equipment for hands-on maintenance. The types of spent consumables will include waste recirculators, lid heaters, bubblers, thermocouples, and jumpers. When spent consumables are ready for change out, they will be placed on a consumable storage rack while awaiting size reduction. The consumables will be reduced in size by dismantling or cutting the spent equipment, or both. This process will be remotely conducted on tables in the containment building. The spent consumables will be placed in baskets and lowered into containers in a transfer tunnel that passes under the HLW melter cave 1 and 2 containment buildings (H-0117, H-0116B, H-0310A and H-0106, H-0105B, H-0304A). The C3/C5 airlocks will be used for packing or unpacking melters or their components.

In case of a HLW melter failure, the melter will be evaluated for meeting the receiving TSD waste acceptance criteria, particularly in terms of the radiological contamination in the HLW glass residue present in the melter, before it is placed in an overpack.

The equipment decontamination pit located within the melter cave containment building will house the Decontamination Tanks (HSH-TK-00001/2) where equipment removed from the melter cave will be decontaminated prior to maintenance. The equipment will be initially decontaminated by soaking in the decontamination tank. After evaluation, additional decontamination may be performed using manipulators before the levels are acceptable for hands-on maintenance.

Located within the melter cave containment building will be the HLW melter; the submerged bed scrubber and HEMEs, which will function as part of the melter offgas system, the Feed Preparation Vessels (HFP-VSL-00001/5), and the HLW Melter Feed Vessels (HFP-VSL-00002/6). These tank systems will have secondary containment and are addressed in section 4.2.2.

HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building Design

The two HLW melter containment buildings are completely enclosed within the HLW vitrification facility. Each of the melter cave containment buildings will house an HLW melter cave, an overpack C3/C5 airlock cell, and an equipment decontamination pit. Both melter cave containment buildings are designed to prevent the release of dangerous constituents and exposure to the outside environment. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility. The roof of the HLW vitrification facility will be metal. Run-off will be collected by roof drains and a drainage system with overflow roof drains. Approximate dimensions of the HLW melter cave 1 and 2 containment buildings are summarized in Table C-7.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid dangerous wastes managed in the HLW melter containment building are addressed under tank systems (see section 4.2.2).

HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building Structure

The HLW melter cave no. 1 and 2 containment buildings will be a fully enclosed, concrete-walled structure within the HLW vitrification facility. Therefore, its structural requirements will be met by the design standards of the HLW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building Materials

The HLW melter cave 1 and 2 containment buildings will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel, except for the C3/C5 airlock. The height of the lining is summarized in Table C-6.

Use of Incompatible Materials for the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

A partial stainless steel liner will be provided for the containment buildings, except for the C3/C5 airlock. The C3/C5 airlock will be partially lined with a protective coating. The stainless steel will be compatible with the wastes that will be managed, which will include spent melters and consumables, including air spargers, metallic parts, and refractory bricks. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the HLW Cave Melter 1 and HLW Melter Cave 2 Containment Buildings

The HLW melter cave 1 and 2 containment buildings are designed to withstand loads from the movement of personnel (C3/C5 Airlock), wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the HLW melter containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained.
The requirements of 40 CFR 264.1101(b) do not apply to this design because liquid dangerous wastes present in the containment building will be managed in tank systems with secondary containment systems, as presented in section 4.2.2.

Operation of the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

Operational and maintenance controls and practices will be established and followed to ensure containment of the wastes within the HLW melter containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

The partial stainless steel lining of the containment building will be designed and constructed in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The liner will be welded at each seam. The stainless steel liner will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, which will include spent melters and spent equipment. Only decontamination chemicals that are compatible with the liner will be used.

Waste containers managed in the containment building will not be stacked. In general, waste will be placed in containers and removed from the containment building.

Measures to Prevent Tracking Wastes from the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Building

The HLW melter cave 1 and 2 containment building design and operating methods include several measures that will prevent wastes from being tracked from the unit. Measures that will be implemented include:

- Limiting the movement of personnel and material from the C3/C5 airlock.

- Using shield doors to prevent the inadvertent spread of contamination.
- Decontaminating materials or containers before they are released from the unit.
- Using C5 ventilation as a primary containment method.

Personnel access to the HLW melter caves, which are classified as a C5 contamination area, will be restricted. Personnel operating in melter cave C3/C5 airlocks will not be in contact with spent melters because they will be encased in overpack containers.

Export of equipment from the melter caves will be kept to a minimum by performing in-cave maintenance to the maximum extent possible. The design of the cave and equipment includes master-slave manipulators, special tools, and a tool import port that will enable maintenance operations to be conducted remotely without removing the equipment from the cave. When equipment must be removed for hands-on maintenance, it will be transferred through shield doors into the Decontamination Tank (HSH-TK-00001/2) or the crane decontamination area (C3/C5) above the C3/C5 airlock. The equipment will be transferred to the maintenance room only after it has been decontaminated in Decontamination Tank HSH-TK-00001/2, and in the equipment decontamination pit, if needed.

Spent consumables and wastes will be size-reduced in the cave and exported to drums through an air lock, which is designed to provide containment of contamination between the C5 melter cave and the C3 drum transfer tunnel. Export of spent Melters will be controlled to prevent the spread of contamination. Melters will be transferred into overpack containers that are docked with the shield doors to the C3/C5 airlock.

Procedures in the Event of Release or Potential for Release from the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

Conditions that could lead to a release from the HLW melter cave 1 and HLW melter cave 2 containment buildings will be corrected on a schedule intended to preclude a release that could be hazardous to public healthe or the environment.

In the unlikely event of a release of dangerous wastes from either containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the HLW Melter Cave 1 and HLW Melter Cave 2 Containment Buildings

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the HLW melter cave 1 and HLW melter cave 2 containment buildings. The inspection and monitoring schedule and methods that will be used to detect a release from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.13 IHLW Canister Handling Cave Containment Building (H-0136)

The HLW canister handling cave containment building will be located in the southern portion of the HLW vitrification facility. Typical waste management activities performed within this containment building include the storage of waste canisters and containerized secondary waste. Located within the containment building will be two cooling and buffer storage areas and two container welding and rework stations. IHLW canisters that have cooled enough to leave the pour areas will be transported to the canister handling cave containment building by means of an overhead crane. The IHLW glass waste will continue to cool in the buffer storage areas. When adequately cooled, canisters will be moved to one of the two weld and rework stations, where the lid will be welded onto the canister. The IHLW canister will then be decontaminated in the HDH system and transported to the IHLW canister swabbing and monitoring cave containment building. Container management practices are discussed in section 4.2.1. The IHLW canister handling cave containment building will provide secondary containment for tank system ancillary equipment (piping).

The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid dangerous wastes managed in the IHLW canister handling cave containment building are addressed under tank systems (see section 4.2.2).

IHLW Canister Handling Cave Containment Building Design

The IHLW canister handling cave containment building will be completely enclosed within the HLW vitrification facility. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility. The roof of the HLW vitrification facility will be metal. Run-off will be collected by roof drains and a drainage system with overflow roof drains. The unit is designed to prevent the release and exposure of dangerous constituents to the outside environment. Its approximate dimensions are summarized in Table C-7.

IHLW Canister Handling Cave Containment Building Structure

Because the IHLW canister handling cave containment building will be a concrete-walled structure fully enclosed within the HLW vitrification facility, its structural requirements will be met by the design standards of the HLW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

IHLW Canister Handling Cave Containment Building Unit Materials

The IHLW canister handling cave containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be lined with stainless steel. The height of the lining will be a minimum of 0.5 feet.

Use of Incompatible Materials for the IHLW Canister Handling Cave Containment Building

The partial stainless steel liner will be provided for the IHLW containment building that will be compatible with the steel canisters that will be managed. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used in the unit.

Primary Barrier Integrity in the IHLW Canister Handling Cave Containment Building

The HLW vitrification facility is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the IHLW Canister Handling Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the IHLW canister handling cave containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containers with free liquid will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7)

Operation of the IHLW Canister Handling Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the IHLW canister handling cave containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the IHLW Canister Handling Cave Containment Building

The partial stainless steel lining of the containment building will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration.

The stainless steel liner will be welded at each seam, and will be free of corrosion or other deterioration because it will be compatible with materials that will be managed in the containment building, including the stainless steel containers. Only decontamination chemicals that are compatible with the liner will be used.

Waste containers that will be managed in the containment building will not be stacked higher than the unit wall; however, wastes are not anticipated to be stacked.

Measures to Prevent Tracking Wastes from the IHLW Canister Handling Cave Containment Building

The IHLW canister handling cave containment building is designed to store cooling IHLW glass waste containers and weld the lids onto the containers.

The outside of the canister will be inspected to see whether glass is present on the container. If glass is found, it will be removed using a needle gun or other mechanical method. The glass shards will be collected for disposal in a shop-type vacuum and disposed of as a secondary waste. The containment building will be classified as a C5 contamination area, and therefore personnel access will be restricted. Wastes leaving the unit will be within containers.

Procedures in the Event of Release or Potential for Release from the IHLW Canister Handling Cave Containment Building

Conditions that could lead to a release from the IHLW canister handling cave containment building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the IHLW Canister Handling Cave Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the IHLW canister handling cave containment building. The inspection and monitoring schedule and methods that will be used to detect a release from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.14 IHLW Canister Swab and Monitoring Cave Containment Building (H-0133)

The IHLW canister swab and monitoring cave containment building is located in the southeast portion of the HLW vitrification facility (room H-0133). The systems associated with the swabbing and monitoring activities in the cave include overhead crane, grapples, power manipulator, swabbing turntable, and swabbing waste storage container.

After decontamination in the Canister Decon Vessels (HDH-VSL-00002/4), the canister is moved to the canister swab and monitoring building and placed on the turntable. The turntable provides a base on which the canister is set and rotated while the surface swabbing is performed. When surface radiolocgical cleanliness has been verified, the canister is placed in the canister storage bogie and transferred to the canister storage cave.

IHLW Canister Swab and Monitoring Cave Containment Building Design

The IHLW canister swab and monitoring cave containment building will be completely enclosed within the HLW vitrification facility, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility.

The roof of the HLW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Run-off will be collected by roof drains and a drainage system with overflow roof drains. Unit dimensions are summarized in Table C-7.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because any dangerous waste containers with free liquid will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

IHLW Canister Swab and Monitoring Cave Containment Building Structure

Because the IHLW canister swab and monitoring cave building will be a concrete-walled structure fully enclosed within the HLW vitrification facility, its structural requirements will be met by the design standards of the HLW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

IHLW Canister Swab and Monitoring Cave Containment Building Unit Materials

The IHLW canister swab and monitoring cave containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the IHLW Canister Swab and Monitoring Cave Containment Building

Treatment reagents that could cause the protective coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the IHLW Canister Swab and Monitoring Cave Containment Building

The IHLW canister swab and monitoring cave building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the IHLW Canister Swab and Monitoring Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the IHLW canister swab and monitoring cave containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the IHLW Canister Swab and Monitoring Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the IHLW canister swab and monitoring cave containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the IHLW Canister Swab and Monitoring Cave Containment Building

The protective coating of the containment building will be maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. Only decontamination chemicals that are compatible with the protective coating will be used. Wastes are not expected to be stacked within the unit.

Measures to Prevent Tracking Wastes from the IHLW Canister Swab and Monitoring Cave Containment Building

The IHLW canister swab and monitoring cave containment building is designed to manage canisters that are swabbed to determine whether they meet the surface radiological requirements. The containment building will be classified as a C3 contamination area with limited personnel access. The air from the unit passes through HEPA filtration prior to discharge out of the plant stack.

Personnel access to the canister swab and monitoring cave containment building will be limited. Therefore, personnel moving into and out of the unit will not track contamination out of the unit.

Procedures in the Event of Release or Potential for Release from the IHLW Canister Swab and Monitoring Cave Containment Building

Conditions that could lead to a release from the IHLW canister swab and monitoring cave containment building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment.

In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the IHLW Canister Swab and Monitoring Cave Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to release of wastes from the IHLW canister swab and monitoring cave containment building. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.15 C3 Workshop Containment Building (H-0311A, H-0311B)

The C3 workshop containment building will be located in the northeast section of the HLW vitrification facility at elevation 37 ft.

Typical waste management activities performed in this containment building include decontamination, size reduction, and packaging of spent equipment. Equipment will be transported to the unit contained in shielded containers, drums, or in a standard waste box. In the workshop, the equipment will be decontaminated to enable hands-on maintenance. Spent equipment parts will be bagged and placed in standard waste containers or boxes for disposal. Size reduction may be performed to facilitate packaging. Other spent equipment will be packaged in drums or standard waste boxes.

C3 Workshop Containment Building Design

The C3 workshop containment building will be designed as a completely enclosed area within the HLW vitrification facility. It will be designed to prevent the release of dangerous waste and their exposure to the outside environment. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility. The roof of the HLW vitrification facility will consist of metal roofing, roof insulation, and vapor barrier. Rainwater run-off will be collected by roof drains and drainage systems with overflow roof drains. The approximate dimensions of the unit are summarized in Table C-7.

