

324 Facility & 300 296 Waste Site Radiological Conditions Summary

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract 89303320DEM000030



P.O. Box 1464
Richland, Washington 99352

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1 Purpose

This document summarizes the radiological conditions in the 324 Facility and underlying 300-296 Waste Site.

2 Scope

Radiological conditions in 324 and the 300-296 waste site are from past operations. The original mission of the 324 Building was to conduct diverse studies on the chemical and physical processing of high-activity radioactive materials, characterization of physical and chemical properties of irradiated materials, and non-radioactive process development. The scope of this document applies to the 324 facility and 300-296 waste site only.

3 Radiological Postings

Radiological postings vary throughout the 324 Facility and include:

- Radioactive Material Storage Areas (RMA)
- Radiological Buffer Areas (RBA) for contamination and exposure control
- Contamination Areas (CA)
- High Contamination Areas (HCA)
- Airborne Radioactivity Areas (ARA)
- Radiation Areas (RA)
- High Radiation Areas (HRA)

Typical postings areas are shown in Figure 1 through 4. Posting may change to support operational needs or to address changes in radiological conditions.

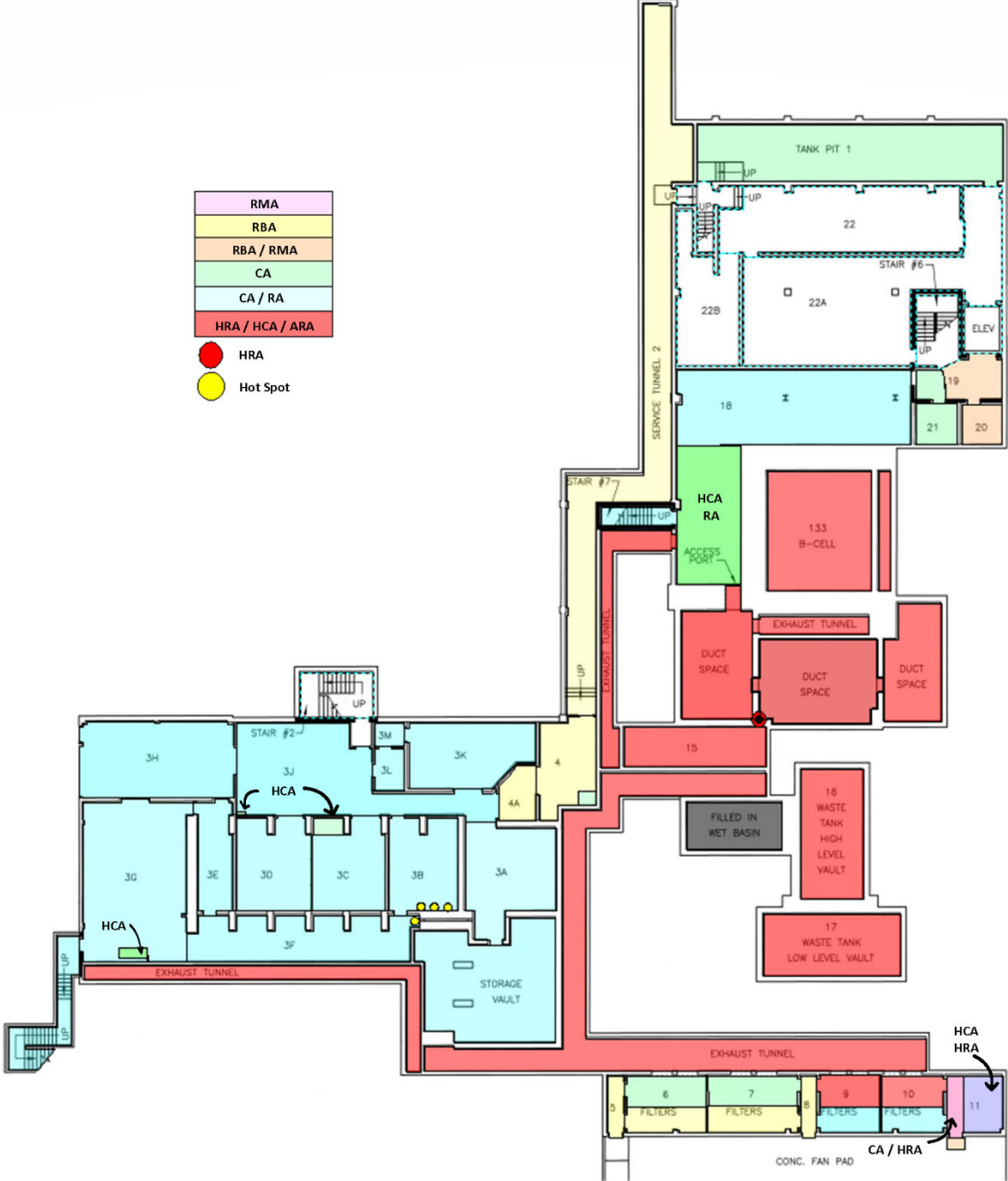


Figure 1. 324 Basement Radiological Postings

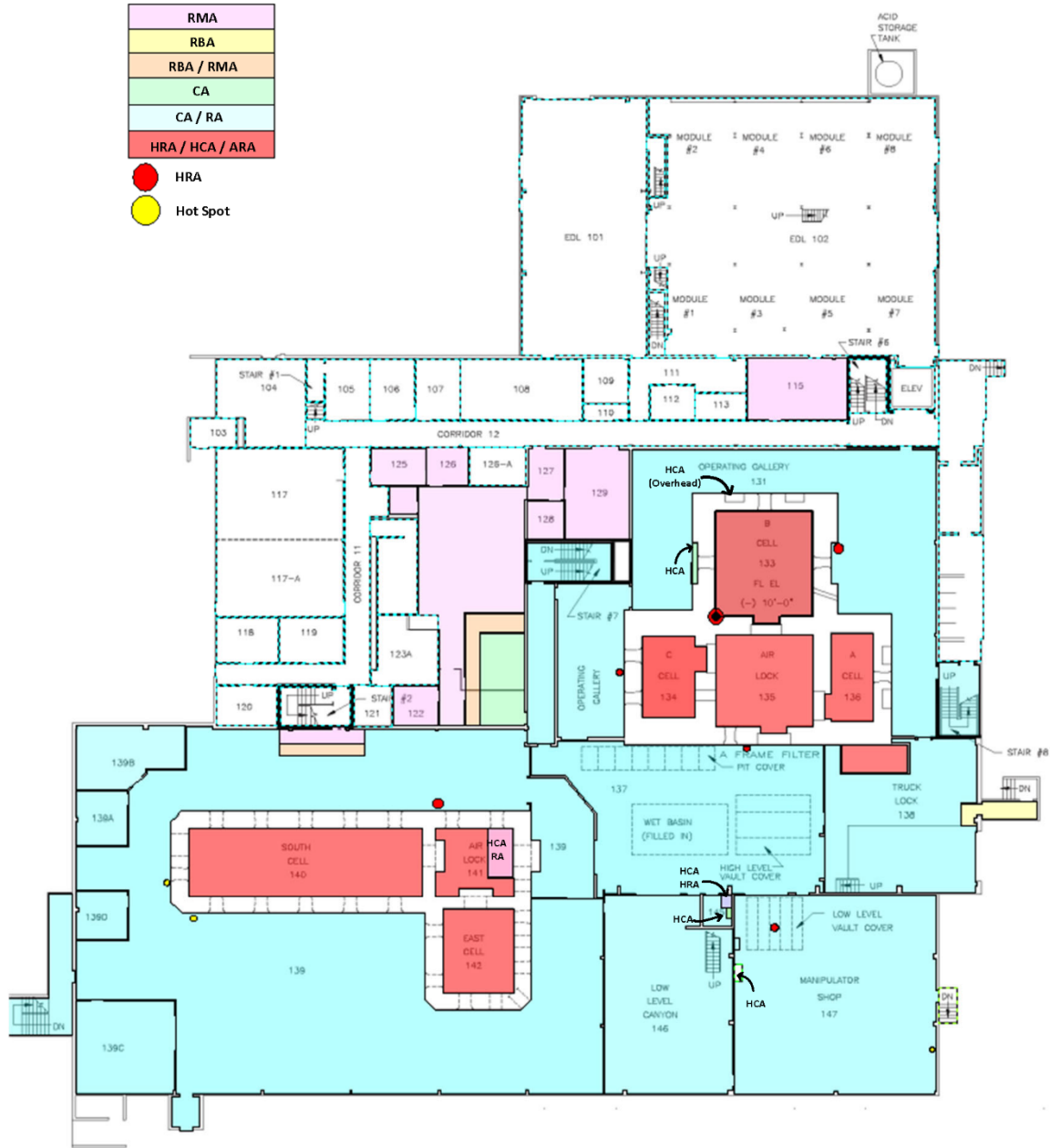


Figure 2. 324 1st Floor Radiological Postings

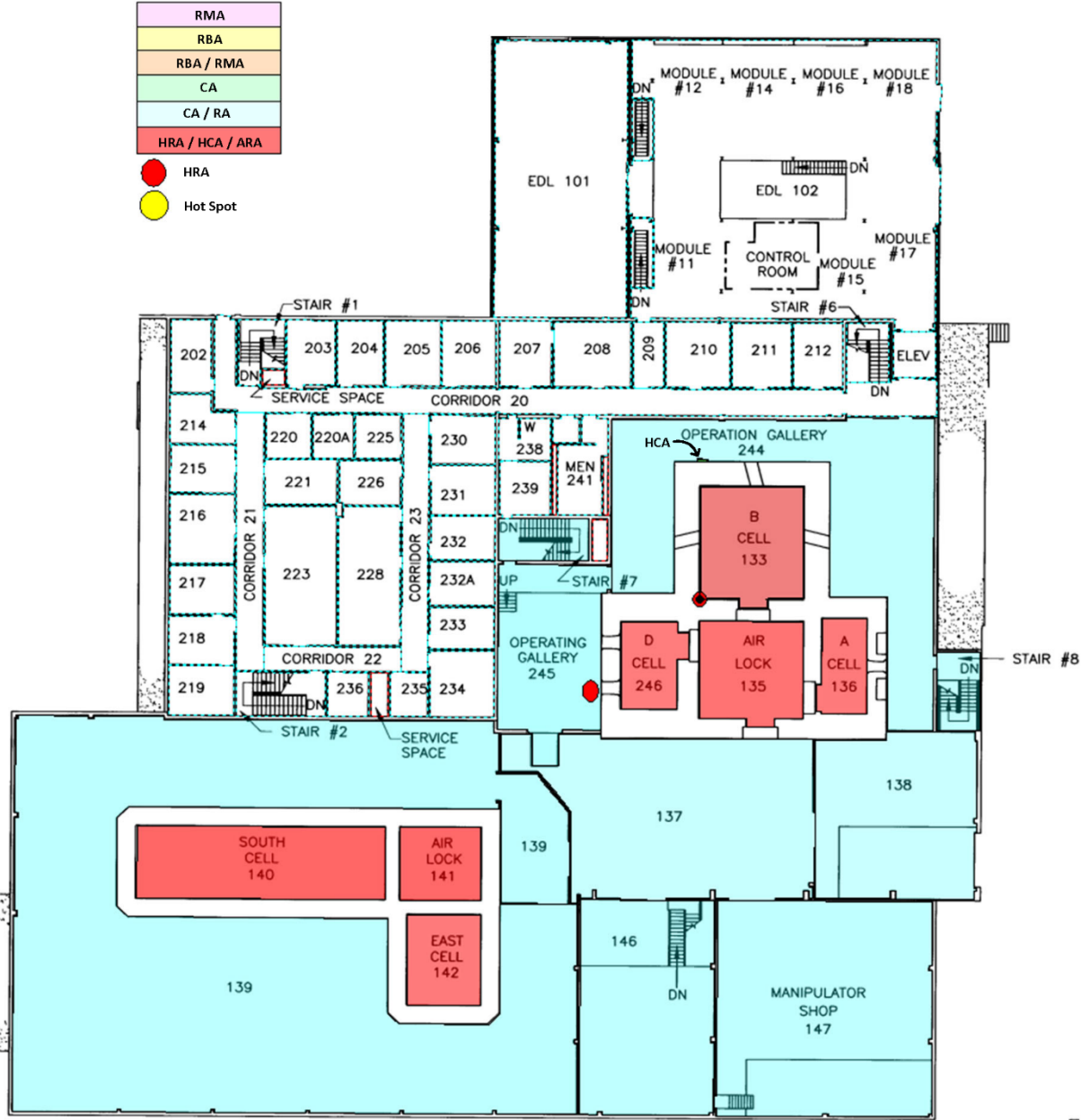


Figure 3. 324 2nd Floor Radiological Postings

