WASTE TREATMENT AND IMMOBILIZATION PLANT
CHAPTER 4H
ANALYTICAL LABORATORY

CHANGE CONTROL LOG

Change Control Logs ensure that changes to this unit are performed in a methodical, controlled, coordinated, and transparent manner. Each unit addendum will have its own change control log with a modification history table. The "**Modification Number**" represents Ecology's method for tracking the different versions of the permit. This log will serve as an up to date record of modifications and version history of the unit.

Modification History Table

Modification Date	Modification Number
02/26/2024	24590-LAB-PCN-ENV-23-001 (8C.2024.Q1)
07/27/2021	24590-LAB-PCN-ENV-20-001 (8C.2021.Q3)
03/22/2019	24590-WTP-PCN-ENV-18-013 (8C.2019.Q1)
12/7/2018	24590-WTP-PCN-ENV-18-001 (8C.2018.Q4)
04/05/2018	8C.2018.1F
09/05/2017	8C.2017.6F
12/15/2016	8C.2016.Q3

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4H ANALYTICAL LABORATORY

The Analytical Laboratory (Lab) is designed to incorporate the features and capability necessary to ensure efficient Hanford Tank Waste Treatment and Immobilization Plant (WTP) operations and meet permitting, process control, authorization basis, and waste form qualification requirements. The Lab is a process support facility designed for "24/7" - 365 days per year operation to support peak throughput for each WTP Facility.

The Resource Conservation and Recovery Act (RCRA) permitted portions of the Lab include the Radioactive Liquid Waste Disposal (RLD) tank system (tank and ancillary equipment) and the container storage areas also known as the Waste Management Area (WMA).

Figure 4H-1 shows the locations of the Lab permitted areas. The Lab also includes Satellite Accumulation Areas (SAAs) and 90-day accumulation areas for the accumulation of secondary wastes generated by Lab activities.

In addition, to support sample management within the Lab, barcode readers and computer workstations are provided in designated areas to input and retrieve data from the Laboratory Information Management System (LIMS). LIMS is a laboratory information management software product. The intended use is to capture, process, store, manage, and report laboratory information generated in support of the WTP waste treatment process.

The Lab contains both high-activity and low-activity laboratories. High-activity samples are managed in the Analytical Hotcell Laboratory (AHL). The AHL will only operate in the Baseline configuration. Associated hotcell laboratories, Hotcell Drain Collection Vessel (RLD-VSL-00165), and associated components are not operational, but will maintain ventilation, in the Direct Feed Low-Activity Waste (DFLAW) configuration.

Low-activity samples are managed and analyzed in the Analytical Radiological Laboratory (ARL). The ARL also includes a sample receiving/shipping area designed to manage the inflow of manually transported samples.

In addition, the first floor of the Lab includes waste drum management, maintenance, and support areas for facility operation.

The second floor of the Lab is dedicated to the mechanical room, which contains the C1 and C2 air handling units.

The facility is designed to coordinate the management of samples that are outsourced and analyzed at off-site laboratories. Outsource laboratories are 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 Double Shell Tank (DST) System unit characterization samples.

Samples are transported to the Lab in two ways. The majority of samples are collected and transported from the processing facilities via the Autosampling System (ASX). The ASX collects samples and transfers them from the requesting facility to the Lab via a Pneumatic Transfer System (PTS) to a hotcell or fume hood sample receipt area. Samples are collected in a sample bottle or vial and transferred into a sample carrier. High-activity samples from the Pretreatment Facility (PTF) and High-Level Waste (HLW) Vitrification Facility are pneumatically transferred to the hotcell sample receipt area through a dedicated transfer system for high-activity samples while low-activity samples from the Low-Activity Waste (LAW) Vitrification Facility are transferred directly to the sample receipt area through a dedicated Low-Activity Transfer System. Effluent Management Facility (EMF) samples and a small percentage of samples from other facilities are transported to the Lab manually in appropriately shielded transportation casks or containers.

General Description of the Analytical Areas

The Lab has two analytical areas, the ARL for low activity samples, and the AHL for high activity samples. The ARL consists of 13 laboratories commonly referred to as Rad Labs and is designed to operate during both the Baseline and DFLAW configurations. The AHL consists of 14 hotcells, 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. 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 to accomplish in-cell tasks remotely. The AHL only operates in the Baseline configuration.

Dangerous and/or mixed waste is managed in both the ARL and AHL in SAAs and 90-Day Accumulation Areas pursuant to the generator requirements (Washington Administrative Code [WAC] 173-303-200). Organic liquids will be segregated and packaged according to WAC 173-303-161 using Lab Packs; other liquid wastes are transferred to RLD Vessels for return to the WTP process.

The ARL is designed to support the preparation and analysis of low-activity mixed waste samples. The ARL also supports the analyses of samples diluted, digested, and prepared in the hotcell facility. Table 4H-1 lists the ARL and AHL analytical areas, their functions and waste management processes. The areas listed in this table are all non-permitted areas and not subject to the requirements of this permit.

4H.1 Containers

This section identifies the containers and container management practices that are followed at the Lab. The term “container” is used as defined in WAC 173-303-040. Container management occurs to store, compact, repackage, and sort dangerous and/or mixed wastes in accordance with WAC 173-303-600. These wastes are generated from the performance of analytical procedures, test plans, and developmental procedures to support WTP operations. Containers are then prepared for shipment to other on-site units or off-site Treatment, Storage, and Disposal (TSD) facilities for further treatment, as required, and compliant disposal.

4H.1.1 Description of Containers

All containers of dangerous and/or mixed wastes are compatible with the contained waste and are labeled to describe the contents of the container and the major risks of the waste as required under WAC 173-303-395 and WAC 173-303-630(3). Each container is assigned a unique identifying number. All containers are labeled according to WAC 173-303-190 prior to shipping.

4H.1.2 Container Management Practices

Waste accumulated in the WMA are generated during Lab operations and analytical processes. Examples of waste streams that are accumulated in the Lab include the following:

- Analytical glassware.
- Plastic containers.
- Failed small equipment.
- Maintenance waste.
- Debris and Personal Protective Equipment (PPE).
- Liquid organic waste streams.

Most miscellaneous secondary dangerous and/or mixed wastes are spent equipment and consumables such as pumps, air lances, High Efficiency Particulate Air (HEPA) filters, etc., and do not contain liquids. Compatible absorbent products may be added to absorb liquids for wastes that contain small quantities of liquids. In addition, some liquid wastes are segregated based on compatibility and packaged as Lab Packs.

4H.1.2.1 Waste Management Area

The WMA, consists of five rooms:

- A-0139, Room A-0139 is the primary dangerous and/or mixed wastes storage room. The waste containers are segregated and arranged by waste type to meet the waste compatibility and separation distances provided in the Uniform Fire Code and applicable sections of WAC 173-303-630. An example of drum configuration in the WMA is provided in Figure 4H-2.
- A-0139A, Room A-0139A is equipped with a walk-in fume hood to facilitate the packaging or repackaging of liquid waste generated within the Lab.
- A-0139B, Room A-0139B is an airlock space between the main room A-0139 and A-0139A and A-0139C.
- A-0139C, Room A-0139C contains an in-drum compactor that will not be used for treatment of hazardous waste. The in-drum compactor will only be used for the mechanical compaction of compactible waste.
- A-0139D, Room A-0139D is used for the staging of empty waste containers and for the storage of waste containers prior to shipping.

Container storage area volumes are summarized in Table 4H-2.

Container management practices, that occur in the WMA, include storage, packaging, repackaging, or sampling waste in containers, transferring containers to and from the WMA and methods for handling and storage. The following list discusses these practices:

- Employees performing waste management activities within the WMA, will have immediate access to a device, such as a telephone or a hand-held, two-way radio, capable of summoning external emergency assistance. (WAC 173-303-340)
- If a container holding dangerous waste is not in good condition (e.g. severe rusting, apparent structural defects) or if it begins to leak, the waste will be transferred to a container that is in good condition or managed in another way that complies with WAC 173-303 and this Permit.
- All containers in storage are labeled to identify the major risk of the waste in the container. [WAC 173-303-395, WAC 173-303-630(3)]
- Waste is maintained in containers that are compatible with the waste stored. [WAC 173-303-630(4)]
- Waste containers are kept closed except when adding or removing waste, or when performing visual verification or sampling. [WAC 173-303-630(5)(a), WAC 173-303-300(5)]
- Containers will not be opened, handled, and/or stored in a manner which may rupture the container or cause it to leak. [WAC 173-303-630(5)(b)]
- Aisles between rows of containers greater than 10-gallon capacity are at least thirty inches wide, or to meet other applicable requirements, whichever is greater. No row of containers greater than 10-gallon capacity will be more than two containers wide. [WAC 173-303-630(5)(c)]
- A system of weekly container inspections is used as described in Chapter 6A, “Inspection Plan.”
- Use of secondary containment is described in Section 4H.1.4.
- Proper management of ignitable or reactive waste is performed in accordance with Section 4H.1.5.
- Proper management of incompatible wastes is performed in accordance with Section 4H.1.5.

U.S. Department of Transportation (DOT) approved containers holding only wastes that do not contain free liquids, do not exhibit either the characteristics of ignitability or reactivity as described in WAC 173-303-090(5) or (7), and are not designated as F020, F021, F022, F023, F026, or F027, need not have a containment system and will be stored on the floor within the WMA. Lab Packs are considered secondary containment and therefore can be stored directly on the floor.

Dangerous waste containers are inspected for integrity and adequate seals before being accepted at the WMA. Waste received for storage and treatment at WMA are either picked up by waste management personnel or brought to the WMA in containers suitable for the waste. Depending on the container weight, size or number of containers to be moved, container(s) of dangerous waste are hand carried or moved on a platform or handcart, as appropriate. Waste management staff moves the dangerous containers, keeping incompatible wastes separated. Prior to completion of required training, WTP waste management personnel must work under the direct supervision of trained personnel until their training is completed.

Waste in containers that are damaged, leaking, lack integrity, or not securely sealed to prevent leakage are not accepted at the WMA. Examples of acceptable packaging include analytical reagents in their original bottles, DOT approved containers, spray cans, sealed ampules, paint cans, leaking containers that have been over packed, etc.

4H.1.2.2 Waste Tracking

A tracking database is used to inventory and track waste containers within the WMA.

The waste tracking database is used by waste management personnel to track waste containers for the following purposes:

- Provides waste container inventory information and locations for each storage area that facilitates weekly and regulator inspections.
- Provides characterization data for each waste stream and container.
- Provides a complete history (cradle-to-grave) of the treatment and disposal of each individual waste container.