C3 Workshop Containment Building Structure

The C3 workshop containment building will be a concrete-walled structure fully enclosed within the HLW vitrification facility. Therefore, structural requirements for the containment building will be met by the design standards of the HLW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure.

DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

C3 Workshop Containment Building Materials

The C3 workshop containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials in the C3 Workshop Containment Building

The epoxy coating will be provided for this unit which will be compatible with the equipment and wastes that will be managed. Activities in the unit will be limited to decontamination, size reduction, and packaging the waste components into drums or waste boxes. Treatment reagents that could cause the liner or coating to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the C3 Workshop Containment Building

The C3 workshop containment building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the C3 Workshop Containment Building

Prior to initial receipt of dangerous and mixed waste, a certification by a qualified registered professional engineer that the C3 workshop containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because the any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the C3 Workshop Containment Building

Operational and maintenance controls and practices will be established and followed to ensure containment of the dangerous wastes within the C3 workshop containment building unit as required by 40 CFR 264.1101(c)(1).

Maintenance of the C3 Workshop Containment Building

The concrete and protective coating, where used, will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The concrete and protective coating, where used, will remain free of corrosion or other deterioration because it is compatible with materials that will be managed in the containment building. The failed equipment that will be managed in the containment building unit will be compatible with the concrete or protective coating, where used. Only decontamination chemicals that are compatible with the concrete or protective, where used, will be applied.

Measures to Prevent Tracking Wastes from the C3 Workshop Containment Building

The C3 workshop containment building will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Personnel access to a C3 contamination area will be limited. Very little dust is expected to be generated in the unit.

The containment building will be classified as a C3 contamination area, which allows only limited access by personnel. Personnel access will be via a C2/C3 subchange room. Equipment will enter and exit the workshop via a C2/C3 airlock. Wastes leaving the unit will be enclosed within containers. If necessary, the containers will be decontaminated in the unit prior to transportation to a permitted storage area. Equipment leaving the unit will be decontaminated, when necessary, before being released for removal from the cells.

Procedures in the Event of Release or Potential for Release from the C3 Workshop Containment Building

The design and operation of the unit makes it very unlikely that releases will occur. The design and operational measures will minimize the generation of dust and contain it within the unit. In the unlikely event that a release of dangerous wastes from the containment building is detected, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste. These methods will be followed to repair conditions that could lead to a release.

Inspections of the C3 Workshop Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the C3 workshop containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.16 Filter Cave Containment Building (H-0104)

The filter cave containment building is located in the northwest portion of the facility. The filter cave containment building will manage spent HEPA filters via an overhead crane. The crane transports the spent filters to a disposal container. The disposal container is then transported via cart, through an air lock and shield doors and to a load-out area for storage pending final disposal.

Filter Cave Containment Building Design

The filter cave containment building will be completely enclosed within the HLW vitrification facility, and will be designed to prevent the release and exposure of dangerous constituents to the outside environment. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility. The roof of the HLW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Run-on will be collected by roof drains and a drainage system with overflow drains. The approximate dimensions of the containment building are summarized in Table C-7.

Filter Cave Containment Building Structure

Because the filter cave containment building will be a concrete-walled structure fully enclosed within the HLW vitrification facility, its requirements will be met by the design standards of the HLW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

Filter Cave Containment Building Materials

The Filter Cave containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the Filter Cave Containment Building

The concrete structure and protective coating, where used, will be compatible with the wastes that will be managed in the unit, which will include spent HEPA filters. Activities in the unit will be limited to HEPA filter change out and waste packaging. Treatment reagents that could cause concrete or protective coating, where used, to leak, corrode, or otherwise fail will not be used within the unit.

Primary Barrier Integrity in the Filter Cave Containment Building

The filter cave containment building will be designed to withstand loads from the movement of personnel, wastes, and handling equipment.

The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the Filter Cave Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the filter cave containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the Filter Cave Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the waste within the filter cave containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the Filter Cave Containment Building

The concrete floor and walls of the unit will be constructed and maintained in a manner that will be free of significant cracks, gaps, corrosion, or other deterioration. The concrete structure will be compatible with materials that will be managed in the containment building, which will include spent HEPA filters. No decontamination chemicals that are incompatible with the concrete will be used.

Measures to Prevent Tracking Wastes from the Filter Cave Containment Building

The filter cave containment building is designed to manage spent HEPA filters. Conducting these activities in a C5 contamination zone will prevent the spread of contaminated materials. Controlled movement of equipment into and out of the unit will decrease the possibility that waste will be tracked from the unit. Personnel access to a C5 contamination area will be restricted.

Procedures in the Event of Release or Potential for Release from the Filter Cave Containment Building

Conditions that could lead to a release from the filter cave containment building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Specific administrative and operating methods that will be used to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the Filter Cave Containment Building

An inspection program will be established to detect conditions that could lead to a release of wastes from the filter cave containment building. The inspection and monitoring schedule and methods that will be used to detect releases from the unit are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.17 HLW Pour Tunnel 1 Containment Building (H-B032) and HLW Pour Tunnel 2 Containment Building (H-B005A)

HLW pour tunnels 1 and 2 containment building contain bogies that transport empty canisters to the melter pour spout. Each of the two pour tunnels extends from the south end of the melter caves in a north-south direction to an area below the canister handling cave. The glass pouring into canisters takes place in the north half of the HLW pour tunnels 1 and 2 containment buildings. After filling with glass, the canisters are allowed to cool down prior to being transported to the south portion of the HLW pour tunnels 1 and 2 containment buildings and transferred through the hatch to the canister handling cave located above. The south portion of the HLW pour tunnels 1 and 2 containment buildings can be used for bogie decontamination, if required, prior to handling in the bogie maintenance area. The bogie maintenance area is segregated from HLW pour tunnels 1 and 2 containment buildings by a shield door.

Bogie decontamination is not considered a dangerous waste management activity performed within the boundary of the HLW pour tunnels 1 and 2 containment buildings. Contaminated liquids which accumulate in the sumps located in the pour tunnels will be sent to RLD-VSL-00008.

HLW Pour Tunnel 1 and HLW Pour Tunnel2 Containment Building Design

The HLW pour tunnels 1 and 2 containment buildings will be completely enclosed within the HLW vitrification facility, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility. The roof of the HLW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Runoff will be collected by roof drains and a drainage system with overflow roof drains. Unit dimensions are summarized in Table C-7.

The HLW pour tunnel 1 containment building will provide secondary containment for tank system ancillary equipment (piping). The containment building design requirements of 40 CFR 264.1101(b) do not apply because the liquid dangerous waste containers managed in the HLW pour tunnel 1 containment building will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

The HLW pour tunnel 2 containment buildings' design requirements of 40 CFR 264.1101(b) do not apply because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Building Structure

Because the HLW pour tunnels 1 and 2 containment buildings will be concrete-walled structures fully enclosed within the HLW vitrification facility, their structural requirements will be met by the design standards of the HLW vitrification facility. The design will ensure that the units have sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Building Unit Materials

The HLW pour tunnels 1 and 2 containment buildings will be constructed of steel-reinforced concrete. The interior floors and a portion of the walls of the units will be lined with stainless steel to protect the insulation and concrete from the effects of high temperatures.

Use of Incompatible Materials for the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The partial stainless steel liner will be provided for the HLW pour tunnels 1 and 2 containment buildings that will be compatible with the steel canisters that will be managed. Treatment reagents that could cause the liner to leak, corrode, or otherwise fail will not be used in the unit. There will be no incompatible dangerous wastes managed within the HLW pour tunnels 1 and 2 containment buildings.

Primary Barrier Integrity in the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The HLW pour tunnels 1 and 2 containment buildings are designed to withstand loads from the movement of wastes and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the HLW pour tunnels 1 and 2 containment buildings meet the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) to this design because any dangerous waste containers with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the HLW pour tunnels No.1 and No. 2 containment buildings, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The partial stainless-steel liner will be installed in the HLW pour tunnels 1 and 2 containment buildings to protect insulation and concrete from the effects of high temperatures. Waste canisters will not be stacked within the unit.

Measures to Prevent Tracking Wastes from the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

The HLW vitrification facility HLW pour tunnels 1 and 2 containment buildings will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

The HLW pour tunnel 1 and 2 containment buildings will be classified as C5 contamination areas with personnel access restricted. Personnel access to the HLW pour tunnels 1 and 2 containment buildings will not be allowed because of high radiation.

Control of Fugitive Dust from the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Operational controls of the HLW vitrification facility ventilation system will be used to control fugitive dust emissions from the units to meet the requirements of 40 CFR 264.1101(c)(1)(iv). The following measures will be used to prevent fugitive dust from escaping the HLW pour tunnels 1 and 2 containment buildings:

- A cascading air flow from areas of least to greatest potential contamination (that is, C2 to C3 to C5).
- Greater negative air pressure in the unit, compared to adjacent C3 units, to pull air into the unit and prevent backflow.
- Intake air through controlled air in-bleed units with backflow prevention dampers.
- Safety interlocks to shut down C3 extract fans to prevent backflow if the C5 system shuts down.
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack.
- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow, even during fan maintenance and repair.

Procedures in the Event of Release or Potential for Release from the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

Conditions that could lead to a release from the HLW pour tunnels 1 and 2 containment buildings will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment buildings, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the HLW Pour Tunnel 1 and HLW Pour Tunnel 2 Containment Buildings

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the HLW pour tunnel containment buildings. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.18 HLW Drum Swabbing and Monitoring Area Containment Building (H-0126A, H-0126B, and H-B028)

The HLW drum swabbing and monitoring area containment building is located in the northeast section of the HLW vitrification facility. Typical waste management activities performed in this containment building include the remote handling of 55 US gallon drums. The drums will be swabbed for surface contamination and decontaminated if needed.

Upon arrival in the HLW drum swabbing and monitoring area, the 55 US gallon drums are weighed, monitored, and then transferred through a hatch and placed into a shielded cask in the cask handling area.

In the cask handling area, drum transport casks are remotely lidded and moved to the truck loading bay for removal from the facility.

Drum Swabbing and Monitoring Area Containment Building Design

The drum swabbing and monitoring area containment building will be completely enclosed within the HLW vitrification facility, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility. The roof of the HLW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Runoff will be collected by roof drains and a drainage system with overflow roof drains. Unit dimensions are summarized in Table C-7.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because the any dangerous waste with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

HLW Drum Swabbing and Monitoring Area Containment Building Structure

Because the HLW drum swabbing and monitoring area will be a concrete-walled structure fully enclosed within the HLW vitrification facility, its structural requirements will be met by the design standards of the HLW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

HLW Drum Swabbing and Monitoring Area Containment Building Unit Materials

The HLW drum swabbing and monitoring area containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be covered with epoxy coating to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the HLW Drum Swabbing and Monitoring Area Containment Building

There will be no incompatible reagents or dangerous wastes managed within the HLW drum swabbing and monitoring containment building.

Primary Barrier Integrity in the HLW Drum Swabbing and Monitoring Area Containment Building

The HLW drum swabbing and monitoring area containment building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the HLW Drum Swabbing and Monitoring Area Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the HLW drum swabbing and monitoring area containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the HLW Drum Swabbing and Monitoring Area Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the HLW drum swabbing and monitoring area containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Drum Swabbing and Monitoring Area Containment Building

Personnel access to the containment building will not be allowed because of high radiation. Drums are not normally expected to be stacked within the unit.

Measures to Prevent Tracking Wastes from the HLW Drum Swabbing and Monitoring Area Containment Building

The HLW drum swabbing and monitoring area containment building will be classified as a C3/C5 contamination area with limited personnel acces. The HLW HLW drum swabbing and monitoring containment building will be designed to isolate failed equipment from the accessible environment and to prevent the spread of contaminated materials. Very little dust is expected to be generated in the unit.

Control of Fugitive Dust from the HLW Drum Swabbing and Monitoring Area Containment Building

Operational controls of the HLW vitrification facility ventilation system will be used to control fugitive dust emissions from the unit to meet the requirements of 40 CFR 264.1001(c)(1)(iv). The following measures will be used to prevent fugitive dust from escaping the HLW drum swabbing and monitoring area containment building:

- A cascading air flow from areas of least to greatest potential contamination (that is, C2 to C3 to C5).
- Greater negative air pressure in the unit, compared to adjacent C3 units, to pull air into the unit and prevent backflow.
- Intake air through controlled air in-bleed units with backflow prevention dampers.
- Safety interlocks to shut down C3 extraction fans to prevent backflow, if the C5 system shuts down.
- Dual HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack.

- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow, even during fan maintenance and repair.

Procedures in the Event of Release or Potential for Release from HLW Drum Swabbing and Monitoring Area Containment Building

Conditions that could lead to a release from the HLW drum swabbing and monitoring area containment building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of mixed or dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the HLW Drum Swabbing and Monitoring Area Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the HLW drum swabbing and monitoring area containment building. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6.0.

