

WASTE TREATMENT AND IMMOBILIZATION PLANT
~~APPENDIX CHAPTER 4I~~
BALANCE OF FACILITIES
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
12/15/2016	8C.2016.Q3

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~~APPENDIX CHAPTER 4I~~
BALANCE OF FACILITIES

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APPENDIX CHAPTER 4I
BALANCE OF FACILITIES

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1 **4I Balance of Facilities (BOF)**

2 The Balance of Facilities (BOF) ~~will provide~~ provides support systems and utilities required for the waste
3 treatment processes within the ~~pretreatment facility, Pretreatment Facility, Low-Activity Waste (LAW)~~
4 vitrification facility, High-Level Waste (HLW) vitrification facility, ~~and~~ Analytical Laboratory (Lab),
5 and the Effluent Management Facility (EMF). These will include, but ~~will not be~~ limited to, heating and
6 cooling, process steam, process ventilation, chilled water, primary and secondary power supplies, and
7 compressed air. The primary BOF process support ~~facilities are described in Sections 4I.2 through 4I.9.~~
8 ~~These support and utility systems do not manage dangerous waste and are described below for~~
9 ~~information only. systems are:~~

- 10 • Plant service air (PSA)
- 11 • Plant cooling water (PCW)
- 12 • Low-pressure steam (LPS)
- 13 • High-pressure steam (HPS)
- 14 • Demineralized water (DIW)
- 15 • Process service water (PSW)
- 16 • Chilled water (CHW)
- 17 • Glass former reagent (GFR)
- 18 • Cathodic protection (CPE)

19 The BOF systems are described in Sections 4I.1 through 4I.10. The BOF support and utility systems
20 described in sections 4I.2 through 4I.9 will not manage dangerous waste, and are described below for
21 informational purposes only. Section 4I.1 addresses BOF dangerous waste container management areas,
22 and Section 4I.10 addresses the BOF cathodic protection system (CPE). The majority of the of
23 underground piping systems within the CPE system are not dangerous/mixed waste lines, however, a
24 segment of dangerous/mixed waste underground transfer lines between the Pretreatment Facility, and the
25 HLW Vitrification Facility, the LAW Vitrification Facility, and the Lab are cathodically protected.
26 Underground waste transfer lines to support the Direct Feed LAW configuration are isolated from the soil
27 environment with insulation and an ~~HPDE~~HDPE jacket, and are not part of the CPE system.

28 **4I.1 Containers**

29 This section identifies the containers and container management practices that will be followed at the
30 BOF. The term “container” is used as defined in Washington Administrative Code ([WAC](#)) [173-303-040](#).
31 Note that in this ~~appendix chapter~~ and throughout the permit, terms other than containers may be used,
32 such as canisters, boxes, bins, flasks, casks, and overpacks.

33 The container storage areas (~~secondary waste~~)-located within the BOF ~~consists of~~ include:

- 34 • Nonradioactive dangerous waste storage area
- 35 • Failed melter storage facility

36 Container storage area dimensions at the BOF are summarized in [Table 4I-1](#).

37 The following sections address waste management containers:

- 38 • Description of Containers - Section 4I.1.1
- 39 • Container Management Practices - Section 4I.1.2
- 40 • Container Labeling - Section 4I.1.3
- 41 • Containment Requirements for Storing Waste - Section 4I.1.4
- 42 • Prevention of Ignitable, Reactive, and Incompatible Wastes in Containers - Section 4I.1.5

1 4I.1.1 Description of Containers

2 ~~These~~The types of waste ~~will be~~ managed in containers include:

- 3 • Miscellaneous mixed waste (secondary waste)
- 4 • Miscellaneous nonradioactive dangerous waste (secondary waste)

5 The waste form dictates the type of containers used for waste management. The following paragraphs
6 describe these types of containerized waste that are managed at the BOF.

7 Miscellaneous Mixed Waste

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

- 10 • Spent or failed equipment
- 11 • Offgas High Efficiency Particulate Air (HEPA) filters
- 12 • Melter consumables
- 13 • Spent melters

14 Spent equipment and offgas filters will typically be managed in commercially-available containers such
15 as steel drums or steel boxes, of varying size. The containers for miscellaneous mixed waste will comply
16 with transportation requirements, with receiving ~~t~~reatment, ~~s~~Storage, and ~~d~~Disposal (TSD) facility waste
17 acceptance criteria, and will be compatible with the miscellaneous mixed waste. These containers may or
18 may not include a liner. Final container selection, container and waste compatibility, and the need for
19 liners, will be based on the physical, chemical, and radiological properties of the waste being managed.

