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FACT SHEET
PART V, CLOSURE UNIT GROUP 25, PUREX

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1 **FACT SHEET**

2 **PART V, CLOSURE UNIT GROUP 25, PUREX**

3 **UNIT DESCRIPTION**

4 The Plutonium-Uranium Extraction (PUREX) Plant is one of five processing facilities the Permittees used
5 for reprocessing spent fuel. (These facilities are sometimes called “canyons” because they are large and
6 their interiors look like canyons.) PUREX is in the southeast part of the 200 East Area.

7 At PUREX, the Permittees recovered plutonium and uranium from spent nuclear fuel. They used liquid
8 processes to separate the plutonium and uranium.

9 The PUREX Plant was built in 1956. It extracted plutonium and uranium more efficiently than the older
10 canyon facilities. So beginning in 1958, PUREX handled spent fuel Hanford produced. Also in 1958, the
11 Permittees began recovering neptunium in PUREX in occasional batches.

12 In 1963 the Permittees began modifying PUREX to handle other fuel types, including fuel from N
13 Reactor. During 1965 and 1966, PUREX processed powered thorium oxide fuel targets that had been
14 irradiated for the production of uranium-233.

15 In September 1972, the PUREX Facility was shut down for 11 years. Maintenance and upgrades
16 continued during this time. In 1983, the Permittees restarted PUREX at a decreased plutonium
17 production rate.

18 In 1988, after steam pressures fell below levels needed to support backup safety equipment, PUREX
19 closed for nearly a year. The Permittees repaired equipment and improved waste handling systems during
20 that period. In early 1990, after a stabilization run lasting only a few weeks, PUREX closed again to
21 prepare more environmental and safety documentation and facility upgrades. In October 1990, the U.S.
22 Secretary of Energy placed the PUREX Facility on standby status. The U.S. Department of Energy
23 (USDOE) issued a final closure order in December 1992.

24 PUREX includes the 202-A Building (the canyon building) and various support structures. The 202-A
25 Building is a reinforced concrete structure about 306 meters long, 36 meters wide, and 30 meters high,
26 with about 12 meters of the height underground. The 202-A Building has three main parts:

- 27 1. A thick-walled, concrete canyon containing remotely operated process equipment (in cells,
28 mostly below grade).
- 29 2. Pipe and operating, sample, and storage galleries.
- 30 3. An annex with offices, process control rooms, laboratories, and building services.

31 PUREX also includes the two tunnels, PUREX Storage Tunnel Number 1 and PUREX Storage Tunnel
32 Number 2. They are connected to and extend from the south side of the PUREX canyon.

33 The Permittees finished building PUREX Storage Tunnel Number 1 in 1956. The tunnel is about
34 5.8 meters (19 feet) wide by 6.7 meters (22 feet) high by 109 meters (358 feet) long. It has storage space
35 for eight railcars. Between June 1960 and January 1965, the Permittees filled the eight railcar spaces and
36 sealed the tunnel.

37 The Permittees finished building PUREX Storage Tunnel Number 2 in 1964. It is about 5.8 meters
38 (19 feet) wide by 6.7 meters (22 feet) high by 514 meters (1,686 feet) long. It has storage space for 40
39 railcars. In December 1967, the first railcar went into in Tunnel Number 2. Tunnel Number 2 now has
40 28 railcars.

41 The PUREX permitted tank system treated and stored waste. A tank system includes the tank (vessel)
42 and its related equipment. The storage tanks within PUREX specifically supported clean up transition
43 phase activities in the mid-1990s. Tanks TK-P4 and TK-40 are outside of the 202-A building, but in the
44 scope of this unit.

1 The Permittees have removed liquids from all 45 tanks and have flushed the tanks. These tanks are
2 considered empty, but have yet to formally satisfy closure performance standards. The tanks await final
3 disposition.

4 PUREX also contains a mixed waste storage area. It includes the canyon deck and F-Cell. Ecology
5 regulates it as a containment building. The containment building is subject to the dangerous waste
6 requirements of Washington Administrative Code ([WAC 173-303-695](#)).

7 The Permittees have removed all debris (process equipment from the PUREX process, lead shielding,
8 etc.) that they stored on the canyon deck. They moved that debris to the PUREX Storage Tunnels. F-Cell
9 stores a steel open-top skid with concrete chips from the E-Cell floor. Although the Permittees have
10 removed waste from the canyon deck, the containment building has yet to meet closure performance
11 standards in the Permit.

12 **TYPE AND QUANTITY OF WASTE**

13 The PUREX process used a recyclable salting agent, nitric acid, and tri-butyl phosphate (TBP) in a
14 normal paraffin hydrocarbon (NPH) solution as a solvent.