4.2.4.19 HLW Waste Handling Area Containment Building (H-410B, H-411)

The HLW waste handling area containment building consists of rooms H-410B, and H-411 on the 58 ft elevation of the HLW vitrification facility. Typical waste management activities performed in this containment building include waste sorting, segregation, and providing temporary storage of mixed waste containers (e.g. spent silver mordenite). The HLW waste handling area containment building will contain floor space for segregated storage of empty and full containers, typically 55 gallon waste drums. Tools and equipment will also be stored in this containment building.

HLW Waste Handling Area Containment Building Design

The HLW waste handling area containment building will be completely enclosed within the HLW vitrification facility, and will be designed to prevent the release of dangerous constituents and their exposure to the outside environment. The design and construction of the HLW vitrification facility exterior will prevent water from running into the facility. The roof of the HLW vitrification facility will consist of metal roofing, roof insulation, and a vapor barrier. Runoff will be collected by roof drains and a drainage system with overflow roof drains. Unit dimensions are summarized in Table C-7.

The containment building design requirements of 40 CFR 264.1101(b) do not apply because any dangerous waste with free liquidss will will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

HLW Waste Handling Area Containment Building Structure

Because the HLW waste handling area containment building will be a concrete-walled structure fully enclosed within the HLW vitrification facility, its structural requirements will be met by the design standards of the HLW vitrification facility. The design will ensure that the unit has sufficient structural strength to prevent collapse or failure. DWP Operating Unit Group 10, Supplement 1 provides documentation that the seismic requirements for the HLW vitrification facility meet or exceed the Uniform Building Code Seismic Design Requirements.

HLW Waste Handling Area Containment Building Unit Materials

The HLW waste handling area containment building will be constructed of steel-reinforced concrete. The interior floor and a portion of the walls of the unit will be covered with epoxy coatings to protect the concrete and facilitate decontamination.

Use of Incompatible Materials for the HLW Waste Handling Area Containment Building

There will be no incompatible reagents or dangerous wastes managed within the HLW waste handling area containment building.

Primary Barrier Integrity in the HLW Waste Handling Area Containment Building

The HLW waste handling area containment building is designed to withstand loads from the movement of personnel, wastes, and handling equipment. The seismic design criteria found in DWP Operating Unit Group 10, Supplement 1 ensures that appropriate design loads, load combinations, and structural acceptance criteria are employed at the WTP.

Certification of Design for the HLW Waste Handling Area Containment Building

Prior to initial receipt of dangerous and mixed waste, certification by a qualified registered professional engineer that the HLW waste handling area containment building meets the design requirements of 40 CFR 264.1101(a) and (c) will be obtained. The requirements of 40 CFR 264.1101(b) do not apply to this design because any dangerous waste with free liquids will be managed on portable secondary containment that meets the requirements of WAC 173-303-630(7).

Operation of the HLW Waste Handling Area Containment Building

Operational and maintenance controls and practices will be established to ensure containment of the wastes within the HLW waste handling area containment building, as required by 40 CFR 264.1101(c)(1).

Maintenance of the HLW Waste Handling Area Containment Building

Wastes are not normally expected to be stacked within the unit.

Measures to Prevent Tracking Wastes from the HLW Waste Handling Area Containment Building

The HLW waste handling area containment building will be classified as a C2/C3 contamination area with limited personnel access. Wastes leaving the HLW waste handling area containment building will be enclosed within containers. If necessary, these containers will be decontaminated in the unit prior to transportation to another permitted TSD facility.

Control of Fugitive Dust from the HLW Waste Handling Area Containment Building

Operational controls of the HLW vitrification facility ventilation system will be used to control fugitive dust emissions from the unit to meet the requirements of 40 CFR 264.1101(c)(1)(iv). The following measures will be used to prevent fugitive dust from escaping the waste handling area containment building:

- A cascading air flow from areas of least to greatest potential contamination (that is, C2 to C3 to C5).
- Greater negative air pressure in the unit, compared to adjacent C2 units, to pull air into the unit and prevent backflow.
- Intake air through controlled air in-bleed units with backflow prevention dampers.
- Safety interlocks to shut down C3 extraction fans to prevent backflow if the C5 system shuts down.
- HEPA filtration of exhaust air before discharge to the atmosphere through a monitored stack.
- A multiple fan extraction system, designed to maintain negative pressure and cascading air flow, even during fan maintenance and repair.
- Personnel ingress and egress through airlocks and subchange rooms.

Procedures in the Event of Release or Potential for Release from HLW Waste Handling Area Containment Building

Conditions that could lead to a release from the HLW waste handling area containment building will be corrected on a schedule intended to preclude any release that could be hazardous to public health or the environment. In the unlikely event of a release of dangerous wastes from the containment building, actions required by 40 CFR 264.1101(c)(3)(i) through (iii) will be taken. Administrative and operating methods to satisfy this requirement will be developed prior to initial receipt of dangerous and mixed waste.

Inspections of the HLW Waste Handling Area Containment Building

An inspection program will be established as required under WAC 173-303-695 to detect conditions that could lead to the release of wastes from the HLW waste handling area containment building. The inspection and monitoring schedule and methods that will be used to detect a release are included in DWP Operating Unit Group 10, Chapter 6.0.

4.3 Other Waste Management Units

Sections 4.3.1 through 4.3.5 discuss the applicability of the requirements for waste management units that have not been discussed up to this point in the permit. Sections 4.3.6 through 4.3.9 describe the applicability of air emission controls, waste minimization, groundwater monitoring, and functional design requirements to the WTP. References to other sections of the permit are provided as appropriate.

4.3.1 Waste Piles [D-3]

The operation of the WTP does not involve the placement of dangerous waste in waste piles. Therefore, the requirements of WAC 173-303-660, “Waste Piles”, do not apply to the WTP.

4.3.2 Surface Impoundments [D-4]

The operation of the WTP does not involve the placement of dangerous waste in surface impoundments. Therefore, the requirements of WAC 173-303-650, “Surface Impoundments”, do not apply to the WTP.

4.3.3 Incinerators [D-5]

The WTP does not include a dangerous waste incinerator. Therefore, the requirements of WAC 173-303-670, “Incinerators”, do not apply to the WTP.

4.3.4 Landfills [D-6]

The operation of the WTP does not involve the placement of dangerous waste in landfills. Therefore, the requirements of WAC 173-303-665, “Landfills”, do not apply to the WTP.

4.3.5 Land Treatment [D-7]

The operation of the WTP does not involve the land treatment of dangerous waste. Therefore, the requirements of WAC 173-303-655, “Land Treatment”, do not apply to the WTP.

4.3.6 Air Emissions Control [D-8]

Information regarding air emissions control is provided in the following sections:

- Pretreatment facility vessel vent process and exhaust system (PVP/PVV) - section 4.1.2.17
- LAW vitrification offgas treatment system description - section 4.1.3.3
- HLW vitrification offgas treatment system description - section 4.1.4.3
- Process vents (40 CFR 264 Subpart AA) - section 4.2.2.10.2
- Equipment leaks (40 CFR 264 Subpart BB) - section 4.2.2.10.3
- Tanks and containers (40 CFR 264 Subpart CC) - section 4.2.2.10.4

4.3.7 Waste Minimization [D-9]

Waste minimization information is presented in Operating Unit Group 10 of the permit.

4.3.8 Groundwater Monitoring for Land-Based Units [D-10]

The groundwater monitoring requirements found in WAC 173-303-645, "Releases from regulated units", do not apply to the WTP, since it is not operated as a regulated dangerous waste surface impoundment, landfill, land treatment area or waste pile, as defined in WAC 173-303-040. Therefore, groundwater monitoring is not required.

4.3.9 Functional Design Requirements

The WTP will be designed to comply with applicable design codes and specifications. The documents referenced in this chapter and contained in DWP Operating Unit Group 10 identify the codes and standards to which the WTP system, structures, and components are being constructed.

TABLES

Table C-1 Container Storage Areas 165
Table C-2 Pretreatment Facility Tanks/Vessels 166
Table C-3 LAW Vitrification Facility Tank Systems 172
Table C-4 HLW Vitrification Facility Tank Systems 174
Table C-5 Analytical Laboratory Tank Systems 176
Table C-6 Secondary Containment Rooms/Areas 177
Table C-7 Containment Buildings Summary 183
Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems) 186
Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines 199

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Table C-1 Container Storage Areas		
Container Storage Area	**Maximum Waste Volume (US Gallons) [1]**	**Approximate Dimensions (L × W × H, in feet) [2]**
HLW Vitrification Facility		
1. IHLW Canister Storage Cave (H-0132)	163,599	66’ x 22’ x 15’
2. HLW East Corridor El. 0’ (HC-0108/09/10)	183,721	(30’ x 34’ x 10’) + (65’ x 16’ x 10’) + (12’ x 32’ x 10’)
3. HLW Loading Area (H-0130)	142,204	70’ x 32’ x 10’
Analytical Laboratory		
1. Laboratory Waste Management Area (A-0139 and A-0139A/B/C/D)	139,586	49’ x 38’ x 10’
Other Areas		
1. Non-Radioactive Dangerous Waste Container Storage Area (located on the Part A Figures)	56,104	25’ × 30’ × 10’
2. Failed Melter Storage Facility (located on the Part A Figures)	403,947	75’ × 45’ × 16’

[1] The conversion factor used to convert from cubic feet to gallons is 7.4805 gal/ft^3.

[2] The dimension for height (H) is based on the height of the largest waste container stored in the area (i.e., LAW container is 7.5 ft, HLW canister is 15 ft, melters are assumed to be 16 ft, and a B-25 box is 5 ft - stacked a maximum of two high is 10 ft).

Table C-2 Pretreatment Facility Tanks/Vessels						
No.	**System**	**Vessel Number/Location**	**Description**	**Material of Construction**	**Approximate Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height or Length in feet and inches) (tangent line/tangent line)**
1	FRP	FRP-VSL-00002A P-0108	Waste Feed Receipt Vessel	Stainless Steel	472,900	47’ x 26’ 10”
2	FRP	FRP-VSL-00002B P-0108A	Waste Feed Receipt Vessel	Stainless Steel	472,900	47’ x 26’ 10”
3	FRP	FRP-VSL-00002C P-0108B	Waste Feed Receipt Vessel	Stainless Steel	472,900	47’ x 26’ 10”
4	FRP	FRP-VSL-00002D P-0108C	Waste Feed Receipt Vessel	Stainless Steel	472,900	47’ x 26’ 10”
5	FEP	FEP-VSL-00017A P-0106	Waste Feed Evaporator Feed Vessel	Stainless Steel	85,496	22’ x 22’ 9”
6	FEP	FEP-VSL-00017B P-0106	Waste Feed Evaporator Feed Vessel	Stainless Steel	85,496	22’ x 22’ 9”
7	FEP	FEP-VSL-00005 P-0105B	Waste Feed Evaporator Condensate Vessel	Stainless Steel	5,022	8’ x 10’ 8”
8	UFP	UFP-VSL-00062A P-0106	Ultrafilter Permeate Collection Vessel	Stainless Steel	34,700	15’ x 21’ 3”
9	UFP	UFP-VSL-00062B P-0106	Ultrafilter Permeate CollectionVessel	Stainless Steel	34,700	15’ x 21’ 3”
10	UFP	UFP-VSL-00062C P-0104	Ultrafilter Permeate Collection Vessel	Stainless Steel	34,700	15’ x 21’ 3”
11	UFP	UFP-VSL-00001A P-0106	Ultrafiltration Feed Preparation Vessel	Stainless Steel	75,594	20’ x 25’ 9”

Table C-2 Pretreatment Facility Tanks/Vessels						
No.	**System**	**Vessel Number/Location**	**Description**	**Material of Construction**	**Approximate Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height or Length in feet and inches) (tangent line/tangent line)**
12	UFP	UFP-VSL-00001B P-0104	Ultrafiltration Feed Preparation Vessel	Stainless Steel	75,594	20’ x 25’ 9”
13	UFP	UFP-VSL-00002A P-0104	Ultrafiltration Feed Vessel	Stainless Steel	40,788	14’ x 30’ 9”
14	UFP	UFP-VSL-00002B P-0104	Ultrafiltration Feed Vessel	Stainless Steel	40,788	14’ x 30’ 9”
15	UFP	UFP-FILT-00001A P-0123	Ultrafilter	Stainless Steel	112	1’ 5” x 10’
16	UFP	UFP-FILT-00001B P-0123	Ultrafilter	Stainless Steel	112	1’ 5” x 10’
17	UFP	UFP-FILT-00002A P-0123	Ultrafilter	Stainless Steel	112	1’ 5” x 10’
18	UFP	UFP-FILT-00002B P-0123	Ultrafilter	Stainless Steel	112	1’ 5” x 10’
19	UFP	UFP-FILT-00003A P-0123	Ultrafilter	Stainless Steel	112	1’ 5” x 10’
20	UFP	UFP-FILT-00003B P-0123	Ultrafilter	Stainless Steel	112	1’ 5” x 10’
21	UFP	UFP-FILT-00004A P-0123	Ultrafilter	Stainless Steel	92	1’ 5” x 8’
22	UFP	UFP-FILT-00004B P-0123	Ultrafilter	Stainless Steel	92	1’ 5” x 8’