The waste tracking database contains the information necessary to:

- Track each container by location and by waste type.
- Identify each container by a unique identification number.
- Track the date of generation, days in storage and ship date.
- Provide reporting at multiple levels (e.g., WTP management, U.S. Department of Energy, regulators).
- Maintain a history of all container movements by date.
- Identify container size and type.
- Identify the type of waste (Dangerous, Radioactive, Mixed, Universal, Non-regulated).
- Identify and consolidate information on stored waste containers.

Records generated as part of waste management activities are managed in accordance with WAC 173-303-380 and WTP procedures. Records are generated either as hard copies or electronically.

4H.1.3 Container Labeling

Once material has been designated as dangerous or mixed waste, all containers are marked/labeled to describe the content of the container as required under WAC 173-303-630(3). Containers are marked with a unique identifying number assigned by the generating unit. All containers used for transfer of dangerous and/or mixed waste are prepared for transport in accordance with WAC 173-303-190.

4H.1.4 Containment Requirements for Storing Waste

Secondary containment requirements for the waste are discussed below.

4H.1.4.1 Secondary Containment System Design

Waste stored within the WMA are required to meet the requirements of WAC 173-303-090(5) and (7), WAC 173-303-630(7) and WAC 173-303-806(4)(b). The WMA is not constructed with containment systems to meet these secondary containment requirements. In order to meet the requirements for secondary containment, containers are placed on portable secondary containment systems or elevated (e.g., pallets, skids), to protect the containers from contacting accumulated liquids. Containers holding only wastes that do not contain free liquids, do not exhibit either the characteristic of ignitability or reactivity as described in WAC 173-303-090(5) or (7), and are not designated as F020, F021, F022, F023, F026, or F027, need not have a containment system as described in WAC 173-303-630(7)(c) since the areas are within a building and are protected from precipitation. Each portable secondary containment systems 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.

4H.1.4.2 System Design

The exterior walls of the WMA are constructed of reinforced concrete and the entire floor area is coated with a special protective coating. Coatings are provided to support the clean-up and decontamination of a potential spill and are not designed to provide secondary containment. The secondary containment requirement for containers containing liquid waste is met by using portable secondary containment pallets. The container storage areas in Rooms A-0139 and A-0139A, A-0139B, A-0139C, and A-0139D are not designed with containment systems as stated in WAC 173-303-630(7)(c) since the areas are within a building and protected from precipitation. Containers are placed on portable secondary containment systems or elevated (e.g., pallets, skids), to protect the containers from contacting accumulated liquids. Containers holding only wastes that do not contain free liquids, do not exhibit either the characteristic of ignitability or reactivity as described in WAC 173-303-090(5) or (7), and are not designated as F020, F021, F022, F023, F026, or F027, need not have a containment system as described in WAC 173-303-630(7)(c) since the areas are within a building and are protected from precipitation. An example of a portable secondary containment pallets is provided in Figure 4H-3.

4H.1.4.3 Structural Integrity of the Base

The WMA floor is not designed nor intended to provide secondary containment of materials. Therefore, no structural integrity assessment is required.

Secondary containment is provided by commercially available portable secondary containment pallets/devices designed to contain 10% of the volume of all containers within the containment pallet, or the volume of the largest container, whichever is greater.

4H.1.4.4 Containment System Capacity

Liquid waste may be stored in the WMA. Each container holding liquid dangerous waste is placed into portable secondary containment that meets the requirements of WAC 173-303-630(7). The waste container functions as the primary containment while the portable containment device functions as the secondary containment.

Each portable secondary containment has 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.

4H.1.4.5 Control of Run-On

Run-on cannot reach the interior of the WMA because of its location inside the Lab. The possibility for precipitation to flow into the WMA through the roll-up door is mitigated by a grated precipitation collection trough located outside of the container storage area roll-up doors on the south side of the airlock/clean drum export area (Room A-0139D). Additionally, the building is provided with gutters to remove precipitation.

4H.1.4.6 Removal of Liquids from Containment System

Spilled or leaked waste and other liquids are removed from the containment system in as timely a manner as is necessary to prevent overflow in accordance with WAC 173-303-630(7)(a)(ii).

4H.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

Free liquids, ignitable wastes and reactive wastes are managed in the WMA. Secondary containment is provided for these types of waste streams. Wastes with the F020-F023, F026, and F027 codes are not identified for the DST system, nor are they anticipated to be generated by the Lab.

4H.1.5 Prevention of Reaction of Ignitable, Reactive, and Incompatible Wastes in Containers

The Lab generates and stores containers of dangerous or mixed waste exhibiting the characteristics of reactivity (D003) and ignitability (D001) as defined in WAC 173-303-090(5) and (7). Incompatible waste includes waste that is unsuitable for mixing with another waste or material because the mixture might produce heat or pressure, fire or explosion, violent reaction, toxic fumes, mists, or gases, or flammable fumes or gases. Proper precautions are taken to prevent any off-normal situations from occurring. Acids and bases are stored in flammable storage cabinets or on separate portable secondary containment; oxidizers are stored separately from combustible materials; and corrosive waste are stored on separate portable secondary containment or in flammable cabinets. These separate storage areas within the WMA are clearly marked with signs indicating the appropriate waste category. Incompatible waste containers are stored at least thirty inches apart with separate containment.

Separate lab pack containers are used, and other waste types are not packed with ignitable waste. Ignitable, reactive, or incompatible waste is separated from containers of other waste types in the WMA. Within the WMA, ignitable or reactive waste are placed on separate portable secondary containment systems, such as individual spill pallets. Personnel inspect the containers for proper packaging, marking, and waste information before transport. Potentially incompatible waste are to be stored at least one aisle width (30”) apart and in separate containment.

4H.1.5.1 Management of Ignitable and Certain Other Reactive Waste in Containers

Ignitable or reactive waste may be generated from analytical or maintenance activities. This waste is accumulated and managed in compliance with regulatory requirements, in approved containers. Containers holding reactive waste exhibiting the characteristic specified in WAC 173-303-090(7)(a)(vi), (vii), or (viii) are managed in accordance with WAC 173-303-395(1)(a).

4H.1.5.2 Design of Areas to Manage Incompatible Waste

Incompatible wastes are segregated using separate secondary containment (if required) and by spacing them at least 30-inches apart.

4H.2 Tank Systems

The RLD system vessels are located at approximately 19 ft below grade. Table 4H-3 lists current tank design information (capacity, materials of construction, and dimensions). Tank systems that manage liquid mixed or dangerous waste are provided with secondary containment. Table 4H-4 summarizes the secondary containment areas and calculated minimum secondary containment heights. Sumps, leak detection boxes, and secondary containment drain systems for the RLD are listed in Table 4H-5. Information on the instrumentation and parameters for the Lab tank system process and leak detection system can be found in Table 4H-7 and 4H-8. Lab vessels and ancillary equipment located in areas that are not routinely accessible are designed to last for the nominal plant life of 40 years. Lab tank vessels can be accessed if replacement is required during operations.

4H.2.1 Radioactive Liquid Waste Disposal System

The Lab RLD system collects liquid effluent generated within the Lab from floor drains, sink drains, hotcell drains, and other drains in the various rooms and areas throughout the Lab.

The analytical Lab 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 Lab RLD system includes piping, instrumentation, pumps, valves, mixers, transfer pump pits, piping pits, cells, and other ancillary equipment associated with the collection and transfer of liquid within the Lab. The Lab vessels are connected to a vessel vent header which maintains a slight vacuum on the vessel headspace. All the vessels are located in areas that are not routinely accessible. Figure 4H-4 shows a simplified process flow diagram for the Lab RLD system.

4H.2.1.1 Laboratory Floor Drain Collection Vessel (RLD-VSL-00163)

The Floor Drain Collection Vessel (RLD-VSL-00163) collects, contains, and transfers non-contaminated liquid effluent. The Floor Drain Collection Vessel is identified as part of the RLD system. It is not designed or permitted to manage dangerous and/or mixed wastes. If a spill or release were to occur that contaminated this vessel, the vessel is 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.

4H.2.1.2 Laboratory Sink Drain Collection Vessel (RLD-VSL-00164)

The Laboratory Area Sink Drain Collection Vessel (RLD-VSL-00164), and associated components are used for collecting, mixing and transferring liquid waste streams from the following sources during routine and non-routine operations:

- Rad Lab sinks.
- Rad Lab fume hood sinks.
- Floor Drain Collection Vessel (RLD-VSL-00163).
- Decontamination room showers and sinks.
- Process vacuum pump skid.
- Hotcell maintenance access area drain.

- Maintenance shop floor/sink drains.
- ASX equipment drains.
- Pump pit sump.

Figure 4H-5a and 5b provide simplified process flow diagrams for the laboratory area sink drain collection vessel (RLD-VSL-00164).

The Laboratory Area Sink Drain Collection Vessel (RLD-VSL-00164) is located in the C3 Effluent Vessel Cell under the C3 filter/fan room in the Lab. Aqueous liquid ARL waste consists of samples (unused and residues), dilutions, and dissolution aliquots prepared for analysis. Liquids may be partially neutralized to reduce corrosivity. Containers of aqueous liquids are discharged to RLD-VSL-00164 through ARL fume hood sink drains, followed with flush water to help minimize potential corrosion and reduce radiological dose rates. While operating in the DFLAW configuration, the contents of the Laboratory Area Sink Drain Collection Vessel are transferred to the EMF Direct Feed Effluent Transfer System for evaporation and treatment prior to being returned to the LAW vitrification process, or sent to be treated at the Liquid Effluent Retention Facility/Effluent Treatment Facility (LERF/ETF).

After the PTF is brought on-line, while operating in the Baseline configuration, the contents of the Laboratory Area Sink Drain Collection Vessel are transferred to the Hotcell Drain Collection Vessel (RLD-VSL-00165). The contents of RLD-VSL-00165 are then transferred to the PTF for treatment in the PTF and HLW vitrification process or treated at the LERF/ETF.

4H.2.1.3 Hotcell Drain Collection Vessel (RLD-VSL-00165)

The Hotcell Drain Collection Vessel (RLD-VSL-00165) and associated components for collecting, mixing, and transferring liquid waste streams, collect waste from the following sources during routine and non-routine operations:

- Hotcell floor drains.
- Laboratory Floor Drain Collection Vessel, (RLD-VSL-00163).
- Laboratory Sink Drain Collection Vessel, (RLD-VSL-00164).
- Hotcell glovebox drains.
- Hotcell transfer port drains.
- C3 decontamination booth drain.
- C5 pump and valve pit sumps.
- Lab Area Sink Drain Collection Vessel sump.
- Hotcell Drain Collection Vessel pit sump.