15 In PUREX Tunnel Number 1, the combined volume of the equipment stored on the eight railcars is about
16 596 cubic meters (780 cubic yards). The maximum process design capacity for storage in this tunnel is
17 about 4,129 cubic meters (5,400 cubic yards).

18 In PUREX Tunnel Number 2, the volume of equipment stored on the 28 railcars is about 2,204 cubic
19 meters (2,883 cubic yards). The maximum process design capacity for storage in this tunnel is about
20 19,878 cubic meters (26,000 cubic yards).

21 The PUREX Storage Tunnels are designated as a Miscellaneous Unit. They store mixed waste subject to
22 the requirements of [WAC 173-303-680](#). The two tunnels store waste from the PUREX Plant and other
23 onsite sources. The Permittees store mixed waste in the tunnels on railcars, but not all the stored material
24 contains mixed waste.

25 PUREX consists of three types or groups of dangerous waste management units. Table 1 shows the units,
26 including the permitting authorizations for managing existing waste and accepting other waste.

27 **Table 1 Closure Unit Group 25 (PUREX) Dangerous Waste Management Units**

Dangerous Waste Management Unit(s)	Manages Existing Waste?	Authorized to Accept Additional Waste?	Regulated Unit Type
PUREX Storage Tunnels	Yes	Tunnel 1 - No Tunnel 2 – Yes	Miscellaneous Unit WAC 173-303-680
PUREX Tank System (See Addendum A)	No	No	Tank System WAC 173-303-640
PUREX Containment Building (canyon deck and F-Cell)	F-Cell – Yes Canyon Deck – No	No	Containment Building 40 CFR 264.1100, incorporated by reference by WAC 173-303-695

28 **BASIS FOR PERMIT CONDITIONS**

29 Only PUREX Storage Tunnel, 1, PUREX Storage Tunnel 2, and the F-Cell in the PUREX Canyon are
30 authorized to manage existing waste. Only PUREX Storage Tunnel 2 is authorized to accept waste.

31 Closure Unit Group 25 (PUREX) includes both closure and operating unit groups. All of the dangerous
32 waste management units are subject to the closure requirements of [WAC 173-303-610](#). The individual
33 units are subject to different WACs:

- 1 • The tank system is subject to [WAC 173-303-640](#)(8).
- 2 • The containment building is subject to [WAC 173-303-695](#), which incorporates 40 CFR 264.1102
- 3 by reference.
- 4 • The two PUREX Storage Tunnels are subject to [WAC 173-303-680](#).

5 The Permittees store mixed waste in the tank system, the containment building, and the tunnels. All this
6 mixed waste is subject to restrictions on disposal of land disposal restricted (LDR) waste under [WAC](#)
7 [173-303-140](#)(2)(a). (The regulation incorporates the LDR restrictions in the federal RCRA regulations).
8 Permittees must treat dangerous waste that is land disposal restricted to prescriptive standards before
9 disposing it to landfills or other land-based units. (See 40 CFR§268.30-.39.)

10 The Resource Conservation and Recovery Act (RCRA) and the Hazardous Waste Management Act both
11 contain a “storage prohibition.” They prohibit any storage of LDR waste in tanks, containers, or
12 containment buildings unless such storage is “*solely for the purpose of the accumulation of such*
13 *quantities of hazardous waste as necessary to facilitate proper recovery, treatment, or disposal...*” This
14 is to discourage the continued accumulation of untreated waste.

15 A permitted treatment, storage, and disposal unit may store LDR wastes for up to one year. Storage can
16 exceed one year only if the facility proves that the storage is solely for the purpose of accumulating
17 enough waste to facilitate proper recovery, treatment, or disposal.

18 In 1992, Congress passed the Federal Facility Compliance Act (FFCA, codified in RCRA). Among other
19 things, it drives USDOE facilities like Hanford to address their backlogs of untreated mixed waste.

20 The FFCA required USDOE to develop plans and schedules for developing “treatment capacities and
21 technologies” to address mixed waste backlogs. Once a state approves and incorporates the plan into a
22 state order, a “site treatment plan” becomes an enforceable compliance schedule. (See 42 US Code,
23 Section 6939C: Mixed waste inventory reports and plan.) So long as USDOE complies with an approved
24 plan, it will not be subject to fines or penalties for storage prohibition violations.

25 At Hanford, the Tri-Party Agreement (TPA) satisfies the site treatment plan requirement. In particular,
26 the LDR report the Permittees develop and maintain under the M-26 milestone serves as a site treatment
27 plan.

28 For PUREX, TPA Milestone 85-20A requires the Permittees to submit a remedial investigation and
29 feasibility study work plan by September 2015.