Table C-2 Pretreatment Facility Tanks/Vessels						
No.	**System**	**Vessel Number/Location**	**Description**	**Material of Construction**	**Approximate Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height or Length in feet and inches) (tangent line/tangent line)**
23	UFP	UFP-FILT-00005A P-0123	Ultrafilter	Stainless Steel	92	1’ 5” x 8’
24	UFP	UFP-FILT-00005B P-0123	Ultrafilter	Stainless Steel	92	1’ 5” x 8’
25	HLP	HLP-VSL-00028 P-0102A	HLW Feed Blend Vessel	Stainless Steel	142,200	26’ 6” x 29’
26	HLP	HLP-VSL-00027A P-0102	HLW Lag Storage Vessel	Stainless Steel	127,260	25’ x 29’ 6”
27	HLP	HLP-VSL-00027B P-0102	HLW Lag Storage Vessel	Stainless Steel	127,260	25’ x 29’ 6”
28	HLP	HLP-VSL-00022 P-0102A	HLW Feed Receipt Vessel	Stainless Steel	268,800	38’ x 24’ 2”
29	CXP	CXP-IXC-00001 P-0123	Cesium Ion Exchange Column	Stainless Steel	1024	4’ 5” x 9’
30	CXP	CXP-IXC-00002 P-0123	Cesium Ion Exchange Column	Stainless Steel	1024	4’ 5” x 9’
31	CXP	CXP-IXC-00003 P-0123	Cesium Ion Exchange Column	Stainless Steel	1024	4’ 5” x 9’
32	CXP	CXP-IXC-00004 P-0123	Cesium Ion Exchange Column	Stainless Steel	1024	4’ 5” x 9’
33	CXP	CXP-VSL-00004 P-0111	Cesium Ion Exchange Feed Vessel	Stainless Steel	10,633	10’ 6” x 14’ 3”

Table C-2 Pretreatment Facility Tanks/Vessels						
No.	**System**	**Vessel Number/Location**	**Description**	**Material of Construction**	**Approximate Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height or Length in feet and inches) (tangent line/tangent line)**
34	CXP	CXP-VSL-00026A P-0114	Cesium Ion Exchange Treated LAW Collection Vessel	Stainless Steel	38,000	15’ x 24’ 6”
35	CXP	CXP-VSL-00026B P-0114	Cesium Ion Exchange Treated LAW Collection Vessel	Stainless Steel	38,000	15’ x 24’ 6”
36	CXP	CXP-VSL-00026C P-0114	Cesium Ion Exchange Treated LAW Collection Vessel	Stainless Steel	38,000	15’ x 24’ 6”
37	CNP	CNP-VSL-00003 P-0111	Eluate Contingency Storage Vessel	Stainless Steel	21,713	14’ x 16’
38	CNP	CNP-VSL-00004 P-0112	Cesium Evaporator Recovered Nitric Acid Vessel	Stainless Steel	11,115	9’ 6” x 19’
39	CNP	CNP-VSL-00001 P-0112	Cesium Evaporator Eluant Lute Pot	Stainless Steel	109	4’ x 3’
40	TLP	TLP-VSL-00002 P-0118	Treated LAW Evaporator Condensate Vessel	Stainless Steel	2,227	6’ x 9’ 3”
41	TLP	TLP-VSL-00009A P-0117	LAW SBS Condensate Receipt Vessel	Stainless Steel	130,010	26’ x 27’ 4”
42	TLP	TLP-VSL-00009B P-0117A	LAW SBS Condensate Receipt Vessel	Stainless Steel	130,010	26’ x 27’ 4”
43	TCP	TCP-VSL-00001 P-0117A	Treated LAW Concentrate Storage Vessel	Stainless Steel	146,740	26’ 6” x 30’ 2”
44	RDP	RDP-VSL-00002A P-0112	Spent Resin Slurry Vessel	Stainless Steel	15,230	12’ x 13’ 2”

Table C-2 Pretreatment Facility Tanks/Vessels						
No.	**System**	**Vessel Number/Location**	**Description**	**Material of Construction**	**Approximate Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height or Length in feet and inches) (tangent line/tangent line)**
45	RDP	RDP-VSL-00002B P-0112	Spent Resin Slurry Vessel	Stainless Steel	15,230	12’ x 13’ 2”
46	RDP	RDP-VSL-00002C P-0112	Spent Resin Slurry Vessel	Stainless Steel	15,230	12’ x 13’ 2”
47	RDP	RDP-VSL-00004 P-0119	Spent Resin Dewatering Moisture Separation Vessel	Stainless Steel	101	2’ x 5’
48	RLD	RLD-TK-00006A P-0150	Process Condensate Tank	Stainless Steel	343,734	42’ x 32’
49	RLD	RLD-TK-00006B P-0150	Process Condensate Tank	Stainless Steel	343,734	42’ x 32’
50	RLD	RLD-VSL-00017A P-0118	Alkaline Effluent Vessel	Stainless Steel	34,340	16’ x 17’ 6”
51	RLD	RLD-VSL-00017B P-0118	Alkaline Effluent Vessel	Stainless Steel	34,340	16’ x 17’ 6”
52	PWD	PWD-VSL-00033 P-B003	Ultimate Overflow Vessel	Stainless Steel	41,650	24’ x 7’ 5”
53	PWD	PWD-VSL-00043 P-B003	HLW Effluent Transfer Vessel	Stainless Steel	41,650	24’ x 7’ 5”
54	PWD	PWD-VSL-00015 P-0109	Acidic/Alkaline Effluent Vessel	Stainless Steel	119,150	22’ x 34’ 7”
55	PWD	PWD-VSL-00044 P-0104	Plant Wash Vessel	Stainless Steel	103,024	23’ x 25’ 6”

Table C-2 Pretreatment Facility Tanks/Vessels						
No.	**System**	**Vessel Number/Location**	**Description**	**Material of Construction**	**Approximate Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height or Length in feet and inches) (tangent line/tangent line)**
56	PWD	PWD-VSL-00046 P-B005	C3 Floor Drain Collection Vessel	Stainless Steel	4,982	8’ x 10’ 6”
57	PWD	PWD-VSL-00016 P-0109	Acid/Alkaline Effluent Vessel	Stainless Steel	119,150	22’ x 34’ 7”
58	PVP	PVP-VSL-00001 P-102A	Vessel Vent HEME Drain Collection Vessel	Stainless Steel	1,969	6’ x 7’ 4”
59	PIH	PIH-TK-00001 P-0123A	Decontamination Soak Tank	Stainless Steel	TBD	8’x 4.1’

Table C-3 LAW Vitrification Facility Tank Systems						
No.	**System**	**Vessel Number/Location**	**Description**	**Material**	**Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter) × Height or Length in feet and inches (tangent line/tangent line)**
1	LCP	LCP-VSL-00001 L-0123	LAW Melter 1 Concentrate Receipt Vessel	Stainless Steel	18,130	14’-0” 12’-9”
2	LCP	LCP-VSL-00002 L-0124	LAW Melter 2 Concentrate Receipt Vessel	Stainless Steel	18,130	14’-0” 12’-9”
3	LFP	LFP-VSL-00001 L-0123	Melter 1 Feed Preparation Vessel	Stainless Steel	9,123	11’-0” 10’-6”
4	LFP	LFP-VSL-00002 L-0123	Melter 1 Feed Vessel	Stainless Steel	9,123	11’-0” 10’-6”
5	LFP	LFP-VSL-00003 L-0124	Melter 2 Feed Preparation Vessel	Stainless Steel	9,123	11’-0” 10’-6”
6	LFP	LFP-VSL-00004 L-0124	Melter 2 Feed Vessel	Stainless Steel	9,123	11’-0” 10’-6”
7	LVP	LVP-TK-00001 L-0218	LAW Caustic Collection Tank	Stainless Steel	14,232	13’-0’ (od) 14’-4”
8	LOP	LOP-VSL-00001 L-0123	LAW Melter 1 SBS Condensate Vessel	Hastelloy	9,056	12’-0” 8’-2”
9	LOP	LOP-VSL-00002 L-0124	LAW Melter 2 SBS Condensate Vessel	Hastelloy	9,056	12’-0” 8’-2”
10	RLD	RLD-VSL-00003 L-0126	Plant Wash Vessel	6% Mo/Stainless Steel	25,780	16’-0” 15’-5”
11	RLD	RLD-VSL-00004 L-B001B	LAW C3/C5 Drains/Sump Collection Vessel	Stainless Steel/Inconel 625	7,696	10’-0” 11’-0”

Table C-3 LAW Vitrification Facility Tank Systems						
No.	**System**	**Vessel Number/Location**	**Description**	**Material**	**Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter) × Height or Length in feet and inches (tangent line/tangent line)**
12	RLD	RLD-VSL-00005 L-0126	SBS Condensate Collection Vessel	6% Mo/Stainless Steel	25,780	16’-0” 15’-5”

Table C-4 HLW Vitrification Facility Tank Systems						
No.	**System**	**Vessel Number/Location**	**Description**	**Material**	**Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height in Length in feet) (tangent line/tangent line)**
1	HOP	HOP-VSL-00903 H-B021	Melter 1 SBS Condensate Receiver Vessel 1	Hastelloy	9,891	23’ x 7’ 9”
2	HOP	HOP-VSL-00904 H-B005	Melter 2 SBS Condensate Receiver Vessel 2	Hastelloy	9.891	23’ x 7’ 9”
3	HDH	HDH-VSL-00001 H-B039B	Canister Rinse Vessel	Stainless Steel	3,314	5’ 11” x 17’
4	HDH	HDH-VSL-00003 H-B035	Waste Neutralization Vessel	Stainless Steel	5,315	7’ x 17’
5	HDH	HDH-VSL-00002 H-B035	Canister Decon Vessel 1	Titanium	630	2’ 6” x 16’ 9”
6	HDH	HDH-VSL-00004 H-B035	Canister Decon Vessel 2	Titanium	630	2’ 6” x 16’ 9”
7	RLD	RLD-VSL-00007 H-B014	Acidic Waste Vessel	Stainless Steel	18,145	13’ x 15’ 6”
8	RLD	RLD-VSL-00008 H-B014	Plant Wash and Drains Vessel	Stainless Steel	13,774	13’ x 9’ 9”
9	RLD	RLD-VSL-00002 H-B014	Off-gas Drains Collection Vessel	Stainless Steel	334	3’ 6” x 4’
10	HFP	HFP-VSL-00001 H-0117	HLW Melter 1 Feed Preparation Vessel	Stainless Steel	8,311	11’ x 9’ 6”
11	HFP	HFP-VSL-00002 H-0117	HLW Melter 1 Feed Vessel	Stainless Steel	8,311	11’ x 9’ 6”

Table C-4 HLW Vitrification Facility Tank Systems						
No.	**System**	**Vessel Number/Location**	**Description**	**Material**	**Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height in Length in feet) (tangent line/tangent line)**
12	HFP	HFP-VSL-00005 H-0106	HLW Melter 2 Feed Preparation Vessel	Stainless Steel	8,311	11’ x 9’ 6”
13	HFP	HFP-VSL-00006 H-0106	HLW Melter 2 Feed Vessel	Stainless Steel	8,311	11’ x 9’ 6”
14	HSH	HSH-TK-00001 H-0310A	Decontamination Tank Melter Cave 1	Stainless Steel	4,000	6’ x 22’ 10”
15	HSH	HSH-TK-00002 H-0304A	Decontamination Tank Melter Cave 2	Stainless Steel	4,000	6’ x 22’ 10”

Table C-5 Analytical Laboratory Tank Systems						
No.	**System**	**Vessel Number/Location**	**Description**	**Material**	**Approximate Total Volume (US Gallons)**	**Approximate Dimensions (Inside Diameter × Height or Length in feet) (tangent line/tangent line)**
1	RLD	RLD-VSL-00164 A-B003	Laboratory Area Sink Drain Collection Vessel	6% Mo	3,180	8’ 6” x 5’ 9”
2	RLD	RLD-VSL-00165 A-B004	Hot Cell Drain Collection Vessel	6% Mo	9,100	16’ 0” x 2’ 3”

1

Table C-6 Secondary Containment Rooms/Areas				
Room/Area	**Approximate Room/Area Dimensions (L×W, in feet)**	**Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)**	**Volume of Largest Plant Item in Room/Area (US Gallons)**	**Minimum Secondary Containment Height (feet)**
Pretreatment Facility				
1. P-B005 C2/C3 Drain Tank Room	Minimum secondary containment for these cells/caves has been deleted and superceded by *Flooding Volume for Below Grade and 0 Ft Level in PT Facility*, 24590-PTF-PER-M-02-005 (DWP Operating Unit Group 10, Appendix 8.8)			
2. P-B001 Inter-Facility Transfer Line Tunnel				
3. P-B001A Inter-Facility Transfer Line Tunnel				
4. P-B002 HLW Drain Vessel Pit				
5. P-B003 Overflow Vessel Pit				
6. P-B004 Future LAW Transfer Line Tunnel				
7. P-0102 HLW Receipt/Storage/Blending Cell				
8. P-0102A HLW Receipt/Storage/Blending Cell				
9. P-0104 Ultrafiltration Cell				
10. P-0106 Feed Evaporator/Ultrafiltration Cell				
11. P-0108 Feed Receipt Cell				
12. P-0108A Feed Receipt Cell				
13. P-0108B Feed Receipt Cell				
14. P-0108C Feed Receipt Cell				
15. P-0109 Acidic/Alkaline Effluent Collection Cell				