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

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

26 The LAW Locally Shielded Melter (LSM) will be classified as hazardous debris for land disposal
27 restrictions purposes. After a spent HLW Melter is deemed to meet criteria and regulations for onsite
28 disposal, it will be placed in a welded carbon steel container (overpack) or other acceptable packaging in
29 accordance with waste acceptance criteria for the receiving TSD facility. ~~Regulatory issues and~~
30 ~~permitting actions associated with onsite disposal of spent and/or failed melters will be addressed in the~~
31 ~~future~~The design of the Failed Melter Storage Facility is addressed in interim compliance schedule, DWP
32 Operating Unit Group 10, Appendix 1.0.

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

36 Most miscellaneous secondary mixed wastes will be spent equipment and consumables such as pumps, air
37 lances, HEPA filters, etc., and are not expected to contain liquids. If wastes are generated that contain
38 liquids, ~~these wastes absorbents~~ may be ~~treated to remove or absorb liquids,~~added in order to comply with
39 the receiving TSD ~~f~~Facility waste acceptance criteria.

40 Miscellaneous Nonradioactive Dangerous Waste

41 Each nonradioactive dangerous waste container will have associated documentation that describes the
42 contents, such as waste type and physical and chemical characterization. ~~Typically,~~eCommercially
43 available containers will be used. The types of containers used for packaging nonradioactive dangerous

1 waste will comply with the receiving TSD facility waste acceptance criteria and transportation
2 requirements. However, final container selection, container and waste compatibility, and the need for
3 liners will be based on the physical and chemical properties of the waste being managed.

4 **4I.1.2 Container Management Practices**

5 The following paragraphs describe how ~~each of the~~ containers ~~used at the BOF~~ are managed in the BOF
6 container management areas.

7 **4I.1.2.1 Miscellaneous Mixed Waste and Miscellaneous Nonradioactive Dangerous** 8 **Waste Containers**

9 Miscellaneous Mixed Waste Containers

10 Miscellaneous mixed waste (secondary waste) will be managed in: the failed melter storage facility.
11 Containers will be kept closed unless waste is being added, removed, or sampled while in the container
12 storage area. Containers stored in this area will be placed on pallets, or otherwise elevated to prevent
13 contact with liquid, if present. Table 4I-1 summarizes the dimensions and maximum capacity of the
14 container storage area. Containers will be managed in the container storage area, and then transferred to a
15 suitable TSD facility.

- 16 • ~~Failed melter storage facility (BOF)~~

17 ~~Containers will be kept closed unless waste is being added, removed, or sampled while in the containment~~
18 ~~storage areas. Containers stored in these areas will be placed on pallets, or otherwise elevated to prevent~~
19 ~~contact with liquid, if present. Table 4I-1 summarizes the dimensions and maximum capacity of~~
20 ~~miscellaneous mixed waste storage areas. Containers will be managed in designated areas throughout the~~
21 ~~BOF, and then transferred to a suitable TSD facility.~~

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

25 Miscellaneous Nonradioactive Dangerous Waste Containers

26 Miscellaneous dangerous waste containers will typically be managed in the nonradioactive dangerous
27 waste container storage area, or in non-permitted waste management units (satellite accumulation areas
28 and less-than-90-day storage areas) located throughout the BOF. The nonradioactive dangerous waste
29 container storage area will consist of a concrete pad approximately 25 feet (ft) by 30 ft. The area may
30 include a metal roof or portable storage buildings such as cargo containers or storage lockers. Containers
31 will be kept closed unless waste is being added, removed, or sampled. They will routinely be moved by
32 forklift or drum cart, and will be managed in a manner that prevents ruptures and leaks. The storage
33 capacity for the nonradioactive dangerous waste container storage area is listed in ~~Table 4I-1.~~ Table 4I-1.
34 The containers in that area may be stacked two high and aisle spacing will be at least 30 inches (in.)
35 between rows of containers. Containers stored in this area will be placed on pallets, or otherwise elevated
36 to prevent contact with liquid, if present.