Figure 4H-6 provides a simplified process flow diagram for the Hotcell Drain Collection Vessel (RLD-VSL-00165).

The vessel is located in the C5 Effluent Vessel Cell under the C5 pump maintenance room in the Lab. The vessel and cell are maintained under a negative pressure. The Hotcell Drain Collection Vessel is provided with vessel pumps (RLD-PMP-00183A/B) for transferring the contents of the vessel and sump. Pumps (RLD-PMP-00183A/B) are self-priming, horizontal centrifugal pumps located in pits above the vessel cell.

In the DFLAW configuration the AHL and the Hotcell Drain Collection Vessel will not be operational.

During Baseline configuration when the AHL and the Hotcell Drain Collection Vessel are operational, to prevent cross-contamination of the Demineralized Water (DIW) System, a backflow preventer (RLD-BFP-00001) is provided in the DIW line for flushing of the transfer lines from the Hotcell Drain Collection Vessel pumps. Under normal operating conditions, a liquid heel is maintained in the vessel.

The vessel is provided with a recirculation loop, but under normal operating conditions, the vessel and sump contents are transferred to the PTF Plant Wash Drain Vessel (PWD-VSL-00044). Wash rings are provided with DIW for vessel, vessel cell, and pump/valve pit flushing. The vessel is also equipped with level instrumentation and mixing eductors.

In the Baseline configuration liquid waste management in the AHL hotcells requires remote handling prior to disposal to the Hotcell Drain Collection Vessel (RLD-VSL-00165) from hotcell cup sink drains. Aqueous liquid AHL 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 are discharged to RLD-VSL-00165 through hotcell cupsink drains, followed with flush water to help minimize corrosion and reduce radiological dose rates. Liquid waste information (including quantity of liquid waste per disposal and identification of the sample that generated the waste) for each of the Lab RLD vessels is recorded using a waste tracking database.

4H.2.2 Design, Installation, and Assessment of Tank Systems

Engineering documents and specifications addressing design of Lab vessels and ancillary equipment are included in WTP Unit-Specific Operating Record. The Lab RLD vessel design information, such as material of construction, total volume, dimensions, and operating parameters are provided in Table 4H-3.

4H.2.2.1 Design Requirements

Applicable codes and standards that were followed for design, construction, and inspection of Lab vessels include, but are not limited to:

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
EPA	US Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
UBC	Uniform Building Code

4H.2.2.2 Integrity Assessments

Independent Qualified Registered Professional Engineer (IQRPE) structural integrity assessments for the Lab RLD vessels, ancillary equipment, and secondary containment are included in WTP Unit-Specific Operating Record.

The results of these assessments demonstrate that vessels, secondary containment, and ancillary equipment have adequate structural integrity and are acceptable for storing and treating dangerous and/or mixed wastes.

Periodic integrity assessment schedule and the results of the integrity assessments for the Lab RLD vessels is located in WTP Unit-Specific Operating Record.

4H.2.3 Secondary Containment and Release Detection for Tank Systems

This section describes the Lab RLD system secondary containment and leak detection systems installed in the Lab. Equipment used to detect and contain dangerous and/or mixed waste liquids include:

- Secondary containment.
- Leak detection and leak detection boxes.
- Sumps.

- Pump and piping pits.
- Vault systems.

4H.2.3.1 Lab Radioactive Liquid Waste Disposal System Secondary Containment

The Lab RLD system ancillary equipment installed to manage dangerous and/or mixed wastes has the following types of secondary containment and leak detection:

- Vessels equipped with radar level detection.
- Coaxial or double-walled piping.
- Stainless steel liners.
- Stainless steel under-sink drip pans.
- Pump and piping pits lined with stainless steel and equipped with radar level detection.
- Stainless steel sumps equipped with radar level detection.
- Leak detection boxes equipped with thermal level switches.

The Lab RLD system ancillary equipment piping may be single-walled or double-walled. Double-walled piping is constructed of stainless steel inner piping with either carbon steel or stainless steel outer containment. Single-walled piping is provided with additional secondary containment. The double-walled pipe is sloped to ensure that the containment pipe drains to the corresponding leak detection box or to a pump or valve pit that is provided with leak detection. The slope for double-walled pipe is sufficient to ensure that applicable leak detection criteria is met. Under-sink drip pans collect and direct spills into the annular space of in-slab double-walled piping where leaks are detected by thermal sensors located in downstream leak detection boxes.

The Laboratory Area Sink Collection Vessel, (RLD-VSL-00164) is located in the C3 Effluent Vessel Cell (A-B003). The Hotcell Drain Collection Vessel, (RLD-VSL-00165) is located in the C5 Effluent Vessel Cell (A-B004). The cell floor is sloped a minimum 1% grade. Process cell walls and pump/piping pits are lined with stainless steel, to approved liner heights, and provide secondary containment for the permitted Lab RLD systems. Minimum cell liner heights are summarized in Table 4H-4. The Lab secondary containment structural design is addressed in IQRPE reports located in the WTP Unit-Specific Operating Record.

The secondary containment stainless steel liners are designed to contain 100% capacity of the largest vessel in the cell. Detailed description of the minimum liner heights for the Lab RLD system are found in the WTP Unit-Specific Operating Record.

The Lab cells are provided with wash rings to facilitate in-cell periodic decontamination or waste removal in the cell. The sloped floors, sumps and sump pumps facilitate liquid collection and removal.

4H.2.3.2 Leak Detection

The Lab RLD system includes sumps and leak detection boxes provided with leak detection instruments to facilitate detection and removal of potential leaks/spills and wash fluids from the secondary containment. If a leak detection alarm occurs in the sump or leak detection box, the source of the leak is identified and the leaking equipment is removed from service until it is repaired. The sump, drain, and leak detection box location and design information is provided in Table 4H-5.

Leak or level indication alarms provide notification of a series of high as well as low level alarms. Alarms allow both a manual response or an automatic stop of agitation, effluent flow, or transfers depending on the type of alarm.

4H.2.3.3 Lab Leak Detection Boxes

The Lab leak detection boxes are designed to detect a leak in the annular space between the double-walled piping. Each box is installed with a drain plug in the closed position to facilitate collecting a detectable volume of leaked waste. All eight of the Lab Leak Detection Boxes (LDBs) are nominal pipe size (NPS) 8-inch, horizontal, schedule 40 pipe, with a NPS 8-inch cap on either end. A detectable leakage volume is built up in an 11-inch segment of pipe, plus the cap, by a 2-inch high baffle located in the middle of the device. The leak detection boxes are connected to drain headers that flow to the Hotcell Drain Collection Vessel (RLD-VSL-00165) and the Laboratory Area Sink Drain Collection Vessel (RLD-VSL-00164).

4H.2.3.4 Lab Radioactive Liquid Waste Disposal System Sumps

There is one sump in each vessel cell. The sump is 30-inch nominal diameter and approximately 13 inches deep. The sump is made from a piece of nominal pipe size (NPS 30) standard-wall pipe (or an equivalent rolled plate) and a 30-inch diameter, standard-wall, pipe cap (or equivalent ellipsoidal-head section). There is one sump in each pump and piping pit. The sump is formed by a shallow rectangular depression in the liner around the drain for the pit. A removable weir around the drain hole allows formation of a detectable volume before excess leakage is directed back to its associated vessel.

RLD-SUMP-00041: This sump is located in the C3 Effluent Cell (A-B003). It is equipped with radar-type level detection and two pumps (RLD-PMP-00182A/B) to transfer the sump contents to Hotcell Drain Collection Vessel, (RLD-VSL-00165) or Laboratory Sink Drain Collection Vessel, (RLD-VSL-00164). When WTP is operating in the DFLAW configuration, RLD-VSL-00164 is isolated from RLD-VSL-00165 and its contents are sent to the EMF Evaporator Feed Vessel (DEP-VSL-00002).

RLD-SUMP-00042: This sump is located in the C5 Effluent Cell (A-B004), and is similar to the RLD-SUMP-00041 described above. The contents of this sump are emptied by pump (RLD-PMP-00183A) into PTF vessel PWD-VSL-00044 or Hotcell Drain Collection Vessel, (RLD-VSL-00165).

RLD-SUMP-00045: This sump is located in the C3 pump and piping pit (A-B002). The liner on the floor of the pit consists of several sloped stainless steel plates that direct leakage and washwater (during maintenance) to a drain located at the lowest point in the pit. The sump is formed by a rectangular depression in the stainless steel liner around the drain that includes a removable weir. The volume of the sump is equal to the volume created by the depression in the liner in the vicinity of the drain and the height of the weir. This volume is limited to a maximum value of 2.4 gallons in order to be able to detect a design basis leak of 0.1 gal/h in 24 hours. With the weir installed, a detectable level is formed in the sump to allow the radar to sense potential liquids. The liquid spills over the weir and drains to the Laboratory Sink Drain Collection Vessel (RLD-VSL-00164). When the liquid is detected in the sump, the weir is manually removed from the sump via an extended drive spindle to allow the sump contents to drain by gravity to the vessel. The weir may be removed during maintenance to preclude the accumulation of washwater residues in the sump.

RLD-SUMP-00043A/B and RLD-SUMP-00044: These sumps are located in the C5 pump and piping pit and are similar in design to the RLD-SUMP-00045 described above. The drain line from the two C5 pump sumps and the one C5 piping pit sump is located entirely within the C5 Effluent Vessel Cell (A-B004). Secondary containment and leak detection for this drain line is provided by the C5 Effluent Vessel and the associated Radar Leak Detection System. These sumps drain to the Hotcell Drain Collection Vessel (RLD-VSL-00165) via a common drain line.

Documentation for general leak detection capabilities in secondary containment sumps and leak detection boxes are found in the WTP Unit-Specific Operating Record.

4H.2.3.5 Secondary Containment System Floor Drains

Locations and specifications on Lab secondary containment floor drains are listed in Table 4H-5.

4H.2.3.6 Pump and Piping Pits

The Lab pump and piping pits are stainless steel lined structural compartments that contain maintainable equipment and provide for maintenance and remote manual operation. The equipment is shielded from high radiation fields emanating from the vessels. The pump and piping pits are provided with wash rings and can be decontaminated to support maintenance activities and spill response. The pits are sloped to direct potential leakage to their respective sumps. Each pump and piping pit includes a sump that is equipped with a removable weir and a radar level sensor for leak detection. Access to the pump and piping pits is achieved via the removal of the pit covers. Table 4H-6 lists the location of the pumps and piping pits.