Table C-6 Secondary Containment Rooms/Areas				
Room/Area	**Approximate Room/Area Dimensions (L×W, in feet)**	**Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)**	**Volume of Largest Plant Item in Room/Area (US Gallons)**	**Minimum Secondary Containment Height (feet)**
16. P-0111 Cesium Ion Exchange Cell				
17. P-0112 Cesium Eluant Collection Cell				
18. P-0113 Reserved Space				
19. P-0114 Treated LAW Collection Cell				
20. P-0117 Treated LAW Feed Cell				
21. P-0117A Treated LAW Feed Cell				
22. P-0118 Alkaline Effluent Collection Cell				
23. P-0123 Hot Cell				
24. P-0105, P-0105A, P-0105B, P-0105C Process Bulge Areas				
25. P-0119 Spent Resin Dewatering Equipment Room	See *Flooding Volume for Room P-0119 in PT Facility*, 24590-PTF-PER-M-04-005 (DWP Operating Unit Group, Appendix 8.8)			
26. P-0123A Remote Decon Maintenance Cell	See *Flooding Volume for Room P-0123A in PT Facility*, 24590-PTF-PER-M-04-007 (DWP Operating Unit Group, Appendix 8.8)			
27. P-0150 Radioactive Liquid Waste Disposal Area	See *Flooding Volume for Room P-0150 in PT Facility*, 24590-PTF-PER-M-04-008 (DWP Operating Unit Group, Appendix 8.8)			
27. P-0304 Waste Feed Evaporator Condenser Room	See *Flooding Volume for 56 Ft Level in PT Facility*, 24590-PTF-PER-M-04-001 (DWP Operating Unit Group, Appendix 8.8)			

Table C-6 Secondary Containment Rooms/Areas				
Room/Area	**Approximate Room/Area Dimensions (L×W, in feet)**	**Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)**	**Volume of Largest Plant Item in Room/Area (US Gallons)**	**Minimum Secondary Containment Height (feet)**
28. P-0320 CNP Evaporator Rectifier Process Area				
29. P-0325 Treated LAW Evaporator Condensor Room				
30. P-0430 CNP Evaporator Condenser Room	See *Flooding Volume for 77 Ft Level for PT Facility*, 24590-PTF-PER-M-04-005 (DWP Operating Unit Group, Appendix 8.8)			
31. ASX Sampler Cabinets • ASX-SMPLR-00015 (P-0311C) • ASX-SMPLR-00017 (P-0311B) • ASX-SMPLR-00019 (P-0302) • ASX-SMPLR-00020 (P-0301) • ASX-SMPLR-00025 (P-0307)	Secondary containment liners for Isolok flush tubing, no minimum liner height required. The PTF ASX sampler upper secondary containment area liner dimensions are approximately 33” X 34”. The lower containment area liner dimensions are approximately 39” X 68”			
32. Bulges • CRP-BULGE-00001 (P-0317) • CXP-BULGE-00004 (P-0317) • DIW-BULGE-00001 (P-0320) • DIW-BULGE-00002 (P-0430) • PVP-BULGE-00001 (P-0105) • PVP-BULGE-00002 (P-0101A) • PVP-BULGE-00014 (P-0302) • PVP-BULGE-00019 (P-0430) • PVP-BULGE-00020 (P-0303C) • PVP-BULGE-00021 (P-0303B)	Secondary containment for ancillary equipment, no minimum liner height required			

Table C-6 Secondary Containment Rooms/Areas				
Room/Area	**Approximate Room/Area Dimensions (L×W, in feet)**	**Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)**	**Volume of Largest Plant Item in Room/Area (US Gallons)**	**Minimum Secondary Containment Height (feet)**
• TCP-BULGE-00004 (P-0116) • UFP-BULGE-00001 (P-0301) • UFP-BULGE-00002 (P-0301) • UFP-BULGE-00005 (P-0311) • UFP-BULGE-00006 (P-0311A)				
Analytical Laboratory				
1. A-B003 Lab Area Sink Drain Collection Vessel Cell	Minimum secondary containment for these cells has been deleted and superceded by *Flooding Volume for Lab Facility*, 24590-LAB-PER-M-02-001 (DWP, Operating Unit Group, Appendix 11.8).			
2. A-B004 Hot Cell Drain Collection,Vessel Cell				
3. A-B002 C3 Pump Pit	Secondary containment for ancillary equipment, no minimum liner height required			
4. A-B005 C5 Pump Pit	Secondary containment for ancillary equipment, no minimum liner height required			
5. A-B006 C5 Piping Pit	Secondary containment for ancillary equipment, no minimum liner height required			
6. A-B007 C5 Pump Pit	Secondary containment for ancillary equipment, no minimum liner height required			
LAW Vitrification Facility				
1. L-0123, Melter 1 Process Cell	Minimum secondary containment for these cells has been deleted and superceded by *Flooding Volume for LAW Facility*, 24590-LAW-PER-M-02-002 (DWP, Operating Unit Group, Appendix 9.8).			
2. L-0124, Melter 2 Process Cell				
3. L-0126, Effluent Cell				
4. L-B001B, C3/C5 Drains/Sump Collection Vessel Room				

Table C-6 Secondary Containment Rooms/Areas				
Room/Area	**Approximate Room/Area Dimensions (L×W, in feet)**	**Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)**	**Volume of Largest Plant Item in Room/Area (US Gallons)**	**Minimum Secondary Containment Height (feet)**
5. L-0218, Caustic Scrub Blowdown Collection Berm				
6. L-0304 F, Caustic Scrubber Curb Area				
7. ASX Sampler Cabinets • ASX-SMPLR-00012 (L-0301) • ASX-SMPLR-00013 (L-0301)	Secondary containment liners for Isolok flush tubing, no minimum liner height required. The LAW ASX sampler upper secondary containment area liner dimensions are approximately 33” X 34”. The lower containment area liner dimensions are approximately 39” X 68”			
8. Bulges • LCP-BULGE-00001 (L-0202) • LCP-BULGE-00002 (L-0202) • LCP-BULGE-00003 (L-0202) • LFP-BULGE-00001 (L-0202) • LFP-BULGE-00002 (L-0202) • LOP-BULGE-00001 (L-0202) • LOP-BULGE-00002 (L-0202) • RLD-BULGE-00001 (L-B001A) • RLD-BULGE-00004 (L-0202)	Secondary containment for ancillary equipment, no minimum liner height required			
HLW Vitrification Facility				
1. H-B014 Wet Process Cell	Minimum secondary containment for these cells/caves has been deleted and superseded by *Flooding Volume for HLW Facility*, 24590-HLW-PER-M-02-003 (DWP, Operating Unit Group, Appendix 10.8).			
2. H-B021 SBS Drains Collection Cell 1				
3. H-B035 Canister Decon Cave				
4. H-B039A, Canister Rinse Bogie Maintenance Room				
5. H-B039B, Canister Rinse Tunnel				

Table C-6 Secondary Containment Rooms/Areas				
Room/Area	**Approximate Room/Area Dimensions (L×W, in feet)**	**Miscellaneous Treatment Units or Tanks in Room/Area (Largest Plant Item)**	**Volume of Largest Plant Item in Room/Area (US Gallons)**	**Minimum Secondary Containment Height (feet)**
6. H-0304A, Melter 2 Equipment Decon Pit				
7. H-0117, Melter Cave 1				
8. H-0310A, Melter 1 Equipment Decon Pit				
9. H-0106, Melter Cave 2				
10. H-0302, Melter 2 - Active Services Cell				
11. H-0308, Melter 1 - Active Services Cell				
12. H-B005, SBS Drains Collection Cell 2				
13. H-0115 Shielded Pipeway				
14. H-0121 Shielded Pipeway				
15. H-0136 Canister Handling Cave				
16. H-0137 Shielded Pipeway	Secondary containment for ancillary equipment, no minimum liner height required			
17. H-B032 Pour Tunnel 1				
18. HCH14 Melter Cave No 1 Vertical Pipe Chase				
19. HCH15 Melter Cave No 2 Vertical Pipe Chase				
20. ASX Sampler Cabinets • ASX-SMPLR-00028 (H-0305A) • ASX-SMPLR-00029 (H-0315) • ASX-SMPLR-00042 (H-0318)	Secondary containment liners for Isolok flush tubing, no minimum liner height required. The HLW ASX sampler upper secondary containment area liner dimensions are approximately 33” X 34”. The lower containment area liner dimensions are approximately 39” X 68”			

Table C-7 Containment Buildings Summary	
Location	**Approximate Room Dimensions (L × W × H in feet)**
Pretreatment Facility	
1. P-0123 Hot Cell	350 × 51 × 52
2. Pretreatment Maintenance Containment Building:	
PM0124 Hot Cell Crane Maintenance Mezzanine	27 × 51 × 33
P-0121A Spent Resin Dewatering	28 × 18 × 28
P-0122A Waste Packaging Area	26 × 51 × 28
P-0123A Remote Decontamination Maintenance Cell	55 × 51 × 52
P-0124 C3 Workshop	34 × 24 × 15
P-0124A C3 Workshop	(73 × 15 × 15) + (16 × 15 × 15)
P-0125 Cask Lidding Airlock & Equipment Chase	24 × 20 × 28
P-0125A Cask Lidding Room	28 × 18 × 25
P-0128A MSM Repair Area	24 × 18 × 28
P-0128 MSM Testing Room	24 × 17 × 27
3. P-0223 Spent Filter Drum Handling Area	54 × 18 × 26
4. P-0335 Filter Cave	198 × 51 × 52
5. P-0431A PJV Secondary HEPA Filter Room Containment Building	93 × 35 × 20
LAW Vitrification Facility	
1. L-0112 LAW LSM Gallery Containment Building	150 x 62 x 24
2. ILAW Container Finishing Containment Building:	
L-0109B Swabbing Area Line 2	21 × 15 × 24
L-0109C Decontamination Area Line 2	18 × 15 × 24

Table C-7 Containment Buildings Summary	
Location	**Approximate Room Dimensions (L × W × H in feet)**
L-0109D Inert Fill Area Line 2	55 × 15 × 24
L-0115B Swabbing Area Line 1	21 × 15 × 24
L-0115C Decontamination Area Line 1	18 × 15 × 24
L-0115D Inert Fill Area Line 1	55 × 15 × 24
L-0109E Container Monitoring/Export Area	19 × 18 × 14
L-0115E Container Monitoring/Export Area	19 × 18 × 14
3. L-0119B LAW Consumable Import/Export Containment Building	30 x 28 x 17
4. L-0226A LAW C3 Workshop Containment Building	34 x 22 x 19
5. LAW Pour Cave Containment Building:	
L-B015A Melter 1 Pour Cave	16.5 × 20 x 23
L-B013C Melter 1 Pour Cave	16.5 × 20 x 23
L-B013B Melter 2 Pour Cave	16.5 × 20 x 23
L-B011C Melter 2 Pour Cave	16.5 × 20 x 23
L-B011B Future Melter 3 Pour Cave	16.5 × 20 x 23
L-B009B Future Melter 3 Pour Cave	16.5 × 20 x 23
6. ILAW Container Buffer Storage Containment Building:	
L-B025C Container Buffer Store	22 x 22 x 23
L-B025D Container Rework	22 x 14 x 23
HLW Vitrification Facility	
1. HLW Melter Cave 1 Containment Building:	
H-0117 Melter Cave 1	75 x 32 x 54

Table C-7 Containment Buildings Summary	
Location	**Approximate Room Dimensions (L × W × H in feet)**
H-0116B Melter Cave 1 C3/C5 Airlock	24 x 25 x 54
H-0310A Melter Cave 1 Equipment Decon Pit	20 x 9 x 69
2. HLW Melter Cave 2 Containment Building:	
H-0106 Melter Cave No 2	75 x 32 x 54
H-0105B Melter Cave 2 C3/C5 Airlock	24 x 25 x 54
H-0304A Melter Cave 2 Equipment Decon Pit	20 x 9 x 69
3. H-0136 IHLW Canister Handling Cave Containment Building	18 x 140 x 54
4. H-0133 IHLW Canister Swab and Monitoring Cave Containment Building	41 x 11 x 54
5. HLW C3 Workshop Containment Building:	
H-0311A C3 Workshop	19 x 30 x 22
H-0311B C3 MSM Maintenance Workshop	58 x 69 x 22
6. H-0104 HLW Filter Cave Containment Building	105 x 36 x 36
7. H-B032 HLW Pour Tunnel 1 Containment Building	85 x 11 x 30
8. H-B005A HLW Pour Tunnel 2 Containment Building	85 x 11 x 30
9. HLW Waste Handling Area Containment Building:	
H-0410B E&I Room	17 x 20 x 10
H-0411 Waste Handling Room	25 x 54 x 10
10. HLW Drum Swabbing and Monitoring Area Containment Building:	
H-0126ACrane Maintenance Room	15 x 20 x 31
H-0126B Swabbing and Monitoring Room	30 x 18 x 31
H-B028 Cask Import/Export Room	15 x 45 x 43