37 **4I.1.2.2 Waste Tracking**

38 The plant information network interfaces with the integrated control network and is designed to collect
39 and maintain plant information. The plant information network is currently planned to support the
40 following systems (all systems used at the plants/facilities and BOF are provided for information only):

- 41 • Plant data warehouse and reporting system
- 42 • Laboratory information management system
- 43 • Waste tracking and inventory system

1 Inventory and Batch Tracking

2 The waste tracking and inventory system will interface with the information system data historian to
3 provide reporting information such as tank volumes, waste characteristics, and facility inventories of
4 process waste. The waste tracking system will also be used to query operations parameters at any time
5 information is needed, as specified by operations, to manage the process system.

6 Secondary Waste Stream Tracking

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

10 Laboratory Information Management System

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

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

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

25 **4I.1.3 Container Labeling**

26 Miscellaneous Mixed Waste Containers

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

32 Miscellaneous Dangerous Waste Containers

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

38 **4I.1.4 Containment Requirements for Storing Waste**

39 Secondary containment requirements for the waste are discussed below.

40 **4I.1.4.1 Secondary Containment System Design**

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

1 Miscellaneous Mixed Waste

2 Miscellaneous mixed waste storage areas may contain waste requiring secondary containment. If wastes
3 containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated,
4 portable secondary containment that meets the requirements of [WAC 173-303-630\(7\)](#) will be provided.
5 The portable secondary containment provided will be capable of collecting and holding spills and leaks.
6 It will have the capacity to contain ten percent of the volume of all containers or the entire volume of the
7 largest container, whichever is greater.

8 Miscellaneous Dangerous Waste

9 The nonradioactive dangerous waste storage area may contain waste requiring secondary containment. If
10 wastes containing liquids or wastes exhibiting the characteristics of ignitability or reactivity are generated,
11 portable secondary containment that meets the requirements of [WAC 173-303-630\(7\)](#) will be provided.
12 The portable secondary containment provided will be capable of collecting and holding spills and leaks.
13 It will have the capacity to contain ten percent of the volume of all containers or the entire volume of the
14 largest container, whichever is greater.

15 **4I.1.4.2 System Design**

16 Miscellaneous Mixed Waste

17 There will be one miscellaneous mixed waste (secondary waste) container storage area at the BOF, as
18 follows:

- 19
 - Failed melter storage facility

20 The failed melter storage facility will be used primarily to manage HLW Melters that have completed
21 their useful service life. These units will be received in carbon steel overpack containers allowing limited
22 hands-on contact. These overpacks will not be opened while the waste melters are located in this storage
23 facility. The facility is capable of storing up to three waste melters at any given time. The spent HLW
24 Melters will not be stacked.

25 The failed melter storage facility may also receive containerized miscellaneous mixed waste, if needed.
26 These waste containers will be sealed prior to transport to the failed melter storage facility. The
27 containers will not be opened while at this storage facility. The waste containers will not be stacked more
28 than two containers high. The failed melter storage facility will be a stand-alone building located in the
29 southern portion of the Waste Treatment Plant (WTP).

30 Miscellaneous Dangerous Waste

31 Waste containing liquid may be present in the nonradioactive dangerous waste storage area. Containers
32 with liquids will be provided with portable secondary containment meeting the requirements of
33 [WAC 173-303-630\(7\)](#).

34 **4I.1.4.3 Structural Integrity of the Base**

35 The storage areas will be constructed to support storage and transportation of containers within the
36 container storage areas and will be designed with the following:

- 37
 - Containment system capable of collecting and holding spills and leaks.
 - 38 • Base will be free of cracks and gaps and sufficiently impervious to contain leaks.
 - 39 • Positive drainage control.
 - 40 • Sufficient containment volume.
 - 41 • Sloped to drain or remove liquid, as necessary.

1 **4I.1.4.4 Containment System Capacity**

2 Miscellaneous Mixed Waste

3 Each container holding liquid dangerous waste will be placed into portable secondary containment that
4 meets the requirements of [WAC 173-303-630\(7\)](#). The waste container will function as the primary
5 containment while the portable containment device will function as the secondary containment.