30 **CLOSURE**

31 PUREX is s undergoing a phased decommissioning and closure process. The process has three distinct
32 phases:

- 33 1. Transition.
- 34 2. Surveillance and maintenance.
- 35 3. Disposition.

36 The Permittees use a phased approach because development of closure performance standards and a
37 complete closure plan during the transition phase is impractical, and future land use determinations are
38 not final.

39 The transition phase began in December 1992, when USDOE ordered the termination of PUREX and
40 directed the shutdown and clean-out activities. The Permittees defined end point criteria for deactivation
41 activities for PUREX in WHC-SD-WM-TPP-053, *PUREX Deactivation End Points*. The criteria were to
42 isolate the facility, mitigate contamination migration, and stabilize the facility.

43 The Permittees achieved this through the removal, stabilization, disposal, or excessing of major
44 radioactive sources, dangerous chemicals, and waste. This included flushing and removal of dangerous

1 waste constituents from vessels regulated as dangerous waste management units. This work placed
2 PUREX in a safe and environmentally secure configuration suitable for a long-term surveillance and
3 maintenance program.

4 The transition phase is complete. PUREX is now safe and stable in the surveillance and maintenance
5 phase. Before this phase started, the Permittees submitted a PUREX Facility Pre-closure Work Plan
6 (DOE/RL-95-78) to Ecology. This work plan defined steps to ensure protection of human health and the
7 environment from dangerous waste management units, and to provide a defensible basis to establish a
8 compliance schedule for final closure of these units during the disposition phase.

9 The Tri-Party Agreement Action Plan Section 8 requirements govern the surveillance and maintenance
10 phase. (*See Surveillance and Maintenance Plan for the Plutonium/Uranium Extraction [PUREX] Plant,*
11 *DOE/RL-98-35, Rev. 3, January 2008.*) No other work is needed to comply with the permit or to protect
12 human health and the environment.

13 The Permittees must establish the current drained and flushed configuration of PUREX dangerous waste
14 management tank systems and the current configuration of the PUREX Canyon Deck as an interim
15 closure performance standard. No specific permit conditions are needed since all tank systems and the
16 PUREX Canyon Deck are now in this configuration. No additional work is needed. The basis of this
17 interim closure performance standard is WAC 173 303-610(2), WAC 173-303-640(8), and 40 CFR
18 264.1102(incorporated by reference in WAC 173-303-695).

19 The Permittees must submit a closure plan outline when they submit the remedial action work plan to the
20 U.S. Environmental Protection Agency (EPA) under the CERCLA Record of Decision. The Permittees
21 must submit a permit modification request to incorporate closure plan performance standards and closure
22 activities into Addendum H. The outline will identify elements of the remedial action work plan the
23 Permittees expect to use to satisfy Permit Condition V.25.L.2. Ecology will review and comment to
24 ensure integration of CERCLA and dangerous waste closure requirements.

25 After completing activities in Condition V.25.L.1, the Permittees will request a permit modification to
26 incorporate a closure and post-closure plan. The plan must comply with WAC 173-303-610, WAC 173-
27 303-640(8) and 40 CFR 264.1102 (incorporated by reference by WAC 173-303-695) for the tank system
28 and containment buildings identified in Addendum A.

29 A permit modification to add a closure plan is usually a Class 2 or Class 3 permit change. In this
30 instance, Ecology will accept notice and comment through the CERCLA process at the proposed plan
31 stage. This will satisfy the notice and comment requirements under WAC 173-303-830.

32 The actual closure could be carried out through permit requirements, CERCLA requirements, or some
33 combination of the two. The closure must satisfy closure performance standards established through a
34 permit modification.

35 Closure will be based on PUREX's safe and stable configuration, and the inspection and maintenance
36 requirements of the Surveillance and Maintenance Plan for the Plutonium/Uranium Extraction (PUREX)
37 Facility, DOE/RL-98-35. The same requirements can also satisfy the operating requirements for storing
38 concrete debris in the F-cell containment building.

39 The permit will establish the canyon deck and F-Cell as a containment building¹. Closure for the canyon
40 deck and F-Cell will require closure performance standards and treatment, decontamination, or
41 verification to meet the standards. The Canyon Disposition Initiative allows use of canyon facilities as
42 disposal units, if the appropriate CERCLA and dangerous waste permit authorizations are in place.

43 **GENERAL WASTE MANAGEMENT**

¹ Although PUREX is included in the dangerous waste permit as a closure unit group, the F-Cell portion of the containment building dangerous waste management unit will receive operating authorization through the permit to store debris.

1 Conditions V.25.B.1 and V.25.B.2 authorize the Permittees to store existing dangerous/mixed waste in
2 the two PUREX Storage Tunnels, and the PUREX Containment Building (F-Cell). These conditions
3 ensure continuity of operations between the expired and re-issued permit.