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
Pretreatment Facility					
1	CNP	CNP-EVAP-00001 P-0112	Cesium Evaporator Separator Vessel	Hastelloy	RESERVED
2	CNP	CNP-HX-00001 P-0123	Cesium Evaporator Concentrate Reboiler	Stainless Steel	NA
3	CNP	CNP-DISTC-00001 P-0320	Cesium Evaporator Nitric Acid Rectifier Column	Stainless Steel	877
4	CNP	CNP-HX-00002 P-0430	Cesium Evaporator Primary Condenser	Stainless Steel	NA
5	CNP	CNP-HX-00003 P-0430	Cesium Evaporator Inter-Condenser	Stainless Steel	NA
6	CNP	CNP-HX-00004 P-0430	Cesium Evaporator After-Condenser	Stainless Steel	NA
7	FEP	FEP-SEP-00001A P-0106	Waste Feed Evaporator Separator Vessel	Stainless Steel	14,512
8	FEP	FEP-SEP-00001B P-0106	Waste Feed Evaporator Separator Vessel	Stainless Steel	14,512
9	FEP	FEP-RBLR-00001A P-0123	Waste Feed Evaporator Reboiler	Stainless Steel	NA
10	FEP	FEP-RBLR-00001B P-0123	Waste Feed Evaporator Reboiler	Stainless Steel	NA
11	FEP	FEP-COND-00001A P-0304	Waste Feed Evaporator Primary Condenser	Stainless Steel	NA
12	FEP	FEP-COND-00001B P-0304	Waste Feed Evaporator Primary Condenser	Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
13	FEP	FEP-COND-00002A P-0304	Waste Feed Evaporator Intercondenser	Stainless Steel	NA
14	FEP	FEP-COND-00002B P-0304	Waste Feed Evaporator Intercondenser	Stainless Steel	NA
15	FEP	FEP-COND-00003A P-0304	Waste Feed Evaporator Aftercondenser	Stainless Steel	NA
16	FEP	FEP-COND-00003B P-0304	Waste Feed Evaporator Aftercondenser	Stainless Steel	NA
17	PIH	PIH-TTBL-00001 PIH-TTBL-00002 PIH-BENCH-00003	Spray Decontamination and Sizing System	Stainless Steel	NA
18	PIH	NA	Hot Cell Floor	Stainless Steel	NA
19	PJV	PJV-HEPA-00001A P-0335	PJV Primary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
20	PJV	PJV-HEPA-00001B P-0335	PJV Primary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
21	PJV	PJV-HEPA-00001C P-0335	PJV Primary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
22	PJV	PJV-HEPA-00001D P-0335	PJV Primary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
23	PJV	PJV-HEPA-00001E P-0335	PJV Primary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
24	PJV	PJV-HEPA-00001F P-0335	PJV Primary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
25	PJV	PJV-HEPA-00001G P-0335	PJV Primary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
26	PJV	PJV-HEPA-00002A P-0431A	PJV Second Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
27	PJV	PJV-HEPA-00002B P-0431A	PJV Secondary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
28	PJV	PJV-HEPA-00002C P-0431A	PJV Secondary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
29	PJV	PJV-HEPA-00002D P-0431A	PJV Secondary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
30	PJV	PJV-HEPA-00002E P-0431A	PJV Secondary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
31	PJV	PJV-HEPA-00002F P-0431A	PJV Secondary Exhaust HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
32	PJV	PJV-FAN-00001A P-0433	PJV Exhaust Fan	Stainless Steel	NA
33	PJV	PJV-FAN-00001B P-0433	PJV Exhaust Fan	Stainless Steel	NA
34	PJV	PJV-FAN-00001C P-0433	PJV Exhaust Fan	Stainless Steel	NA
35	PJV	PJV-DMST-00002A P-0335	PJV Demister	Mesh Pad/ Stainless Steel	NA
36	PJV	PJV-DMST-00002B P-0335	PJV Demister	Mesh Pad/ Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
37	PJV	PJV-DMST-00002C P-0335	PJV Demister	Mesh Pad/ Stainless Steel	NA
38	PVP	PVP-ADBR-00001A P-0328	Vessel Vent Carbon Bed Adsorber	TEDA/Stainless Steel	NA
39	PVP	PVP-ADBR-00001B P-0328	Vessel Vent Carbon Bed Adsorber	TEDA/Stainless Steel	NA
40	PVP	PVP-CLR-00001 P-0318	Vessel Vent Aftercooler	Stainless Steel	NA
41	PVP	PVP-OXID-00001 P-0326	Vessel Vent VOC Oxidizer Unit	Stainless Steel	NA
42	PVP	PVP-FILT-00001 P-0318	Vessel Vent Adsorber Outlet Filter	Synthetic Fibrous Materials/Stainless Steel	NA
43	PVP	PVP-HEME-00001A P-0335	Vessel Vent HEME (Mist Eliminator)	Packed Fiber Bed/Stainless Steel	NA
44	PVP	PVP-HEME-00001B P-0335	Vessel Vent HEME (Mist Eliminator)	Packed Fiber Bed/Stainless Steel	NA
45	PVP	PVP-HEME-00001C P-0335	Vessel Vent HEME (Mist Eliminator)	Packed Fiber Bed/Stainless Steel	NA
46	PVP	PVP-HX-00002 P-0302	Vessel Vent Scrubbing Liquid Cooler	Stainless Steel	NA
47	PVP	PVP-SCB-00002 P-0104	Vessel Vent Caustic Scrubber	Metal Intalox Packing/ Stainless Steel	3,237
48	PVV	PVV-HEPA-00001A P-0335	Vessel Vent Primary HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
49	PVV	PVV-HEPA-00001B P-0335	Vessel Vent Primary HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
50	PVV	PVV-HEPA-00002A P-0324	Vessel Vent Secondary HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
51	PVV	PVV-HEPA-00002B P-0324	Vessel Vent Secondary HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
52	PVV	PVV-FAN-00001A P-0418	Vessel Vent Exhaust Fan	Stainless Steel	NA
53	PVV	PVV-FAN-00001B P-0418	Vessel Vent Exhaust Fan	Stainless Steel	NA
54	TLP	TLP-SEP-00001 P-0117	Treated LAW Evaporator Separator Vessel	Stainless Steel	13,359
55	TLP	TLP-RBLR-00001 P-0123	Treated LAW Evaporator Reboiler	Stainless Steel	NA
56	TLP	TLP-COND-00001 P-0325	Treated LAW Primary Condenser	Stainless Steel	NA
57	TLP	TLP-COND-00002 P-0325	Treated LAW Intercondenser	Stainless Steel	NA
58	TLP	TLP-COND-00003 P-0325	Treated LAW Aftercondenser	Stainless Steel	NA
LAW Vitrification Facility					
1	LOP	LOP-FCLR-00001 L-0112	Melter 1 Primary Film Cooler	Stainless Steel	NA
2	LOP	LOP-FCLR-00002 L-0112	Melter 1 Standby Film Cooler	Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
3	LOP	LOP-FCLR-00003 L-0112	Melter 2 Primary Film Cooler	Stainless Steel	NA
4	LOP	LOP-FCLR-00004 L-0112	Melter 2 Standby Film Cooler	Stainless Steel	NA
5	LOP	LOP-SCB-00001 L-0123	Melter 1 Submerged Bed Scrubber	Ceramic Packing/Hastelloy	4,948
6	LOP	LOP-SCB-00002 L-0124	Melter 2 Submerged Bed Scrubber	Ceramic Packing/Hastelloy	4,948
7	LOP	LOP-WESP-00001 L-0123	Melter 1 Wet Electrostatic Precipitator	6% Molybdenum/Stainless Steel	N/A
8	LOP	LOP-WESP-00002 L-0124	Melter 2 Wet Electrostatic Precipitator	6% Molybdenum/Stainless Steel	N/A
9	LMP	LMP-MLTR-00001 L-0112	LAW Melter 1	Stainless Steel/Alloys	1,860
10	LMP	LMP-MLTR-00002 L-0112	LAW Melter 2	Stainless Steel/Alloys	1,860
11	LVP	LVP-SCB-00001 L-0304F	Melter Offgas Caustic Scrubber	Hastelloy/Metal Intalox Packing/Stainless Steel	TBD
12	LVP	LVP-HEPA-00001A L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
13	LVP	LVP-HEPA-00001B L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
14	LVP	LVP-HEPA-00002A L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
15	LVP	LVP-HEPA-00002B	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
		L-0304H			
16	LVP	LVP-HEPA-00003A L-0304H	Melter Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
17	LVP	LVP-SCO-00001 (located on LVP SKID-00002) L-0304F	Thermal Catalytic Oxidizer	Stainless Steel	NA
18	LVP	LVP-SCR-00001 (located on LVP SKID-00002) L-0304F	NOx Selective Catalytic Reduction Unit	Stainless Steel	NA
19	LVP	LVP-HTR-00001A L-0304H	Melter Offgas HEPA Preheater	Stainless Steel/Incoloy 800	NA
20	LVP	LVP-HTR-00001B L-0304H	Melter Offgas HEPA Preheater	Stainless Steel/Incoloy 800	NA
21	LVP	LVP-HTR-00002 (located on LVP SKID-00002) L-0304F	Catalytic Oxidizer Electric Heater	Stainless Steel	NA
22	LVP	LVP-HX-00001 (located on LVP SKID-00002) L-0304F	Catalytic Oxidizer Heat Recovery Unit	Stainless Steel	NA
23	LVP	LVP-ADBR-00001A (located on LVP-SKID-00001) L-0304F	Offgas Mercury Adsorber	Stainless Steel	NA
24	LVP	LVP-ADBR-00001B (located on LVP-SKID-00001) L-0304F	Offgas Mercury Adsorber	Stainless Steel	NA
25	LVP	LVP-EXHR-00001A L-0304C	Melter Offgas Exhausters	Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
26	LVP	LVP-EXHR-00001B L-0304D	Melter Offgas Exhausters	Stainless Steel	NA
27	LVP	LVP-EXHR-00001C L-0304E	Melter Offgas Exhausters	Stainless Steel	NA
HLW Vitrification Facility					
1	HMP	HMP-MLTR-00001 H-0117	HLW Melter 1	Stainless Steel/Alloys	1,078
2	HMP	HMP-MLTR-00002 H-0106	HLW Melter 2	Stainless Steel/Alloys	1,078
3	HOP	HOP-WESP-00001 H-0308	Melter 1 Wet Electrostatic Precipitator (WESP)	6% Molybdenum/ Stainless Steel	NA
4	HOP	HOP-WESP-00002 H-0302	Melter 2 Wet Electrostatic Precipitator (WESP)	6% Molybdenum/Stainless Steel	NA
5	HOP	HOP-SCO-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	Thermal Catalytic Oxidizer	Stainless Steel	NA
6	HOP	HOP-SCO-00004 (located on Catalyst Skid HOP-SKID-00007) H-A123	Thermal Catalytic Oxidizer	Stainless Steel	NA
7	HOP	HOP-SCR-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	NOx Selective Catalytic Reducer	Stainless Steel	NA
8	HOP	HOP-SCR-00002	NOx Selective Catalytic Reducer	Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
		(located on Catalyst Skid HOP-SKID-00007) H-A123			
9	HOP	HOP-ABS-00002 H-B001B	Silver Mordenite Column	Calcium Silicate/ Stainless Steel	NA
10	HOP	HOP-ABS-00003 H-B001B	Silver Mordenite Column	Calcium Silicate/ Stainless Steel	NA
11	HOP	HOP-FCLR-00001 H-0117	Melter 1 Offgas Film Cooler	Stainless Steel	NA
12	HOP	HOP-FCLR-00002 H-0106	Melter 2 Offgas Film Cooler	Stainless Steel	NA
13	HOP	HOP-FCLR-00003 H-0117	Melter 1 Standby Offgas Insert	Stainless Steel	NA
14	HOP	HOP-FCLR-00004 H-0106	Melter 2 Standby Offgas Insert	Stainless Steel	NA
15	HOP	HOP-HEPA-00001A H-0104	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
16	HOP	HOP-HEPA-00001B H-0104	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
17	HOP	HOP-HEPA-00002A H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
18	HOP	HOP-HEPA-00002B H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
19	HOP	HOP-HEPA-00007A H-0104	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
20	HOP	HOP-HEPA-00007B	Primary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
		H-0104			
21	HOP	HOP-HEPA-00008A H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
22	HOP	HOP-HEPA-00008B H-0104	Secondary Offgas HEPA Filter	Synthetic Fibrous Materials/Stainless Steel	NA
23	HOP	HOP-HTR-00001B H-0104	HEPA Preheater	Stainless Steel	NA
24	HOP	HOP-HTR-00002A H-0104	HEPA Preheater	Stainless Steel	NA
25	HOP	HOP-HTR-00005A H-0104	HEPA Preheater	Stainless Steel	NA
26	HOP	HOP-HTR-00005B H-0104	HEPA Preheater	Stainless Steel	NA
27	HOP	HOP-HX-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	Catalyst Skid Preheater	Stainless Steel	NA
28	HOP	HOP-HX-00002 H-0104	Silver Mordenite Preheater	Stainless Steel	NA
29	HOP	HOP-HX-00003 (located on Catalyst Skid HOP-SKID-00007) H-A123	Catalyst Skid Preheater	Stainless Steel	NA
30	HOP	HOP-HX-00004 H-0104	Silver Mordenite Preheater	Stainless Steel	NA
31	HOP	HOP-FAN-00001A	Booster Extraction Fan	Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
		H-B001C			
32	HOP	HOP-FAN-00001B H-B001C	Booster Extraction Fan	Stainless Steel	NA
33	HOP	HOP-FAN-00001C H-B001C	Booster Extraction Fan	Stainless Steel	NA
34	HOP	HOP-FAN-00008A H-0429	Stack Extraction Fan	Stainless Steel	NA
35	HOP	HOP-FAN-00008B H-0429	Stack Extraction Fan	Stainless Steel	NA
36	HOP	HOP-FAN-00008C H-0329	Stack Extraction Fan	Stainless Steel	NA
37	HOP	HOP-FAN-00009A H-B001C	Booster Extraction Fan	Stainless Steel	NA
38	HOP	HOP-FAN-00009B H-B001C	Booster Extraction Fan	Stainless Steel	NA
39	HOP	HOP-FAN-00009C H-B001C	Booster Extraction Fan	Stainless Steel	NA
40	HOP	HOP-FAN-000010A H-0429	Stack Extraction Fan	Stainless Steel	NA
41	HOP	HOP-FAN-000010B H-0429	Stack Extraction Fan	Stainless Steel	NA
42	HOP	HOP-FAN-000010C H-0429	Stack Extraction Fan	Stainless Steel	NA
43	HOP	HOP-ADBR-00001A (located on Activated Carbon Adsorber Skid	Activated Carbon Adsorber	Stainless Steel	NA