6 Each portable secondary containment will have the capacity to contain 10% of the volume of all
7 containers within the containment area, or the volume of the largest container, whichever is greater.

8 Miscellaneous Dangerous Waste

9 Waste containing liquid may be present in the nonradioactive dangerous waste container storage area.

10 Each container holding liquid nonradioactive dangerous waste will be placed into portable secondary
11 containment. The waste container will function as the primary containment while the portable
12 ~~sump~~secondary containment device will function as the secondary containment.

13 Each portable secondary containment will have the capacity to contain 10% of the volume of all
14 containers within the containment area, or the volume of the largest container, whichever is greater.
15 Typically, the waste containers will be steel drums.

16 **4I.1.4.5 Control of Run-On**

17 Miscellaneous Mixed Waste

18 Run-on will not reach the interior of the BOF miscellaneous mixed waste storage areas, because ~~they~~the
19 storage areas will be located within buildings, ~~which will have provided with~~ roof gutters to remove
20 precipitation.

21 Miscellaneous Dangerous Waste

22 Run-on will not reach the interior of the nonradioactive dangerous waste container storage area, because
23 waste will be managed in buildings with walls and roof to remove precipitation.

24 **4I.1.4.6 Removal of Liquids from Containment System**

25 Miscellaneous Mixed Waste

26 Portable secondary containment ~~sumps~~devices will be provided for individual containers that contain
27 liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary
28 containments.

29 Miscellaneous Dangerous Waste

30 Portable secondary containment ~~sumps~~devices will be provided for individual containers that contain
31 liquids. Hand pumps or similar devices will be used to remove liquid released to the portable secondary
32 containments.

33 **4I.1.4.7 Demonstration that Containment is not Required because Containers do not** 34 **Contain Free Liquids, Wastes that Exhibit Ignitability or Reactivity, or Wastes** 35 **Designated F020-023, F026 or F027**

36 Miscellaneous Mixed Waste

37 Secondary containment will be provided for individual containers that manage liquids. Wastes with the
38 F020-F023, F026, and F027 numbers are not identified for the double shell tank (DST) system.
39 Therefore, these waste numbers will not be present at the BOF.

40 Miscellaneous Dangerous Waste

1 The nonradioactive dangerous waste container storage area may manage liquids and D001 and D003
 2 waste; therefore, secondary containment will be provided. Wastes with the F020-F023, F026, and F027
 3 numbers are not identified for the DST system. Therefore, these waste numbers will not be present at the
 4 BOF.

5 **4I.1.5 Prevention of Reaction of Ignitable, Reactive, and Incompatible Wastes in** 6 **Containers**

7 ~~The requirements of this section are not applicable to the spent melter.~~

8 Ignitable, Reactive, or Incompatible Miscellaneous Mixed Waste and Miscellaneous Dangerous 9 Waste

10 Potentially incompatible wastes are not expected to be managed in the ~~miscellaneous mixed waste storage~~
 11 ~~areas, except for the nonradioactive dangerous waste~~BOF container storage areas. If such wastes are
 12 managed in ~~this these~~ areas, the containers of incompatible wastes or chemicals will not be stored in close
 13 proximity to each other. Acids and bases will be stored on separate portable secondary containment
 14 ~~sumps~~devices; oxidizers will be stored in areas separate from combustible materials; and corrosive
 15 chemicals will be stored on a separate portable secondary containment ~~sump~~devices. These separate
 16 storage areas within the unit will be clearly marked with signs indicating the appropriate waste to be
 17 stored in each area. Potentially incompatible waste will be stored at least one aisle width apart.

18 **4I.2 Plant Service Air (PSA) / Instrument Service Air Systems**

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

26 The PSA system components will consist of compressors, dryers, air receiver vessels, distribution piping,
 27 pressure control stations, air amplifiers, valves, vents, drains, utility racks, filters, and monitoring
 28 instruments.

29 The ISA system is a distribution piping network that will reduce and control downstream air pressure and
 30 supplies compressed air to designated equipment, instruments, and other end users located throughout the
 31 facility. It will maintain a reservoir of compressed air received from the BOF PSA system and in doing
 32 so, dampen pressure fluctuations caused by variations in the supplied airflow or in end-user demands. In
 33 addition, the Pretreatment facility and LAW vitrification facility are designed to use ISA stored air as a
 34 short-term supply of backup air in the event that services from the BOF PSA are interrupted.