4H.2.3.7 Vault Systems

Laboratory Area Sink Drain Collection Vessel, (RLD-VSL-00164) and the Hotcell Drain Collection Vessel (RLD-VSL-00165) are located in vault-like stainless steel lined cells which consist of a welded stainless steel liner attached to the walls and floors.

4H.2.4 Tank Management Practices

The RLD system collects liquid effluent generated within the laboratory and does not have the capability to treat or alter its composition.

The effluent accumulated in the Laboratory Area Sink Drain Collection Vessel (RLD-VSL-00164) is comprised primarily of the liquid wastes generated within the ARL and disposed of through Lab sinks and cup sinks within the fume hoods. This effluent includes flush water which comprises the bulk of the effluent volume. Since solids and immiscible organic chemicals are separate from the sample and analytical wastes in the ARL and disposed of as radioactive mixed waste, the residual amount of solids and organic chemicals in the effluent sent to the Laboratory Area Sink Drain Collection Vessel is minimal. Miscible organics (alcohols) if present in the effluent do not separate and are sent to the Laboratory Area Sink Drain Collection Vessel. The effluent contains inorganic chemicals from the samples, analytical standards and calibration fluids, and other chemicals used in the sample analyses.

The effluent accumulated in Hotcell Drain Collection Vessel (RLD-VSL-00165) is comprised primarily of the liquid wastes generated within the AHL and disposed of through floor drains within the individual hotcells. This effluent includes flush water which comprises the bulk of the effluent volume. Effluent is also received through drains in the hotcell gloveboxes and sample import/export boxes. Since solids and immiscible organic chemicals are separated from the sample and analytical wastes in the AHL and disposed of as solid waste, the residual amount of solids and organic chemicals in the effluent sent to the Hotcell Drain Collection Vessel is minimal. The effluent contains inorganic chemicals from the samples, analytical standards and calibration fluids, and other chemicals used in the sample analyses.

To minimize the potential for radioactive contamination, in-cell sumps collect periodic wash-down of cells that help reduce the radioactive contamination. Built-in spray rings are installed to facilitate waste removal and decontamination. During operations, wash-downs of vessels will be scheduled based on the amount of radioactive contamination on the outside of each vessel, on an as-needed basis. Plant operations will determine when and if vessel wash-downs are required.

4H.2.4.1 Laboratory Area Sink Collection Vessel RLD-VSL-00164

The Laboratory Area Sink Collection Vessel, (RLD-VSL-00164), its internal components, and the associated ancillary equipment include the following:

- Three vessel mixing eductors.
- Wash rings.
- Instruments, including liquid level measurement.

- Vessel overflow line to RLD-SUMP-00041.
- Two pumps (RLD-PMP-00182A/B).

The Laboratory Area Sink Collection Vessel, (RLD-VSL-00164) is equipped with wash rings for vessel wash down. There are three venturi jet eductors that use pressurized liquid to re-suspend solids and mix the vessel contents. The vessel has level instrumentation to maintain the liquid level within the acceptable operating range and detect vessel overflow.

Two pumps, RLD-PMP-00182A/B, are located in C3 pump pit (Room A-B002). The pumps are self-priming, magnetic-drive, seal-less centrifugal pumps equipped with electrical plugs for ease of removal. The wetted surfaces of the pumps are constructed of 316 stainless steel. Based upon valve configuration during Baseline operations, the pumps can re-circulate the vessel contents, or discharge to the Hotcell Drain Collection Vessel (RLD-VSL-00165), or empty RLD-SUMP-00041 located within the vessel cell. Failure of any individual pump during a transfer is detected by the pressure elements on the suction or discharge side of the pumps. If a pump fails due to mechanical problems, the alternate pump is placed in service. While operating in the DFLAW configuration, the Laboratory Area Sink Drain Collection Vessel (RLD-VSL-00164) is isolated from RLD-VSL-00165 and its contents are transferred to the EMF Evaporator Feed Vessel (DEP-VSL-00002).

The operating states of the Laboratory Area Sink Collection Vessel (RLD-VSL-00164) are described below.

Receipt: Laboratory Area Sink Collection Vessel routinely collects effluent from the following sources:

- Rad Lab sinks and fume hood sinks.
- Hotcell maintenance area drain.
- C3 maintenance shop floor/sink drains.
- C3 pump and piping pit sump.
- Floor Drain Collection Vessel (RLD-VSL-00163).

Mix: The contents of the vessel may be periodically mixed to prevent formation of a hard layer of solids, or to re-suspend the solids prior to transfer. To initiate a mixing sequence, the manual and actuated valves are aligned for recirculation, a transfer pump is selected, and the mixing operation is initiated for a pre-determined amount of time.

Transfer: During Baseline operations the contents of Laboratory Area Sink Collection Vessel are transferred to the Hotcell Drain Collection Vessel for eventual transfer to the PTF. A mixing step may be performed prior to transfer to re-suspend any solids within the vessel; if necessary. During DFLAW configuration, RLD-VSL-00165 will be isolated from RLD-VSL-00164.

Wash: The vessel may be washed periodically or as required for maintenance purposes. The vessel is equipped with wash rings supplied with DIW to flush the interior of the vessel.

4H.2.4.2 Hotcell Drain Collection Vessel, RLD-VSL-00165

The Lab Hotcell Drain Collection Vessel (RLD-VSL-00165), its internal components, and the associated ancillary equipment include the following:

- Eight eductors.
- Wash rings.
- Instruments, including liquid level measurement.
- Vessel overflow line to RLD-SUMP-00042.
- Two pumps (RLD-PMP-00183A/B).

Two pumps (RLD-PMP-00183A/B) are located in C5 pump pits (A-B005 and A-B007). The pumps are self-priming, magnetic-drive, seal-less centrifugal pumps, and are equipped with electrical plugs for ease of removal. The wetted surfaces of the pumps are constructed of 316 stainless steel. The pumps discharge the contents of Hotcell Drain Collection Vessel for transfer to the PTF (PWD-VSL-00044) located within the vessel cell. Failure of any individual pump during a transfer is detected by the pressure elements on the suction or discharge side of the pumps. If a pump fails due to mechanical problems, the alternate pump is placed in service.

The operations of the Hotcell Drain Collection Vessel are described below.

Receipt: The Hotcell Drain Collection Vessel routinely collects effluent from the following sources:

- Hotcell floor drains.
- Floor Drain Collection Vessel (RLD-VSL-00163).
- Laboratory Area Sink Collection Vessel (RLD-VSL-00164).
- C3 Effluent Vessel cell sump (RLD-SUMP-00041).
- C5 Effluent Vessel cell sump (RLD-SUMP-00042).
- Hotcell transfer port and glove box drains.
- C3 decontamination booth drain.
- C5 pump and piping pit sumps.

Mix: The contents of the vessel may be periodically mixed to prevent formation of a hard layer of solids, or to re-suspend the solids prior to transfer. To initiate a mixing sequence, the manual and actuated valves are aligned for recirculation, the transfer pump is selected, and the mixing operation is initiated for a pre-determined amount of time.

Transfer: The contents of Hotcell Drain Collection Vessel are transferred to PWD-VSL-00044. A mixing step may be performed prior to transfer to re-suspend any solids within the vessel, if necessary.

Wash: The vessel may be washed periodically or as required for maintenance purposes. The vessel is equipped with wash rings supplied with DIW to flush the interior of the vessel.

4H.2.5 Marking or Labeling

Due to as low as reasonably achievable concerns associated with the Lab RLD vessels, the vessels are not labeled. The vessels are located in stainless steel vaults, the entrance to the vaults are labeled to meet the requirements of WAC 173-303-395 and WAC 173-303-640(5)(d). The marking of the access points is legible from a distance of 50 feet and identifies the major risks associated with the waste. The label adequately warns employees, emergency response personnel, and the public of the major risks associated with the waste being stored within the vessel.

4H.2.6 Management of Ignitable or Reactive Waste in Tank Systems

Ignitable and/or reactive waste may be generated from analytical or maintenance activities. Lab wastes are designated by either process knowledge or sample analysis and if aqueous and acceptable for transfer are discharged to the Lab RLD system. Organic waste streams generated by analytical processes are not discharged to the Lab RLD system. These wastes are accumulated and managed in approved containers.

4H.2.7 Management of Incompatible Waste in Tank Systems

Incompatible waste generated from analytical or maintenance activities are not managed in the Lab RLD systems. Reagents that could react with waste in the vessels are stored in areas that are segregated by physical barriers from process vessels.

4H.3 Air Emission Control

The Lab 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 occupancy 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 Lab heating, ventilation, and air conditioning 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 C5V Ventilation System, which services the hotcells and the Hotcell Drain Collection Vessel (RLD-VSL-00165), will be isolated while in the DFLAW configuration.

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 Lab stacks. Air cascading into the C5 areas from the adjacent C2 and/or C3 areas will be exhausted through the Lab building stacks by the C5 exhaust fans after passing through two stages of HEPA filter banks.

4H.3.1 Applicability of AA Standards

There are no process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations in the WTP Lab, so the requirements of WAC 173-303-690 do not apply.

4H.3.2 Applicability of BB Standards

Similarly, no waste management equipment contacting dangerous or mixed waste with organic concentrations of above 10% by weight is employed in the Lab, so the requirements of WAC 173-303-691 do not apply.

4H.3.3 Applicability of CC Standards

The air emission standards of Subpart CC are applicable to containers having a design capacity greater than 0.1 cubic meters. Lab pack configurations are not subject to Subpart CC standards because the inner containers are less than 0.1 cubic meter. Subpart CC standards are also not applicable to containers and tanks managing mixed waste. Therefore, the Lab Tank System container waste management units are not subject to Subpart CC standards.