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
		HOP-ADBR-00001) H-A123			
44	HOP	HOP-ADBR-00001B (located on Activated Carbon Adsorber Skid HOP-ADBR-00001) H-A123	Activated Carbon Adsorber	Stainless Steel	NA
45	HOP	HOP-ADBR-00002A (located on Activated Carbon Adsorber Skid HOP-ADBR-00002) H-A123	Activated Carbon Adsorber	Stainless Steel	NA
46	HOP	HOP-ADBR-00002B (located on Activated Carbon Adsorber Skid HOP-ADBR-00002) H-A123	Activated Carbon Adsorber	Stainless Steel	NA
47	HOP	HOP-HEME-00001A H-0117	Melter 1 High Efficiency Mist Eliminator (HEME)	Packed Fiber Bed/Stainless Steel	NA
48	HOP	HOP-HEME-00001B H-0117	Melter 1 High Efficiency Mist Eliminator (HEME)	Packed Fiber Bed/Stainless Steel	NA
49	HOP	HOP-HEME-00002A H-0106	Melter 2 High Efficiency Mist Eliminator (HEME)	Packed Fiber Bed/Stainless Steel	NA
50	HOP	HOP-HEME-00002B H-0106	Melter 2 High Efficiency Mist Eliminator (HEME)	Packed Fiber Bed/Stainless Steel	NA
51	HOP	HOP-SCB-00001 H-0117	Melter 1 Submerged Bed Scrubber (SBS)	Ceramic Packing/Hastelloy	4,516

Table C-8 WTP Facility Miscellaneous Units (Systems and Sub-Systems)					
No.	**System/ Subsystem**	**Component Number/Location**	**Description**	**Material**	**Total Volume (US gallons)**
52	HOP	HOP-SCB-00002 H-0106	Melter 2 Submerged Bed Scrubber (SBS)	Ceramic Packing/Hastelloy	4,516
53	HOP	HOP-HTR-00001 (located on Catalyst Skid HOP-SKID-00005) H-A123	Catalyst Skid Electric Heater	Stainless Steel	NA
54	HOP	HOP-HTR-00007 (located on Catalyst Skid HOP-SKID-00007) H-A123	Catalyst Skid Electric Heater	Stainless Steel	NA
55	PJV	PJV-HEPA-00004A H-0104	PJV System HEPA Filter (Primary)	Synthetic Fibrous Materials/Stainless Steel	NA
56	PJV	PJV-HEPA-00004B H-0104	PJV System HEPA Filter (Standby Primary)	Synthetic Fibrous Materials/Stainless Steel	NA
57	PJV	PJV-HEPA-00005A H-0104	PJV System HEPA Filter (Primary)	Synthetic Fibrous Materials/Stainless Steel	NA
58	PJV	PJV-HEPA-00005B H-0104	PJV System HEPA Filter (Standby Primary)	Synthetic Fibrous Materials/Stainless Steel	NA
59	PJV	PJV-HTR-00002 H-0104	Pulse Ventilation HEPA Electric Preheater	Stainless Steel	NA
60	PJV	PJV-FAN-00002A H-0424	Pulse Vent Extraction Fan	Stainless Steel	NA
61	PJV	PJV-FAN-00002B H-0424	Pulse Vent Extraction Fan	Stainless Steel	NA

1

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
Pretreatment Facility				
Sumps				
PWD-SUMP-00071 P-B005 (C2/C3 Floor Drain Collection Vessel Room, El. -19')	60	Radar	30"Dia x 18"Deep Epoxy Coating	**24590-PTF** -M6-PWD-00041
PWD-SUMP-00040 P-B002 (Pit-45, El. -45')	210	Bubbler	60"x 30"x 30" Stainless Steel	**24590-PTF** -M6-PWD-00012
PWD-SUMP-00001 P-0108B (Feed Receipt Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00008
PWD-SUMP-00001A P-0108C (Feed Receipt Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00010
PWD-SUMP-00002 P-0108A (Feed Receipt Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00008
PWD-SUMP-00002A P-0108 (Feed Receipt Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00010
PWD-SUMP-00003 P-0106 (Feed Evaporator/Ultra Filtration Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00008
PWD-SUMP-00004 P-0104 (Ultra Filtration Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00008
PWD-SUMP-00005 P-0102A (HLW Receipt/Blending Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00008

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
PWD-SUMP-00006 P-0102 (HLW Storage Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00008
PWD-SUMP-00007 P-0109 (Acidic/Alkaline Effluent Collection Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00009
PWD-SUMP-00008 P-0111 (Cs Ion Exchange Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00009
PWD-SUMP-00009 P-0112 (Resin Disposal/CNP Evaporated Process Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00009
PWD-SUMP-00010 P-0113 (Reserved Space, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00009
PWD-SUMP-00011 P-0114 (Treated LAW Collection Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00009
PWD-SUMP-00012 P-0117 (Treated LAW Evaporator Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00009
PWD-SUMP-00013 P-0117A (Treated LAW Concentrated Storage Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00010
PWD-SUMP-00026 P-0123 (Hot Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00014
PWD-SUMP-00028	75	Radar	30" Dia. x 27" Deep	**24590-PTF**

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
P-0123 (Hot Cell, El. 0')			Stainless Steel	-M6-PWD-00014
PWD-SUMP-00029 P-0123 (Hot Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00014
PWD-SUMP-00031 P-0119 (Spent Resin Dewatering Equipment Room, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00010
PWD-SUMP-00032 P-0123A (Remote Decon Maint Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00010
PWD-SUMP-00033 P-0123A (Remote Decon Maint Cell, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00010
PWD-SUMP-00034 P-0121A (Spent Resin Dewatering, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00012
PWD-SUMP-00035 P-0122A (Waste Packaging Area, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00012
PWD-SUMP-00036 P-0118 (Alkaline Effluent Collection, El. 0')	75	Radar	30" Dia. x 27" Deep Stainless Steel	**24590-PTF** -M6-PWD-00012
PWD-SUMP-00037 P-0124A (Decon Booth Sump, El. 0")	7.5	Radar	72" x 12" x 2" Deep Stainless Steel	**24590-PTF** -M6-PWD-00012
RLD-SUMP-00003 P-0150 (Radioactive Liquid Waste Disposal Area, El. 0', outdoor)	583	Radar	78" x 48" x 36" Deep Epoxy coating	**24590-PTF** -M6-RLD-00002003

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
Leak Detection Boxes				
PWD-LDB-00001 P-B001 (Inter Facility Transfer Line Tunnel, El. -45’)	6	Thermal Dispersion	8” Dia. x 24” Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00002 P-B001 (Inter Facility Transfer Line Tunnel, El. -45’)	6	Thermal Dispersion	8” Dia. x 24” Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00003 P-B001 (Inter Facility Transfer Line Tunnel, El. -45’)	6	Thermal Dispersion	8” Dia. x 24” Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00004 P-B001 (Inter Facility Transfer Line Tunnel, El. -45’)	6	Thermal Dispersion	8” Dia. x 24” Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00005 P-B001 (Inter Facility Transfer Line Tunnel, El. -45’)	6	Thermal Dispersion	8” Dia. x 24” Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00006 P-B001 (Inter Facility Transfer Line Tunnel, El. -45’)	6	Thermal Dispersion	8” Dia. x 24” Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00007 P-B001 (Inter Facility Transfer Line Tunnel, El. -45’)	6	Thermal Dispersion	8” Dia. x 24” Length Stainless Steel	**24590-PTF** -M6-PWD-00050

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
PWD-LDB-00008 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00009 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00010 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00011 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00050
PWD-LDB-00012 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00051
PWD-LDB-00013 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00051
PWD-LDB-00014 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00051

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
PWD-LDB-00015 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length Stainless Steel	**24590-PTF** -M6-PWD-00051
PWD-LDB-00016 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	**24590-PTF** -M6-PWD-00051
PWD-LDB-00017 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	**24590-PTF** -M6-PWD-00051
PWD-LDB-00018 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	**24590-PTF** -M6-PWD-00051
PWD-LDB-00019 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel	**24590-PTF** -M6-PWD-00051
RLD-LDB-00012 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	9	Thermal Dispersion	8" Dia. x 34" Length/ Stainless Steel	**24590-PTF** -M6-PWD-00058
RLD-LDB-00013 P-B001 (Inter Facility Transfer Line Tunnel, El. -45')	9	Thermal Dispersion	8" Dia. x 34" Length/ Stainless Steel	**24590-PTF** -M6-PWD-00058

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
Bulges/Drain Lines				
PVP-ZY-00037-S11B-03, PVP-BULGE-00001Drain Line P-0105 (El. 0')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-PVP-00017002
PVP-ZY-00036-S11B-03, PVP-BULGE-00002 Drain Line P-0101A (El. 0')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-PVP-00018002
TCP-ZF-00032-S11B-03, TCP-BULGE-00004 Drain Line P-0116 (El. 0')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-TCP-00001002
DIW-ZF-01511-S11B-03, DIW-BULGE-00001 Drain Line P-0320 (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-DIW-00004001
DIW-ZF-01511-S11B-03, DIW-BULGE-00002 Drain Line P-0320 (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-DIW-00004001
CRP-ZF-00002-S11B-03, CRP-BULGE-00001 Drain Line P-0317 (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-CXP-00003001
CXP-ZF-00012-S11B-03, CXP-BULGE-00004 Drain Line P-0317 (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-CXP-00003003

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
UFP-ZF-00043-S11B-03, UFP-BULGE-00001 Drain Line P-0301 (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-UFP-00016001
UFP-ZF-00042-S11B-03, UFP-BULGE-00002 Drain Line P-0301 (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-UFP-00017001
UFP-ZY-00002-S11B-03, UFP-BULGE-00005 Drain Line P-0311 (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-UFP-00031001
UFP-ZY-00001-S11B-03, UFP-BULGE-00006 Drain Line P-0311A (El. 56')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-UFP-00032001
Floor Drains/Lines				
PWD-FD-00005/PWD-ZF-03000-S11B-06 Floor Drain/Line P-0123 (Hot Cell, El. 0')	N/A	N/A	6" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00011
PWD-FD-00006/PWD-ZF-03001-S11B-06 Floor Drain/Line P-0123 (Hot Cell, El. 0')	N/A	N/A	6" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00011
PWD-FD-00435 Floor Drain P-0105 (Ultra Filtration Process Area, El. 0')	N/A	NA	3" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044
PWD-FD-00349 Floor Drain P-0105 (Ultra Filtration Process Area, El. 0')	N/A	NA	6" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
PWD-FD-00436 Floor Drain P-0105 (Ultra Filtration Process Area, El. 0')	N/A	NA	3" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044
PWD-FD-00438 Floor Drain P-0105A (Feed Evaporation Ultra Filtration Process Area, El. 0')	N/A	NA	6" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044
PWD-FD-00348 Floor Drain P-0105A (Feed Evaporation Ultra Filtration Process Area, El. 0')	N/A	N/A	6" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044
PWD-FD-00437 Floor Drain P-0105B (Feed Receipt Process Area, El. 0')	N/A	N/A	3" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044
PWD-FD-347 Floor Drain P-0105B (Feed Receipt Process Area, El. 0')	N/A	N/A	6" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044
PWD-FD-346 Floor Drain P-0105C (Feed Receipt Process Area, El. 0')	N/A	N/A	4" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00044
Autosampler Drain Lines				
ASX-ZF-00013-S11B-03 ASX Sampler 00017 Lower Containment Drain Line (P-0311B, El. 56')	N/A	Thermal Dispersion	3" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00007001
ASX-ZF-00015-S11B-03 ASX Sampler 00019 Lower Containment Drain Line (P-0302, El. 56')	N/A	Thermal Dispersion	3" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00007001
ASX-ZF-00016-S11B-03 ASX Sampler 00020 Lower Containment Drain Line	N/A	Thermal Dispersion	3" Dia.	**24590-PTF**