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

37 **4I.3 Plant Cooling Water System (PCW)**

38 The BOF plant cooling water system (PCW) ~~provides~~system will provide a continuous supply of cooling
 39 water to selected plant equipment for heat removal. The ~~BOF PCW system supplies will receive potable~~
 40 make-up water from the domestic water system (DOW) at the cooling tower. A backup source will be
 41 provided from the raw water system (RWW). The PCW system will supply cooling water to the air and
 42 chiller ~~compressors/compressor plant~~, steam plant and process areas. The system will remove heat from
 43 active process equipment and cooling coils in process buildings and conducts this heat to the atmosphere
 44 or local environment through evaporation at the cooling tower. In ~~PTF~~the Pretreatment facility, the PCW
 45 is used in the waste feed evaporation process (FEP), treated LAW evaporation process (TLP), cesium
 46 nitric acid recovery process (CNP), and pretreatment vessel vent process (PVP) systems.

1 Cooling water for the HLW ~~facility~~vitrification facility supports the HLW ~~concentrate receipt process~~
 2 ~~(HCP), HLW melter feed process (HFP), HLW melter process (HMP), and the HLW melter offgas~~
 3 ~~treatment system (HOP), and melter power supplies.~~ For the LAW ~~facility~~vitrification facility, the major
 4 user is the LAW melter process system (LMP), ~~pour cave cooling panels, and LAW melter power~~
 5 ~~supplies.~~

6 ~~The BOF PCW system will include, but is not limited to, the cooling tower, cooling tower basin, the~~
 7 ~~primary cooling water circulation pumps, filter pumps, chemical injection tanks, and associated piping.~~
 8 The cooling water system is designed with primary and secondary loops to remain uncontaminated by
 9 mixed waste constituents. The primary loop circulates cooling ~~water~~waste through heat exchangers
 10 within the HLW vitrification facility, LAW vitrification facility, and ~~pretreatment facilities~~Pretreatment
 11 ~~facility~~ and through equipment in the BOF chiller compressor plant. The system also provides cooling
 12 water to quench the steam plant blow down. The HLW vitrification facility, LAW vitrification facility,
 13 and ~~pretreatment facilities~~Pretreatment facility will also have closed secondary loops that distribute
 14 cooling water to process equipment. Cooling water will be chemically treated to promote system
 15 operability and service life of 40 years.

16 **4I.4 Low-Pressure Steam System (LPS)**

17 ~~This~~The low-pressure steam system (LPS) will provide a continuous supply of low-pressure steam for
 18 various users in the pretreatment facility, Lab, LAW vitrification facility, EMF, and HLW vitrification
 19 facility. The process facilities main use of steam will be for tank heating for the evaporation process, and
 20 for HVAC heating coils.

21 The low-pressure steam system will be supplied from the high-pressure steam system through
 22 pressure-reducing stations. The low pressure applications will consist of air handling units, humidifiers,
 23 and booster heaters. The steam condensate and feed system will collect condensate from the low-pressure
 24 steam users, monitor for mixed waste contamination, and return it to the steam plant for re-use.

25 **4I.5 High-Pressure Steam System (HPS)**

26 The high-pressure steam system (HPS) will provide a continuous supply of high-pressure steam ~~for~~
 27 ~~ejectors used for fluid transfers, and hot water heaters in the pretreatment, LAW to the Pretreatment~~
 28 ~~facility, Lab, LAW vitrification facility, EMF, and HLW vitrification facility facilities.~~ The high pressure
 29 saturated steam is generated in the BOF steam plant facility (SPF) houses the boilers that produce the
 30 steam, which consists of six fire tube boiler packages (five continuously operating at peak conditions, and
 31 one in standby), and associated supporting equipment. The HPS distributes steam through above ground
 32 piping to process equipment, ejectors for transfer of fluids, and hot water heaters in the Pretreatment
 33 Facility, Lab, LAW Vitrification Facility, EMF, and HLW Vitrification Facility.