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Table 4H-1 Analytical Areas

Area	Room	Function	Waste Activities	Permitted
ARL	Sample Receipt Laboratory	Sample receipt and staging for samples delivered manually or via the ASX.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Dissolution/Dilution Laboratory	General wet chemistry for preparation of samples, also primary location for decontamination of glassware/equipment.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Distillation/Titration Lab	Sample preparation and analysis, including distillation, titration, and physical measurements of samples.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Standard/Reagent Preparation Laboratory	Primary purpose is to prepare, stage and distribute reagents and quality control standards.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	X-ray Laboratory	Sample preparation, X-ray fluorescence (XRF), and optical microscopy. Quantifying metals concentrations utilizing the XRF system.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Instrument Laboratory	Primarily used for process technology testing. Space is provided for test beds for evaluation of ion exchange resins and Lab scale filtration units.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Process Technology Laboratories	Non-routine measurement of physical characteristics of low-activity process samples and process tests using synthetic solutions. Particle size analysis, differential scanning calorimeter/thermal gravimetric analysis (DSC/TGA), non-routine tests, analytical method development, and process support using synthetic solutions.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Elemental Analysis Laboratories	Preparation and analysis of samples using an inductively coupled plasma/atomic emission spectrometer (ICP/AES) or inductively coupled plasma-mass spectrometer (ICP/MS).	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	General Chemistry Lab	Preparation and analysis of samples for selected anions, organic acids, total inorganic carbon, and total organic carbon.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Radionuclide Preparation Laboratories	Samples are separated and prepared for counting. This includes weighing, evaporating, purifying, and preparing.	Dangerous and/or Mixed Waste managed in SAAs	No

Table 4H-1 Analytical Areas

Area	Room	Function	Waste Activities	Permitted
ARL	Radioisotope Counting Laboratory	Quantitation of concentration of alpha, beta, and gamma emitting radioisotopes in samples. Includes gamma spectrometry, gas proportional counting, alpha spectrometry, and liquid scintillation counting.	Dangerous and/or Mixed Waste managed in SAAs	No
ARL	Sample Shipping and Receiving Area	Provides space for loading shipping containers with outsourced sample material to laboratories and for initial receipt of manually delivered samples.	Dangerous and/or Mixed Waste managed in SAAs	No
Analytical Hotcell Laboratories				
AHL	Hotcell Sample Receiving	The hotcell is designed to receive the delivery of samples from the ASX or diluted manually delivered samples. Sample pH, specific gravity, and temperature are performed in this hotcell.	Dangerous and/or Mixed Waste managed in SAAs	No
AHL	Hotcell Sample Preparation	Generation of individual sample aliquots using sample homogenizer, electronic scales, centrifuge, filtration, stirring, and desiccators.	Mixed Waste managed in SAAs	No
AHL	Limited Process Technology	Evaluation of anomalies occurring in the processing facilities such as potential plugging of ultrafilters, ion exchange malfunction and material foaming, etc.	Mixed Waste managed in SAAs	No
AHL	Physical Properties	Measurements such as rheology, solids, and particle size measurements to support process operations.	Mixed Waste managed in SAAs	No
AHL	Digestion/Dilution Hotcells	Perform thermal-assisted acid digestion and alkali fusion dissolutions of WTP process samples.	Mixed Waste managed in SAAs	No
AHL	Radionuclide Preparation Hotcells	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.	Mixed Waste managed in SAAs	No
AHL	Ion Chromatography (IC) and Total Inorganic Carbon/Total Organic Carbon Preparation	Prepare samples for ion chromatography or carbon analyses in the ARL. Liquid samples are diluted and transferred to the ARL. Solid samples are leached with water and transferred to the ARL for analyses.	Mixed Waste managed in SAAs	No
AHL	Boildown and Physical Properties	Determine volume reduction of sample material achievable before solids form and test compatibility of different waste types.	Mixed Waste managed in SAAs	No

Table 4H-1 Analytical Areas

Area	Room	Function	Waste Activities	Permitted
AHL	ICP Preparation and Analyses	Preparation and analysis of samples using an ICP/AES or ICP/MS. These hotcells receive samples from sample preparation hotcells, or Limited Process Technology hotcell, or dissolution/dilution hotcells. ICP/AES instrument integrated with the glovebox/MS instrument integrated with the glovebox. The ICP/AES and ICP/MS instruments are integrated with a glovebox attached to the hotcell.	Mixed Waste managed in SAAs	No
AHL	Hotcell Solid Waste Management	Mixed and dangerous waste is generated within the hotcells. Compatible aqueous liquid waste is poured directly into the floor drain and flushed to the RLD system. Organic and solid waste is packaged into drums and managed by the radioactive solid waste handling system.	Mixed Waste managed in SAAs	No

1

Table 4H-2 Analytical Laboratory Container Storage Areas

Container Storage Area	Approximate Room Volume[1]	Maximum Waste Volume (US Gallons)[2]
Room A-0139	9,130 ft^3	68,297
Room A-0139A	1,370 ft^3	10,248
Room A-0139B	1,410 ft^3	10,548
Room A-0139C	1,240 ft^3	9,276
Room A-0139D	5,510 ft^3	41,217
Total WMA Volume	18,660 ft^3	139,586

[1]The dimension for height (H) is based on the assumption that the height of the largest waste container stored in the area (B-25 box is 5ft – stacked a maximum of two high is 10ft). Approximate room volume was calculated using (L x W x H, in feet).

[2]The conversion factor used to convert from cubic feet to gallons is 7.4805 gal/ft^3.

2

Table 4H-3 Analytical Laboratory Tank Systems

	RLD-VSL-00164	RLD-VSL-00165
Design standard	ASME Sec VIII Div 1	ASME Sec VIII Div 1
Material	Austenitic stainless steel UNS N08367, with a min. 6% Mo alloy.	Austenitic stainless steel UNS N08367, with a min. 6% Mo alloy.
Corrosion allowance	0.04”	0.04”
Total volume (US Gallons)[1]	3,180	9,100
Outside Diameter[1]	8’6”	16’0”
Height[2]	5’9”	2’3”
Shell thickness[1]	3/8”	11/16”
Bottom/top thickness[1]	3/8”	5/8”
Maximum operating volume (US Gallons)	2,740	6,615
Operating pressure	Atmospheric	Atmospheric
Operating temperature	Ambient	Ambient
Level indicator	Radar	Radar

[1]Approximate value

[2]Approximate Dimensions (inside Diameter) x Height or Length in feet and inches (tangent line/tangent line)

1

Table 4H-4 Analytical Laboratory Tank Systems Secondary Containment 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)[1]
A-B003 Lab Area Sink Drain Collection Vessel Cell	27ft 3in x 13ft	Laboratory Area Sink Drain Collection Vessel, RLD-VSL-00164	3,180	3.8
A-B004 Hot Cell Drain Collection Vessel Cell	29ft x 21ft	Hot Cell Drain Collection, RLD-VSL-00165	9,100	2.7

[1]Liner height calculations are in 24590-LAB-PER-M-02-001 “Dangerous Waste Permit Liner Heights in the LAB Facility” located in Appendix 11.8 Laboratory Engineering Calculations.

Table 4H-5 Analytical Laboratory 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 (US 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 and General Arrangement Diagram Number
Analytical Laboratory				
Sumps				
RLD-SUMP-00041 A-B003 (C3 Effluent Vessel Cell, El. -18'7")	30	Radar	30" Dia. x 13" Deep Stainless Steel (6% Mo)	**24590-LAB** -M6-RLD-00002001 -P1-60-00007
RLD-SUMP-00042 A-B004 (C5 Effluent Vessel Cell, El. -19'2")	30	Radar	30" Dia. x 13" Deep Stainless Steel (6% Mo)	**24590-LAB** -M6-RLD-00001001 -P1-60-00007
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 (6% Mo)	**24590-LAB** -M6-RLD-00002003 -P1-60-00007
RLD-SUMP-00043A A-B007 (C5 Pump Pit Sump, El. -6'-7" LP)	1.40	Radar	1'-6" x 3'-0" x 1/2" Stainless Steel (6% Mo)	**24590-LAB** -M6-RLD-00001002 -P1-60-00007
RLD-SUMP-00043B A-B005 (C5 Pump Pit Sump, El. -6'-7" LP)	1.40	Radar	1'-6" x 3'-0" x 1/2" Stainless Steel (6% Mo)	**24590-LAB** -M6-RLD-00001003 -P1-60-00007
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 (6% Mo)	**24590-LAB** -M6-RLD-00001004 -P1-60-00007

Table 4H-5 Analytical Laboratory 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 (US 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 and General Arrangement Diagram Number
Leak Detection Boxes				
RLD-LDB-00002 A-B004 (C5 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00008001 -P1-60-00007
RLD-LDB-00004 A-B004 (C5 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00008001 -P1-60-00007
RLD-LDB-00005 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00007001 -P1-60-00007
RLD-LDB-00006 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00007001 -P1-60-00007
RLD-LDB-00007 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00007001 -P1-60-00007
RLD-LDB-00008 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00007001 -P1-60-00007
RLD-LDB-00009 A-B004 (C5 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00008001 -P1-60-00007

Table 4H-5 Analytical Laboratory 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 (US 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 and General Arrangement Diagram Number
RLD-LDB-00011 A-B003 (C3 Effluent Vessel Cell, El. -10')	6	Thermal Dispersion	8" Dia. x 24" Length/ Stainless Steel 316L	**24590-LAB** -M6-RLD-00007001 -P1-60-00007
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 -P1-60-00007
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 -P1-60-00007
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 -P1-60-00007
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 -P1-60-00007

1

Table 4H-6 Analytical Laboratory Pump and Piping Pits

Cell Name	Room No.	Equipment	Leak Detection/Sump
C3 Pump Pit	A-B002	RLD-PMP-00182A/B	RLD-SUMP-00045
C5 Pump Pit (south)	A-B007	RLD-PMP-00183A	RLD-SUMP-0043A
C5 Piping Pit	A-B006	Valves and Piping for RLD-PMP-00183A/B	RLD-SUMP-00044
C5 Pump Pit (north)	A-B005	RLD-PMP-00183B	RLD-SUMP-00043B

1

Table 4H-7 Analytical Laboratory Tank Systems Description

Mixed Waste Tank Systems Name	Unit Designation	Engineering Description (Drawing Nos., Specification Nos., etc.)	Narrative Description, Tables & Figures	Maximum Capacity (gallons)
Radioactive Liquid Waste Disposal System RLD-VSL-00164 (Laboratory Area Sink Drain Collection Vessel) • RLD-LT-6202 • RLD-EDUC-00002A/B/C • RLD-SUMP-00041 • RLD-LT-6211 • RLD-PMP-00182A/B • RLD-SUMP-00045 • RLD-TWDVC-00003 • RLD-LT-6212 • RLD-LDB-00005/6/7/8/11 RLD-VSL-00165 (Hotcell Drain Collection Vessel) • RLD-LT-6104 • RLD-EDUC-00003A/B/C/D/E/F/G/H	RLD	**24590-LAB** -3ZD-RLD-00001[a] -M5-V17T-00029 -M6-RLD-00001001 -M6-RLD-00001002 -M6-RLD-00001003 -M6-RLD-00001004 -M6-RLD-00002001 -M6-RLD-00002003 -M6-RLD-00006001 -M6-RLD-00006002 -M6-RLD-00006003 -M6-RLD-00007001 -M6-RLD-00007002 -M6-RLD-00008001 -M6-RLD-00008002 -MVD-RLD-00164 -MVD-RLD-P0165	Section 4H.2.1; Table 4H-3 of Operating Unit Group 10, Chapter 4H of this Permit.	RLD-VSL-00164 = 3,200 RLD-VSL-00165 = 9,090