4 Condition V.25.B.3 authorizes the Permittees to accept additional waste for storage in PUREX Tunnel 2.
5 Such acceptance is governed by the criteria and waste acceptance process in Addendum B, the waste
6 analysis plan. Most or all the discarded or failed equipment or waste the Permittees may place in PUREX
7 Storage Tunnel 2 is expected to be from on-site. It would be similar to what is now in the tunnel.

8 Condition V.25.B.4 requires operation of the PUREX Storage Tunnels according to Addendum C.
9 Ecology believes Addendum C satisfies the requirements for authorizing miscellaneous units in [WAC](#)
10 [173-303-680](#).

11 **WASTE ANALYSIS**

12 Addendum B characterizes wastes in the PUREX Storage Tunnels and the PUREX Containment Building
13 (Cell F-11). The basis for this addendum is [WAC 173-303-300](#).

14 Condition V.25.C requires the Permittees to document newly received wastes in a waste profile. They
15 must maintain waste profiles in the facility operating record. The profiles comply with the recordkeeping
16 requirements of [WAC 173-303-380](#)(1)(a) through (c), and document the characteristics of new wastes to
17 ensure they comply with waste acceptance criteria.

18 Sampling and analysis is not necessary for the purposes of accepting new waste into PUREX Storage
19 Tunnel 2 based on waste acceptance criteria established in Section 4.4 of Addendum B. These waste
20 criteria, based on physical and regulatory designation factors, ensure that wastes meeting the criteria are
21 acceptable for storage, and can be stored in a manner compliant with the permit and as necessary to
22 protect human health and the environment.

23 **RECORDKEEPING AND REPORTING**

24 Condition V.25.D requires the Permittees to document all work, such as results of monitoring, testing,
25 and analytical work, and quality assurance and control data, in the Hanford Facility Operating Record. ,
26 requires the Permittees to in the Hanford Facility Operating Record. This condition follows the
27 requirements of Condition II.I.2, [WAC 173-303-380](#) and [WAC 173-303-810](#)(16) to ensure proper
28 recordkeeping and reporting.

29 **SECURITY**

30 PUREX is within the secured area of Hanford. Access to the unit is subject to the general security
31 provision of Condition II.L. Security provisions, access controls, and signage specific to this unit will
32 comply with the requirements of [WAC 173-303-310](#).

33 **PREPAREDNESS AND PREVENTION**

34 Condition V.25.F covers preparedness and prevention. The basis for this condition is [WAC 173-303-340](#).
35 The permit has specific requirements to control ignition sources and to manage ignitable and reactive
36 wastes. The Permittees will prevent ignitable and reactive wastes from exposure to excessive heat and
37 sources of ignition. The Permittees must store incompatible wastes in separate containers to prevent
38 mixing.

39 **CONTINGENCY PLAN**

40 The basis for Condition II.A for contingency plan requirements is [WAC 173-303-350](#).

41 **INSPECTIONS**

42 The basis for inspection requirements in Conditions II.X and V.25.H, and Addendum I, is
43 [WAC 173-303-320](#). We do not require the Permittees to inspect inside PUREX Tunnels 1 and 2 because

1 of the hazard to workers from potential exposure to the mixed wastes stored there. We do require an
2 annual inspection of the exterior of both tunnels. The inspections are to detect structural deterioration,
3 tunnel subsidence, erosion of the earth cover, and vent stack damage, or any other condition or discharge
4 that could harm human health or the environment.

5 **TRAINING**

6 The Permittees must ensure employees have the skills and knowledge to do their work safely. The Permit
7 requires that the training requirements established in Addendum G be maintained in a Dangerous Waste
8 Training Plan prepared according to Condition II.C.1. The training program and written training plan
9 must meet the requirements of [WAC 173-303-330](#).

10 **REQUESTED VARIANCES OR ALTERNATIVES**

11 The dissolvers in the PUREX Storage Tunnels are not labeled as containing characteristic toxic mercury
12 (D009) [[WAC 173-303-090\(8\)\(c\)](#)]. The Permittees stored the waste in the tunnels before those
13 procedures for labeling were in effect. Labeling the waste now is not feasible because of the hazard to
14 workers from exposure to the mixed waste. Ecology will not require the Permittees to label the mixed
15 waste now in the tunnels. But the Permittees must label any new mixed waste they put into the
16 PUREX Storage Tunnels. They must label the railcars as specified by [WAC 173-303-395\(6\)](#) and
17 [WAC 173-303-630\(3\)](#).

18 **STATE ENVIRONMENTAL POLICY ACT (SEPA)**

19 The SEPA determination for this unit is in the Hanford-Wide Permit Fact Sheet.

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