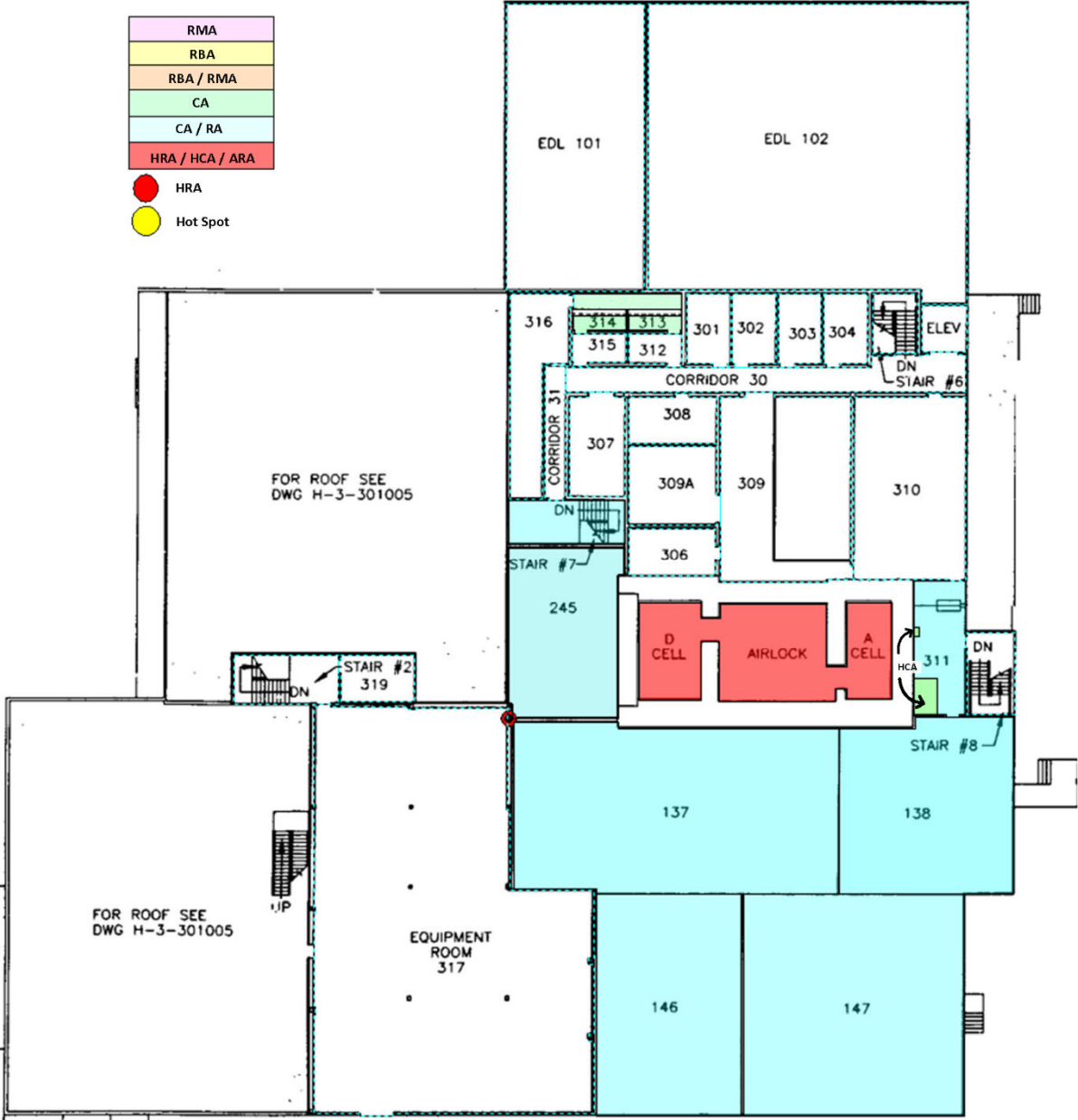


Figure 4. 324 3rd Floor Radiological Postings

4 Radioactive Material Inventory

324 Building and 300-296 radioactive material inventories are large and somewhat varied. Many documents have been generated over the years that define, redefine, or summarize, radionuclide quantities and relative ratios for the various source terms. Total radioactive material inventories are summarized in Table 1. Radionuclide inventories are included in listed references.