Table 4H-7 Analytical Laboratory Tank Systems Description

Mixed Waste Tank Systems Name	Unit Designation	Engineering Description (Drawing Nos., Specification Nos., etc.)	Narrative Description, Tables & Figures	Maximum Capacity (gallons)
• RLD-SUMP-00042 • RLD-LT-6115 • RLD-PMP-00183A • RLD-SUMP-00043A • RLD-TWDVC-00002A • RLD-LT-6116 • RLD-PMP-00183B • RLD-SUMP-00043B • RLD-TWDVC-00002B • RLD-LT-6124 • RLD-SUMP-00044 • RLD-TWDVC-00001 • RLD-LT-6123 • RLD-LDB-00002/4/9		-N1D-RLD-P0002 -N1D-RLD-P0003 -P1-60-00007 -P1-60-00008 **24590-WTP** -3PS-G000-T0002 -3PS-MV00-T0001 -3PS-MV00-T0002 -3PS-MV00-T0003 24590-CM-POA-MVA0-00010-01-02 24590-QL-POC-MVA0-00008-01-00001		

[a]System Descriptions are maintained in the Administrative Record, and are listed here for information only.

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Table 4H-8 Analytical Laboratory Tank System Process and Leak Detection System Instruments and Parameters

Instrument/ Monitor Tag Number	Type and Location	Monitored Parameter	Measurement or Display Range	Expected Operating Range	Failure State	Accuracy	Numerical Set Point	Control Function	Calibration Method and Frequency
Lab Area Sink Drain Collection Vessel (RLD-VSL-00164) in A-B003 (see 24590-LAB-M6-RLD-00002001)									
RLD-LT-6202	Radar level transmitter/ A-0160	Liquid level in RLD-VSL-00164	0 to 104-inches	35.5 to 51-inches	NA	± 0.4-inch	NA	Transmit liquid level in RLD-VSL-00164 to Process Control System (PCJ)	Non-calibratable
RLD-LI-6202A	Graphic display level indicator/ Control room	Liquid level in RLD-VSL-00164	0 to 3,200 gallons	1,018 to 1,578 gallons	Alarm as "bad quality," hold last good value	NA	NA	Display liquid level in control room, provides notifications	NA
RLD-LSHH-6202A	Level interlock/ software	Overfill prevention	NA	NA	Will cause protective interlocks to trip	NA	High-high liquid level = 2,248 gallons (70-inches)	Close RLD-YV-6210 and RLD-YV-6216 at Level HH set point	NA
C3 Vessel Cell Sump (RLD-SUMP-00041) in A-B003 (see 24590-LAB-M6-RLD-00002001)									
RLD-LT-6211	Radar level transmitter/ A-0160	Liquid level in RLD-SUMP-00041	0 to 75-inches	1.74 to 10-inches	NA	± 0.4-inch	HHH Alarm: 10 inches	Transmit liquid level in RLD-SUMP-00041 to PCJ	Non-calibratable
RLD-LI-6211	Graphic display level indicator/ Control room	Liquid level in RLD-SUMP-00041	0 to 75-inches	1.74 to 10-inches HHH Alarm: 10 inches	NA	NA	NA	Display liquid level in control room, provides notifications	NA

Table 4H-8 Analytical Laboratory Tank System Process and Leak Detection System Instruments and Parameters

Instrument/ Monitor Tag Number	Type and Location	Monitored Parameter	Measurement or Display Range	Expected Operating Range	Failure State	Accuracy	Numerical Set Point	Control Function	Calibration Method and Frequency
RLD-LKY-6211	Graphic display leak rate indicator/ Control room	Rate of liquid level change (LKY) in RLD-SUMP-00041	NA	NA	NA	NA	High leak rate = 2.4 gallons per day	Display control room high leak rate alarm	NA
C3 Leak Detection Box (RLD-LDB-00005) in A-B003 (see 24590-LAB-M6-RLD-00007001)									
RLD-LSH-6215	Thermal level switch/ A-0160	Liquid level in RLD-LDB-00005	NA	NA	NA	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable
RLD-LAH-6215	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA
C3 Leak Detection Box (RLD-LDB-00006) in A-B003 (see 24590-LAB-M6-RLD-00007001)									
RLD-LSH-6701	Thermal level switch/ A-0160	Liquid level in RLD-LDB-00006	NA	NA	NA	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable
RLD-LAH-6701	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA

Table 4H-8 Analytical Laboratory Tank System Process and Leak Detection System Instruments and Parameters

Instrument/ Monitor Tag Number	Type and Location	Monitored Parameter	Measurement or Display Range	Expected Operating Range	Failure State	Accuracy	Numerical Set Point	Control Function	Calibration Method and Frequency
C3 Leak Detection Box (RLD-LDB-00007) in A-B003 (see 24590-LAB-M6-RLD-00007001)									
RLD-LSH-6702	Thermal level switch/ A-0160	Liquid level in RLD-LDB-00007	NA	NA	NA	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable
RLD-LAH-6702	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA
C3 Leak Detection Box (RLD-LDB-00008) in A-B003 (see 24590-LAB-M6-RLD-00007001)									
RLD-LSH-6703	Thermal level switch/ A-0160	Liquid level in RLD-LDB-00008	NA	NA	NA	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable
RLD-LAH-6703	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA
C3 Leak Detection Box (RLD-LDB-00011) in A-B003 (see 24590-LAB-M6-RLD-00007001)									
RLD-LSH-6704	Thermal level switch/ A-0160	Liquid level in RLD-LDB-00011	NA	NA	NA	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable
RLD-LAH-6704	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA

Table 4H-8 Analytical Laboratory Tank System Process and Leak Detection System Instruments and Parameters

Instrument/ Monitor Tag Number	Type and Location	Monitored Parameter	Measurement or Display Range	Expected Operating Range	Failure State	Accuracy	Numerical Set Point	Control Function	Calibration Method and Frequency
C3 Pump Pit Sump (RLD-SUMP-00045) in A-B002 (see 24590-LAB-M6-RLD-00002003)									
RLD-LT-6212	Radar level transmitter/ A-0160	Liquid level in RLD-SUMP-00045	0 to 15-inches	0 to 1.25-inches	NA	± 0.4-inch	NA	Transmit liquid level in RLD-SUMP-00045 to PCJ	Non-calibratable
RLD-LI-6212	Graphic display level indicator/ Control room	Liquid level in RLD-SUMP-00045	0 to 15-inches	0 to 1.25-inches	NA	NA	High liquid level = 1.25-inches	Display liquid level in control room, provides notifications	NA
Hotcell Drain Collection Vessel (RLD-VSL-00165) in A-B004 (see 24590-LAB-M6-RLD-00001001)									
RLD-LT-6104	Radar level transmitter/ A-0167	Liquid level in RLD-VSL-00165	0 to 100-inches	21 to 43-inches	NA	± 0.4-inch	NA	Transmit liquid level in RLD-VSL-00165 to PCJ	Non-calibratable
RLD-LI-6104A	Graphic display level indicator/ Control room	Liquid level in RLD-VSL-00165	0 to 9,090 gallons	1,258 to 3,829 gallons	Alarm as "bad quality," hold last good value	NA	NA	Display liquid level in control room, provides notifications	NA
RLD-LSHH-6104A	Level interlock/ software	Overfill prevention	NA	NA	Will cause protective interlocks to trip	NA	High-high liquid level = 4,609 gallons (50-inches)	Close RLD-YV-6511, RLD-YV-6802, and RLD-YV-6102 at Level HH set point	NA

Table 4H-8 Analytical Laboratory Tank System Process and Leak Detection System Instruments and Parameters

Instrument/ Monitor Tag Number	Type and Location	Monitored Parameter	Measurement or Display Range	Expected Operating Range	Failure State	Accuracy	Numerical Set Point	Control Function	Calibration Method and Frequency
C5 Vessel Cell Sump (RLD-SUMP-00042) in A-B004 (see 24590-LAB-M6-RLD-00001001)									
RLD-LT-6115	Radar level transmitter/ A-0167	Liquid level in RLD-SUMP-00042	0 to 66-inches	1.74 to 10-inches	NA	± 0.4-inch	HHH Alarm: 10 inches	Transmit liquid level in RLD-SUMP-00042 to PCJ	Non-calibratable
RLD-LI-6115	Graphic display level indicator/ Control room	Liquid level in RLD-SUMP-00042	0 to 66-inches	1.74 to 10-inches	NA	NA	NA	Display liquid level in control room, provides notifications	NA
RLD-LKY-6115	Graphic display leak rate indicator/ Control room	Rate of liquid level change (LKY) in RLD-SUMP-00042	NA	NA	NA	NA	High leak rate = 2.4 gallons per day	Display control room high leak rate alarm	NA
C5 Pump Pit Sump (RLD-SUMP-00043A) A-B007 (see 24590-LAB-M6-RLD-00001002)									
RLD-LT-6116	Radar level transmitter/ A-0167	Liquid level in RLD-SUMP-00043A	0 to 75-inches	0 to 1.25-inches	NA	± 0.4-inch	NA	Transmit liquid level in RLD-SUMP-00043A to PCJ	Non-calibratable
RLD-LI-6116	Graphic display level indicator/ Control room	Liquid level in RLD-SUMP-00043A	0 to 75-inches	0 to 1.25-inches	NA	NA	High liquid level = 1.25-inches	Display liquid level in control room, provides notifications	NA

Table 4H-8 Analytical Laboratory Tank System Process and Leak Detection System Instruments and Parameters