34 **4I.6 Demineralized Water System (DIW)**

35 ~~This~~The demineralized water system ~~treats~~(DIW) will treat process service water ~~to, and produce, store~~
 36 and distribute ~~demineralized water~~the treated water through an underground piping distribution system to
 37 users in ~~pretreatment, HLW, LAW BOF, Pretreatment facility, Lab, and BOF facilities.~~LAW vitrification
 38 facility, EMF, and HLW vitrification facility. Demineralized water ~~is~~will be produced in the BOF water
 39 treatment building by pumping process service water through ~~5 micron, 2 micron, and 1 micron a series~~
 40 ~~of~~ cartridge filters. ~~Water is further treated by one of two and~~ reverse osmosis units. ~~Demineralized~~The
 41 treated water iswill be stored in the BOF demineralized storage tank. ~~Prior to distribution to process~~
 42 ~~facilities, demineralized water is treated using~~Demineralized water will be pumped from the storage tank
 43 through an ultraviolet (UV) sterilization and an additional 2 micron system to decontaminate biological
 44 organisms then sent through a final cartridge filter, before it is fed into the distribution system.

45 ~~The primary systems that utilize demineralized water include:~~

- 46 ~~• Fresh ion exchange resin addition~~

- 1 ~~• Chemical reagent makeup~~
- 2 ~~• Wet electrostatic precipitator misting~~
- 3 ~~• Wash rings~~
- 4 ~~• Decontamination~~
- 5 ~~• Melters~~
- 6 ~~• Analytical laboratory~~
- 7 ~~• Process and transfer piping and tank system flushes~~
- 8 ~~• Boiler make up~~

9 Demineralized water will primarily be used for boiler makeup, chemical reagent makeup, equipment
 10 decontamination, process pipeline flushes, sampling pipeline flushes, vessel and bulge rinses, pump
 11 priming, Wet Electrostatic Precipitator misting, and instrumentation rinses.

12 **41.7 Process Service Water System (PSW)**

13 ~~This~~The process service water system (PSW) will supply provide filtered water for operations and
 14 maintenance purposes. The water will be stored and distributed to the Pretreatment facility, LAW
 15 vitrification facility, EMF, HLW vitrification facility and Lab. The system will consist of two storage
 16 tanks, filters, pumps, and distribution piping and supply filtered water to end users. This water will serve
 17 processes for various systems, such as offgas treatment, plant wash systems, and make-up to chilled water
 18 systems. The BOF process service water system receives. The PSW will receive water directly from the
 19 Hanford site domestic (potable) water system (DOW). The water is stored and distributed to the
 20 pretreatment, LAW, HLW, and Lab facilities, Equipment for the chiller compressor plant (CCP), PSW is
 21 located in the demineralized water system (DIW), and water treatment building (WTB), except for the
 22 tanks, which are located outside.

23 **41.8 Chilled Water (CHW) System**

24 ~~This closed loop~~The chilled water (CHW) system will supply chilled water to various HVAC unit cooling
 25 coils and plant selected equipment coolers for in the WTP. Chilled water HLW vitrification facility, EMF,
 26 Lab, LAW vitrification facility, and Pretreatment facility. The CHW system will consist of chillers,
 27 fixed-speed distribution pumps, adjustable-speed drive booster pumps, an expansion vessel, a chemical
 28 feed vessel, an air separator, piping, valves, in-line components, instruments, and controls.

29 Each of these facilities will be used in various systems throughout equipped with a secondary CHW loop
 30 that draws from the WTP primary distribution. The HLW vitrification facility, Lab, EMF, and LAW
 31 vitrification facility secondary loops will supply water to air handling units, fan coil units, in-bleed
 32 cooling coils, and breathing service air system compressors. Both the LAW vitrification facility and
 33 Pretreatment facility secondary loops will supply water to heat exchangers used by the process cooling
 34 loops.

35 The chilled water system is designed to remain uncontaminated by mixed waste constituents. The
 36 process cooling loops are closed loops systems and do not share circulating water with the secondary or
 37 primary loops. The process cooling loops in the LAW vitrification facility and Pretreatment facility are
 38 used for cooling both process vessel cooling coils and process vessel cooling jackets. Secondary chilled
 39 water will be chemically treated to promote system operability and provide a service life of 40
 40 years returns from the HLW vitrification facility, Lab, LAW vitrification facility, EMF, and Pretreatment
 41 facility and cascades through the PSA dryer coolers before it is cooled and once again returns to the end
 42 users.