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
(P-0301, El. 56')			Stainless Steel	-M6-PWD-00007001
ASX-ZF-00027-S11B-03 ASX Sampler 00025 Lower Containment Drain Line (P-0307, El. 56')	N/A	Thermal Dispersion	3" Dia. Stainless Steel	**24590-PTF** -M6-PWD-00007001
LAW Vitrification Facility				
Sumps				
RLD-SUMP-00028 L-B001B (C3/C5 Drains/Sump Collection Vessel Cell, El. –21')	59	Radar	24" Dia. x 30" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00002005
RLD-SUMP-00029 L-0123 (Process Cell, El. 3'	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002
RLD-SUMP-00030 L-0123 (Process Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002
RLD-SUMP-00031 L-0124 Process Cell Sump, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002
RLD-SUMP-00032 L-0124 (Process Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003002

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
RLD-SUMP-00035 L-0126 (Effluent Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003003
RLD-SUMP-00036 L-0126 (Effluent Cell, El. 3')	37	Radar	30" Dia. x 12" Deep Stainless Steel (6% Mo)	**24590-LAW** -M6-RLD-00003003
Bulges/Floor Drains				
RLD-FD-00001 Floor Drain L-B001B (RLD-BULGE-00001 Drain, El. -21')	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-RLD-00002003
RLD-FD-00035 Floor Drain L-0126 (RLD-BULGE-0000-4 Drain El. 3')	N/A	N/A	2" Dia. 6% Mo	**24590-LAW** -M6-RLD-00001005
LOF-FD-00001 Floor Drain L-0123 (LOP-BULGE-00001 drain El. 3)	N/A	N/A	2" Dia. 6% Mo	**24590-LAW** -M6-LOP-00001003
LCP-FD-00001 Floor Drain L-0123 (LCP-BULGE-00001 Drain, El. 3')	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-LCP-00001001
LCP-FD-00002 Floor Drain L-0123 (LCP-BULGE-00002 Drain, El. 3')	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-LCP-00001004
LFP-FD-00001 Floor Drain L-0123 (LFP-BULGE-00001 Drain, El. 3)	N/A	N/A	2" Dia. 316L	**24590-LAW** -M6-LFP-00001005
LOP-FD-00002 Floor Drain L-0124 (LOP-BULGE-00002 Drain, El. 3)	N/A	N/A	2" Dia. 6% Mo	**24590-LAW** -M6-LOP-00002003

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
LCP-FD-00003 Floor Drain L-0124 (LCP-BULGE-00003 Drain, El. 3)	N/A	N/A	2” Dia. 316L	**24590-LAW** -M6-LCP-00002001
LFP-FD-00002 Floor Drain L-0124 (LFP-BULGE-00002 Drain, El. 3)	N/A	N/A	2” Dia. 316L	**24590-LAW** -M6-LFP-00003005
LVP-FD-00001 Floor Drain L-0218 (Berm floor drain for LVP-TK-00001, El. 28’)	N/A	N/A	4” Dia. 316L	**24590-LAW** -M6-LVP-00002003
RLD-FD-00025 Floor Drain L-0304F (Curb floor drain for LVP-TK-00001, El. 48’)	N/A	N/A	4” Dia. 316L	**24590-LAW** -M6-RLD-00003001
Drain Lines				
RLD-WS-20037-S11B-01 Drain Line L-0123 (Melter 1 Encasement Assembly Drain, El. 3’)	N/A	N/A	1” Dia. 316L	**24590-LAW** -M6-LMP-00012001
RLD-WS-20033-S11B-11 Drain Line L-0124 (Melter 2 Encasement Assembly Drain, El. 3’)	N/A	N/A	1” Dia. 316L	**24590-LAW** -M6-LMP-00042001
Autosampler Drain Lines				
RLD-WU-22123-S11B-03 ASX Sampler 00012 Lower Containment Drain Line (L-0301, El. 48’)	N/A	Thermal Dispersion	3” Dia. Stainless Steel 316L	**24590-LAW** -M6-RLD-00003001

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
RLD-WU-22117-S11B-03 ASX Sampler 00013 Lower Containment Drain Line (L-0301, El. 48')	N/A	Thermal Dispersion	3" Dia. Stainless Steel 316L	**24590-LAW** -M6-RLD-00003001
HLW Vitrification Facility				
Sumps				
HCP-SUMP-00001 H-B014 (Wet Process Cell, El. -21')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00015001
RLD-SUMP-00001 H-B014 (Wet Process Cell, El. -21')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00015001
HOP-SUMP-00003 H-B021 (SBS Drain Collection Cell 1, El. -21')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00015001
HOP-SUMP-00008 H-B005 (SBS Drain Collection Cell 2, El. -21'	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-20004001
HDH-SUMP-00001 H-B039B (Canister Rinse Tunnel, El. -16.5')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00016001
HDH-SUMP-00002 H-B039A (Canister Rinse Bogie Maintenance Room, El. -16')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00016001
HDH-SUMP-00003 H-B035 (Canister Decon Cave, El. -16')	75	Radar	30" Dia. x 18" Deep Stainless Steel	**24590-HLW** -M6-RLD-00004002

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
HFP-SUMP-00002 H-0117 (Melter Cave 1, El. 5’)	50	Radar	30” x 24” x 16” Deep Stainless Steel	**24590-HLW** -M6-RLD-00008002
HFP-SUMP-00005 H-0106 (Melter Cave 2 El. 5’)	50	Radar	30” x 24” x 16” Deep Stainless Steel	**24590-HLW** -M6-RLD-20005001
HSH-SUMP-00003 H-0117 (Melter Cave 1, El. 3’)	50	Bubbler	20.5” x 20.5” x 16” Deep Stainless Steel	**24590-HLW** -M6-RLD-00008002
HSH-SUMP-00007 H-0106 (Melter Cave 2, El. 3’)	50	Bubbler	20.5” x 20.5” x 16” Deep Stainless Steel	**24590-HLW** -M6-RLD-20005001
HSH-SUMP-00008 H-310A (Melter 1 Equipment Decon Pit, El. 0’)	50	Radar	20.5” x 20.5” x 16” Deep Stainless Steel	**24590-HLW** -M6-RLD-00003001
HSH-SUMP-00009 H-0304A (Melter 2 Equipment Decon Pit, El. 0’)	50	Radar	20.5” x 20.5” x 16” Deep Stainless Steel	**24590-HLW** -M6-RLD-20003001
HPH-SUMP-00001 H-0136 (Canister Handling Cave, El. -3’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	**24590-HLW** -M6-RLD-00016001
HPH-SUMP-00005 H-0136 (Canister Handling Cave, El. -3’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	**24590-HLW** -M6-RLD-00004001
HPH-SUMP-00003 H-B032 (Pour Tunnel 1, El. -21’)	75	Radar	30” Dia. x 18” Deep Stainless Steel	**24590-HLW** -M6-RLD-00016001
Floor Drain Lines				
RLD-ZF-03330-S11B-03 Floor Drain Line H-B021 (SBS Drain Collection Cell 1, El. -21’)	N/A	N/A	3” Dia. 316L Stainless Steel	**24590-HLW** -M6-RLD-00017001

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
RLD-ZF-03447-S11B-03 Floor Drain Line H-B005 (SBS Drain Collection Cell 2, El. -21')	N/A	N/A	3" Dia. 316L Stainless Steel	**24590-HLW** -M6-RLD-20005001
RLD-FD-0186 Floor Drain/Line RLD-ZF-00033-S11B-03 H-0308 (Melter 1 - Active Services Cell, El. 37')	N/A	N/A	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-00015001
RLD-FD-0187 Floor Drain/Line RLD-ZF-003428-S11B-03 H-0302 (Melter 2 - Active Services Cell, El. 37')	N/A	N/A	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-20004001
Autosampler Drain Lines				
RLD-ZF-04118-S11B-03 ASX Sampler 00028 Lower Containment Drain Line (H-0305A, El. 37')	N/A	Thermal Dispersion	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-00002002
RLD-ZF-04119-S11B-03 ASX Sampler 00029 Lower Containment Drain Line (H-0315, El. 37')	N/A	Thermal Dispersion	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-00002002
RLD-ZF-04120-S11B-03 ASX Sampler 00042 Lower Containment Drain Line (H-0318, El. 37')	N/A	Thermal Dispersion	3" Dia. Stainless Steel	**24590-HLW** -M6-RLD-00002002
Analytical Laboratory				
Sumps				
RLD-SUMP-00041 A-B003 (C3 Effluent Vessel Cell, El. -18'7")	30	Radar	30" Dia. x 13" Deep Stainless Steel	**24590-LAB** -M6-RLD-00002001

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Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
RLD-SUMP-00042 A-B004 (C5 Effluent Vessel Cell, El. -19’2”)	30	Radar	30” Dia. x 13” Deep Stainless Steel	**24590-LAB** -M6-RLD-00001001
RLD-SUMP-00045 A-B002 (C3 Pump Pit Sump, EL -6’-81/2”LP)	1.60	Radar	2’-0” x 2’-6” x 1/2” Stainless Steel	**24590-LAB** -M6-RLD-00002003
RLD-SUMP-00043A A-B007 (C5 Pump Pit Sump, EL -6’-7”LP)	1.60	Radar	1’-6” x 3’-0” x 1/2” Stainless Steel	**24590-LAB** -M6-RLD-00001002
RLD-SUMP-00043B A-B005 (C5 Pump Pit Sump, EL -6’-7” LP)	1.60	Radar	1’-6” x 3’-0” x 1/2” Stainless Steel	**24590-LAB** -M6-RLD-00001003
RLD-SUMP-00044 A-B006 (C5 Piping Pit Sump, EL -6’-7” LP)	1.60	Radar	2’-0” x 2’-6” x 1/2” Stainless Steel	**24590-LAB** -M6-RLD-00001004
Leak Detection Boxes				
RLD-LDB-00002 A-B004 (C5 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00008001
RLD-LDB-00004 A-B004 (C5 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00008001
RLD-LDB-00005 A-B003 (C3 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00007001
RLD-LDB-00006 A-B003 (C3 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00007001
RLD-LDB-00007 A-B003 (C3 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00007001

Table C-9 WTP Sumps, Leak Detection Boxes, and Floor Drains/Lines				
Sump/Leak Detection Box, or Floor Drain/Line I.D.#, Room, and Elevation	**Maximum Sump/Leak Detection Box Capacity (gallons)**	**Sump/Leak Detection Box Level Detection Type**	**Sump, Leak Detection Box or Floor Drain/Line Dimensions (approximate) and Materials of Construction**	**Piping and Instrumentation Diagram Number**
RLD-LDB-00008 A-B003 (C3 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00007001
RLD-LDB-00009 A-B004 (C5 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00008001
RLD-LDB-00011 A-B003 (C3 Effluent Vessel Cell, El. -10’)	6	Thermal Dispersion	8” Dia. x 24” Length/ Stainless Steel	**24590-LAB** -M6-RLD-00007001
Drain Lines				
RLD-WU-02207-S11E-04 Drain Line A-B003, (C3 Effluent Vessel Cell, El. -18’7”)	N/A	N/A	4” Dia. 316L	**24590-LAB** -M6-RLD-00002001
RLD-ZN-02203-S11E-04 Drain Line A-B004, (C5 Effluent Vessel Cell, El. -19’2”)	N/A	N/A	4” Dia. 316L	**24590-LAB** -M6-RLD-00001001
RLD-ZN-03393-S11E-04 Drain Line A-B004, (C5 Effluent Vessel Cell, El. -19’2”)	N/A	N/A	4” Dia. 316L	**24590-LAB** -M6-RLD-00001001
RLD-ZN-03394-S11E-04 Drain Line A-B004, (C5 Effluent Vessel Cell, El. -19’2”)	N/A	N/A	4” Dia. 316L	**24590-LAB** -M6-RLD-00001001