Instrument/ Monitor Tag Number	Type and Location	Monitored Parameter	Measurement or Display Range	Expected Operating Range	Failure State	Accuracy	Numerical Set Point	Control Function	Calibration Method and Frequency
C5 Pump Pit Sump (RLD-SUMP-00043B) in A-B005 (see 24590-LAB-M6-RLD-00001003)									
RLD-LT-6124	Radar level transmitter/ A-0167	Liquid level in RLD-SUMP-00043B	0 to 15-inches	0 to 1.25-inches	NA	± 0.4-inch	NA	Transmit liquid level in RLD-SUMP-00043B to PCJ	Non-calibratable
RLD-LI-6124	Graphic display level indicator/ Control room	Liquid level in RLD-SUMP-00043B	0 to 15-inches	0 to 1.25-inches	NA	NA	High liquid level = 1.25-inches	Display liquid level in control room, provides notifications	NA
C5 Piping Pit Sump (RLD-SUMP-00044) in A-B006 (see 24590-LAB-M6-RLD-00001004)									
RLD-LT-6123	Radar level transmitter/ A-0167	Liquid level in RLD-SUMP-00044	0 to 24-inches	0 to 1.25-inches	NA	± 0.4-inch	NA	Transmit liquid level in RLD-SUMP-00044 to PCJ	Non-calibratable
RLD-LI-6123	Graphic display level indicator/ Control room	Liquid level in RLD-SUMP-00044	0 to 24-inches	0 to 1.25-inches	NA	NA	High liquid level = 1.25-inches	Display liquid level in control room, provides notifications	NA
C5 Leak Detection Box (RLD-LDB-00002) in A-B004 (see 24590-LAB-M6-RLD-00008001)									
RLD-LSH-6120	Thermal level switch/ A-0167	Liquid level in RLD-LDB-00002	NA	NA	NA	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable

Table 4H-8 Analytical Laboratory Tank System Process and Leak Detection System Instruments and Parameters

Instrument/ Monitor Tag Number	Type and Location	Monitored Parameter	Measurement or Display Range	Expected Operating Range	Failure State	Accuracy	Numerical Set Point	Control Function	Calibration Method and Frequency
RLD-LAH-6120	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA
C5 Leak Detection Box (RLD-LDB-00004) in A-B004 (see 24590-LAB-M6-RLD-00008001)									
RLD-LSH-6118	Thermal level switch/ A-0167	Liquid level in RLD-LDB-00004	NA	RESERVED	RESERVED	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable
RLD-LAH-6118	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA
C5 Leak Detection Box (RLD-LDB-00009) in A-B004 (see 24590-LAB-M6-RLD-00008001)									
RLD-LSH-6801	Thermal level switch/ A-0167	Liquid level in RLD-LDB-00009	NA	NA	NA	±0.25-inch	NA	Detect liquid in leak detection box	Non-calibratable
RLD-LAH-6801	Graphic alarm display/ Control room	Presence of liquid	On/off	NA	NA	NA	High liquid level = 0.5-inch	Indicate presence of liquid Alarm notifies operator of condition in LDB	NA

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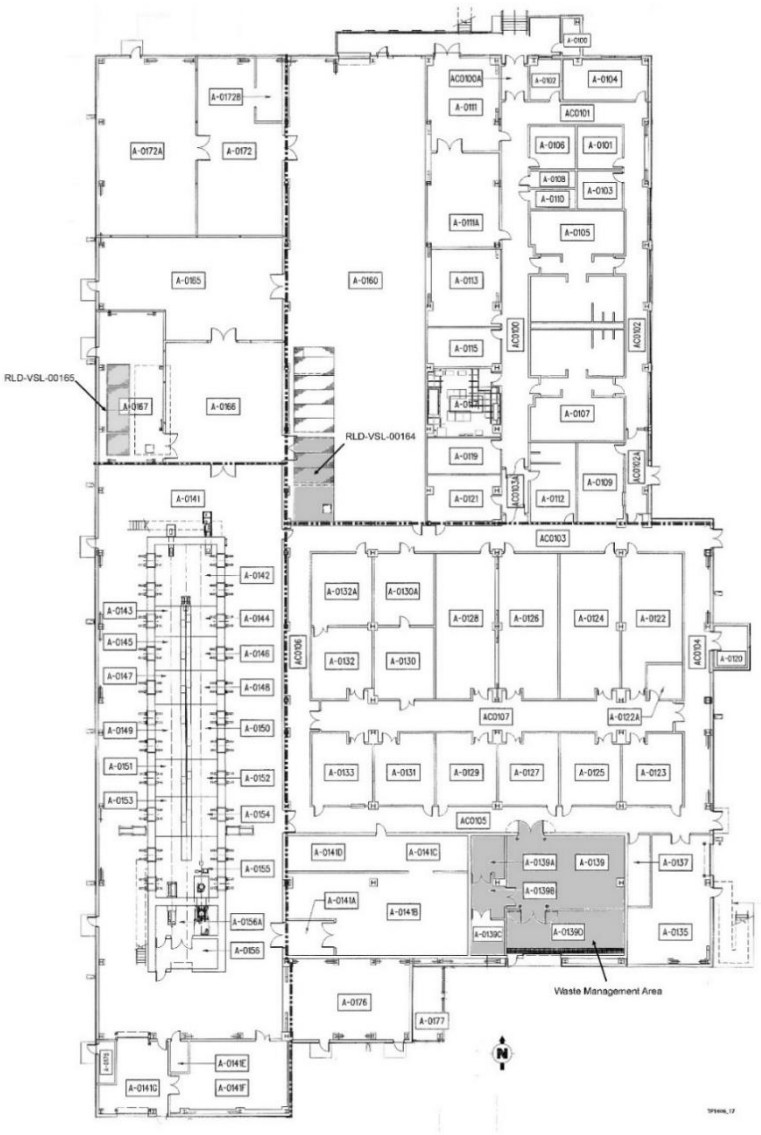