43 The CHW system primary and secondary loops, as well as the LAW and PTF CHW process cooling
 44 loops, will receive corrosion inhibitors and pH adjustment chemicals, as needed, to limit deterioration of
 45 the materials that are in contact with the cooling medium and the fouling of heat transfer surfaces.

41.9 Glass Former Reagent (GFR) System

The glass former reagent system ~~provides~~(GFR) will provide glass former reagents and sucrose to the LAW Vitrification Facility and HLW ~~vitrification facilities.~~Vitrification Facility. The system will also provides silica to the LAW container finishing handling system (LFH) for inert void fill for ILAW containers. Sucrose may also be mixed with the glass formers and added to the radioactive waste to enhance melter performance. The GFR system is comprised of the equipment needed to receive, store, blend, and transport glass formers to the ~~vitrification facilities.~~LAW Vitrification Facility and HLW Vitrification Facility. The GFR system includes the glass former handling equipment in BOF, the glass former mixers located in HLW vitrification facility and LAW ~~facilities~~vitrification facility and the inert fill ~~day~~-hoppers in the LAW facility vitrification facility. The LAW vitrification facility and HLW vitrification facility portions of the GFR system are described in WTP DWP Permit Sections 4E.2.1 and 4F.2.1, respectively.

41.10 Cathodic Protection System

An impressed current cathodic protection system will be used for eliminating or mitigating corrosion on interplant underground piping as well as the interior surfaces and bottoms of most field erected tanks. The cathodic protection system will maintain a negative polarized potential between the protected pipe or tank and a saturated copper/copper sulfide reference electrode. The impressed current cathodic protection system will use direct current provided by a rectifier that is powered from the plant's normal 480 VAC power system. The direct current from the rectifier will be connected across the buried anode wire and the protected pipe or tank bottom. The current flows from the anode wire, which is positive, through the electrolyte, to the protected surface, which is negative, and back to the rectifier completing the electrical circuit.

BOF non-dangerous/mixed waste containing pipelines and equipment that will be cathodically protected include:

- Plant service air main headers
- Diesel fuel oil pipelines (between the diesel fuel oil tank and the steam plant facility)
- Anhydrous ammonia reagent pipeline
- PSA-ITS compressed air pipeline
- Metallic piping and fittings that are within the zone of influence of the cathodic protection system.

BOF non-dangerous/mixed waste field erected tanks that are cathodically protected include:

- Fuel oil tank
- Domestic water tank
- Demineralized water tank
- Process service water feed tank
- Process service water supply tank
- Non-rad effluent tank
- Fire water tanks

Additionally, various underground waste transfer pipelines that manage mixed waste are cathodically protected. Underground mixed waste transfer pipelines within WTP that will be cathodically protected include:

- Transfer lines between the Pretreatment Facility and the HLW Vitrification Facility
- Transfer lines between the Pretreatment Facility and the LAW Vitrification Facility

1 • Transfer lines between the Analytical Laboratory and the Pretreatment Facility

2 The underground waste transfer lines installed to support the Direct Feed LAW (DFLAW) configuration
3 are coaxial lines that are constructed of stainless steel primary pipe, with a carbon steel encasement pipe
4 that is coated with fusion bonded epoxy (FBE). The coating system and water barrier consist of the FBE,
5 polyurethane insulation, and a jacket or thermoplastic outer water barrier made of high density
6 polyethylene (HDPE). Cathodic protection is not needed for the underground waste transfer lines installed
7 to support the DFLAW configuration as the pipe system is made of corrosion resistant materials,
8 providing water resistant construction. Additional information on the cathodic protection system for the
9 underground waste transfer lines that manage mixed waste for all facilities can be found in Chapter 4
10 Process Information.

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Table 4I-1 BOF Container Storage Areas		
Container Storage Area	Maximum Waste Volume (US Gallons) ¹	Approximate Dimensions (L x W x H, in feet) ²
Other Areas		
1. Nonradioactive Dangerous Waste Container Storage Area (located on the Part A Figures)	56,104	25' x 30' x 10'
2. Failed Melter Storage Facility (located on the Part A Figures)	403,947	75' x 45' x 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).		

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