Figure 4H-1 Location of Analytical Laboratory Permitted Areas

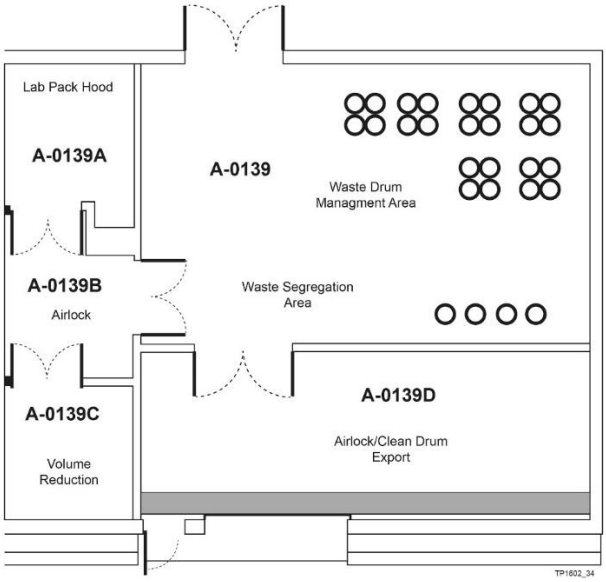

Figure 4H-2 Example of Drum Configuration in Waste Management Area

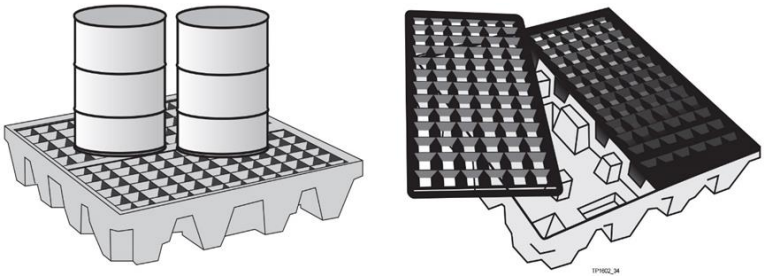

Figure 4H-3 Examples of Typical Secondary Containment Pallets

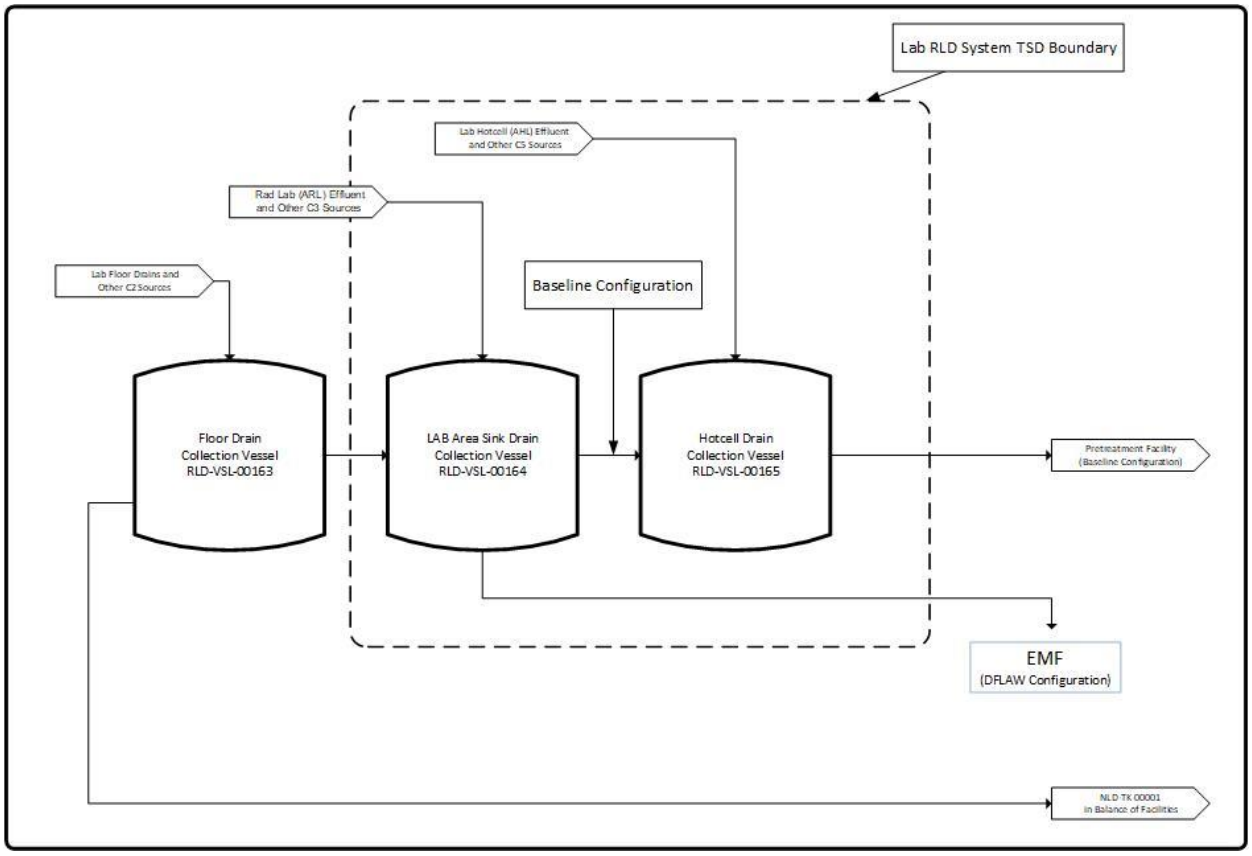

Figure 4H-4 Simplified Radioactive Liquid Waste Disposal Process Flow Diagram

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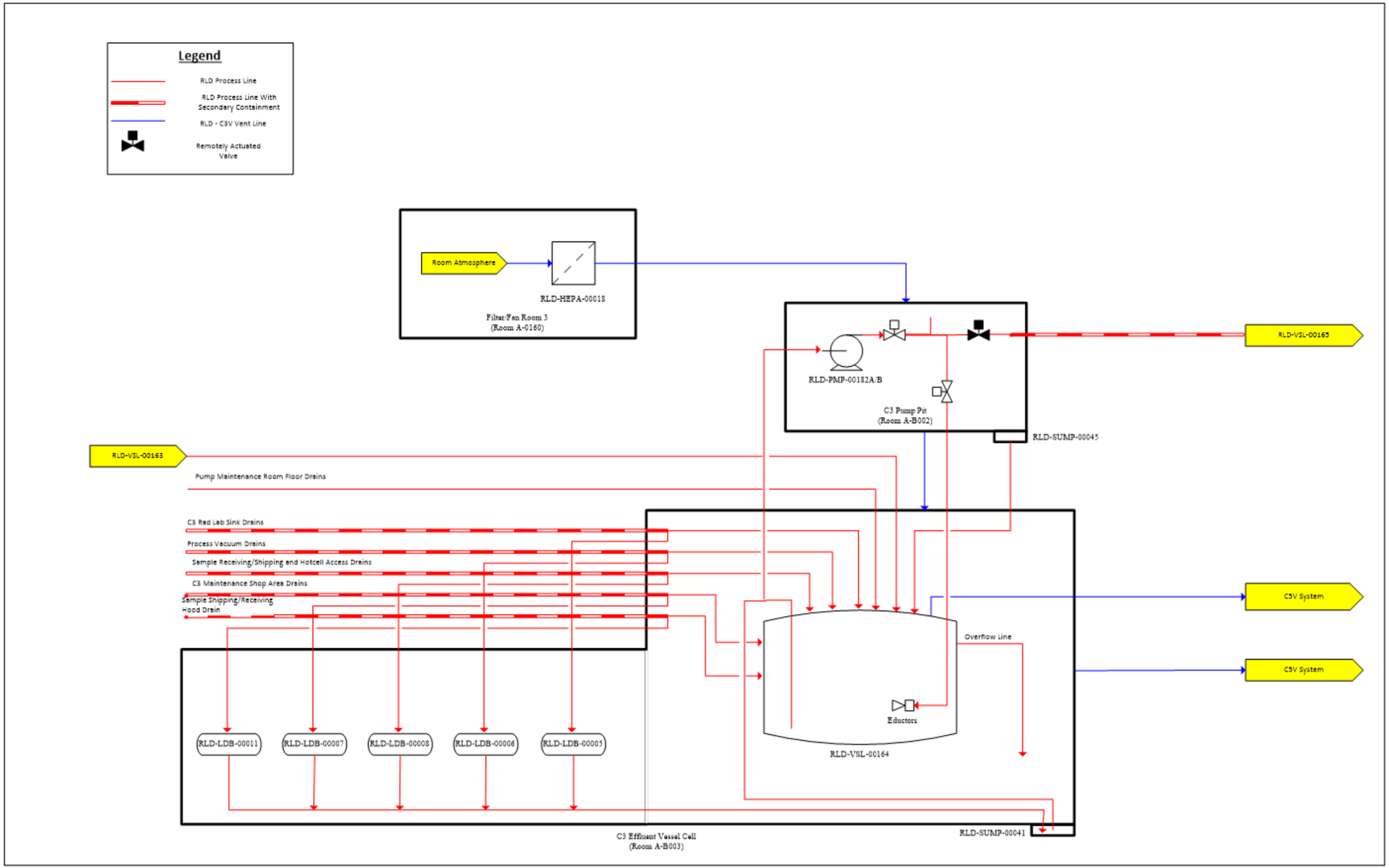
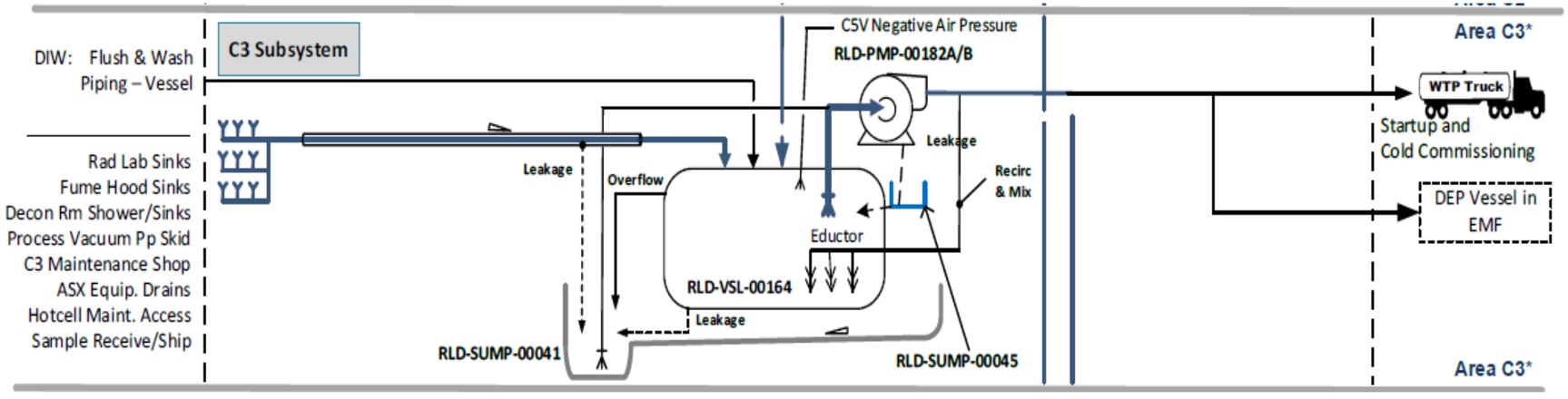


Figure 4H-5a Simplified Process Flow Diagram for Analytical Laboratory Area Sink Collection Vessel, RLD-VSL-00164



1 **Figure 4H-5b Simplified Process Flow Diagram for Analytical Laboratory Area Sink Collection Vessel, RLD-VSL-00164 in the DFLAW Configuration**

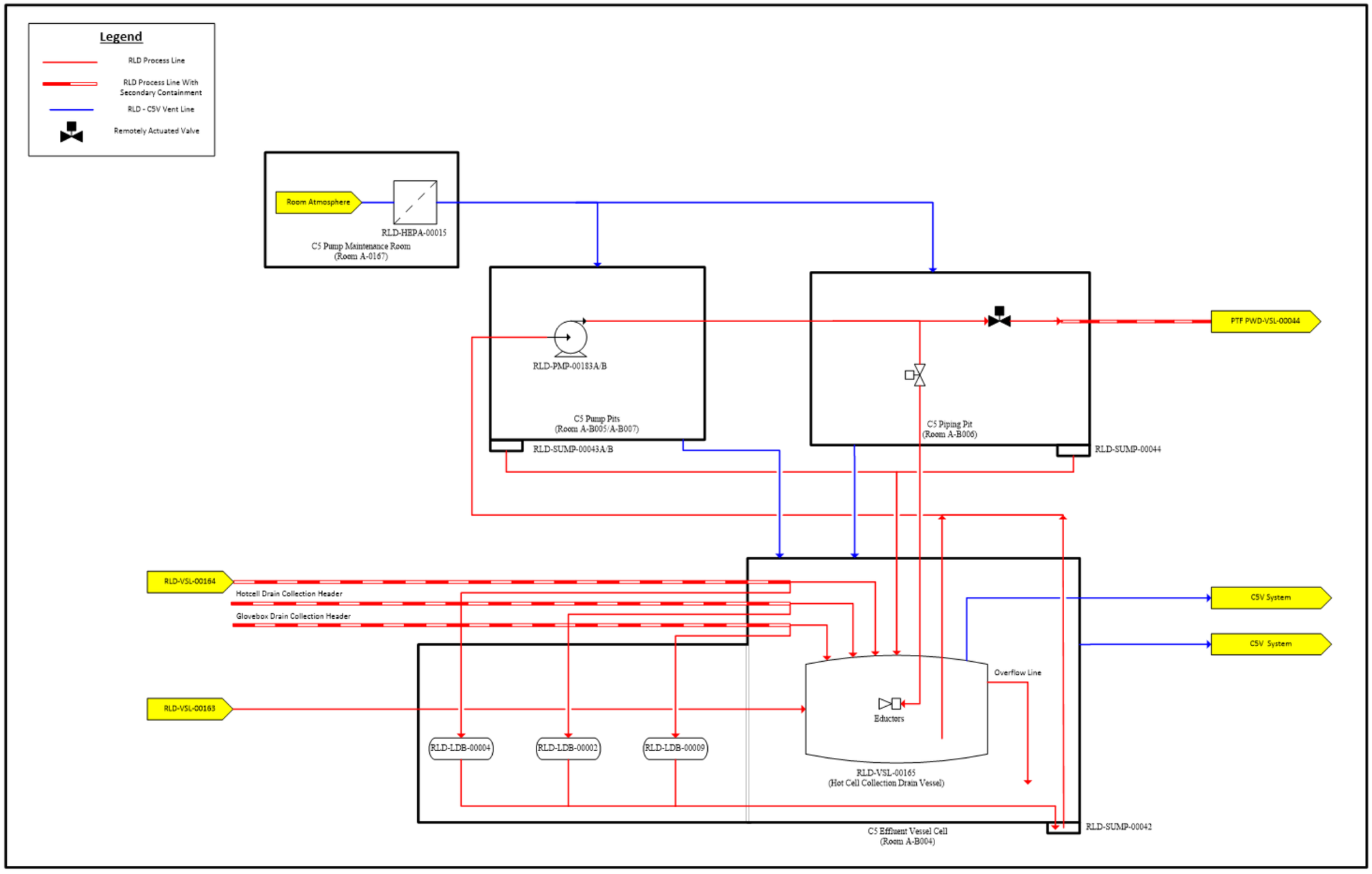


Figure 4H-6 Simplified Process Flow Diagram for Hotcell Drain Collection Vessel, RLD-VSL-00165

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