Table 1 324 Facility, 300-265 Waste Site and 300-296 Waste Site Radioactive Material Inventories

| Location | Area/Component | Ci | Location % | References |
|------------------|--------------------|-----------------|----------------|---|
| REC | A-Cell | 2.29E+03 | 12.79% | ECF-324-BLDG-17-0086, Rev. 0, Tables 2 through 5 |
| | B-Cell | 1.51E+04 | 84.27% | ECF-324-BLDG-17-0086, Rev. 0, Table 8 |
| | C-Cell | 3.22E+00 | 0.02% | ECF-324-BLDG-17-0086, Rev. 0, Table 11 |
| | D-Cell | 1.81E+02 | 1.01% | ECF-324-BLDG-17-0086, Rev. 0, Table 14 |
| | Airlock | 1.38E+01 | 0.08% | ECF-324-BLDG-17-0086, Rev. 0, Table 17 |
| | Pipe Trench | 2.32E+02 | 1.29% | ECF-324-BLDG-17-0086, Rev. 0, Table 20 |
| | A-Frame Filter Pit | 5.34E+01 | 0.30% | ECF-324-BLDG-17-0086, Rev. 0, Table 36 |
| | Exhaust Ductwork | 4.28E+01 | 0.24% | ECF-324-BLDG-17-0086, Rev. 0, Table 37 |
| | REC Total | 1.79E+04 | 100.00% | |
| HLV | T-104 Tank | 3.52E+03 | 15.81% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-104 Pot | 8.43E+02 | 3.79% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-105 Tank | 1.39E+04 | 62.58% | 0300X-CA-N0118, Rev. 1, Table 28 |
| | T-105 Pot | 7.23E+02 | 3.25% | 0300X-CA-N0118, Rev. 1, Table 28 |
| | T-106 Tank | 1.04E+03 | 4.68% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-106 Pot | 2.69E+02 | 1.21% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-107 | 1.61E+03 | 7.23% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-107 Pot | 3.52E+03 | 15.81% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | Process Piping | 1.96E+02 | 0.88% | ECF-324-BLDG-17-0086, Rev. 0, Table 48 |
| HLV Total | 2.23E+04 | 100.00% | | |
| LLV | T-101 Tank | 1.20E+02 | 11.91% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-101 Pot | 4.52E+01 | 4.48% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-102 Tank | 7.30E+01 | 7.25% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-102 Pot | 2.44E+01 | 2.42% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | T-103 Tank | 4.34E+02 | 43.08% | 0300X-CA-N0118, Rev. 1, Table 26 |
| | T-103 Pot | 0.00E+00 | 0.00% | 0300X-CA-N0118, Rev. 1, Table 26 |
| | T-108 Tank | 3.11E+02 | 30.83% | ECF-324-BLDG-17-0086, Rev. 0, Table 33 |
| | Process Piping | 3.15E-01 | 0.03% | ECF-324-BLDG-17-0086, Rev. 0, Table 48 |
| | LLV Total | 1.01E+03 | 100.00% | |
| SMF | South Cell | 1.52E+03 | 100.00% | 0300X-CA-N0118, Rev. 1, Tables 30, 33, 34, and 36 |
| | East Cell | 2.04E-02 | 0.00% | ECF-324-BLDG-17-0086, Rev. 0, Table 27 |
| | Airlock | 2.22E-02 | 0.00% | ECF-324-BLDG-17-0086, Rev. 0, Table 30 |
| | SMF Total | 1.52E+03 | 100.00% | |
| Containments | Zone I | 2.30E-01 | 62.97% | ECF-324-BLDG-17-0086, Rev. 0, Table 40 |
| | Zone II | 1.35E-01 | 37.03% | ECF-324-BLDG-17-0086, Rev. 0, Table 40 |

Table 1 324 Facility, 300-265 Waste Site and 300-296 Waste Site Radioactive Material Inventories

| Location | Area/Component | Ci | Location % | References |
|---------------------------|---|--------------------------|-----------------|--|
| | Containment Total | 3.66E-01 | 100.00% | |
| HEPA Filters | SMF Basement Rm 3 Exhaust HEPA | 3.49E-04 | 0.00% | ECF-324-BLDG-17-0086, Rev. 0, Table 43 |
| | Rm 3C Hood Exhaust HEPA | 1.31E-03 | 0.00% | ECF-324-BLDG-17-0086, Rev. 0, Table 42 |
| | Rm 6 Zone 2 Exhaust Plenum HEPAs | 2.00E-03 | 0.01% | ECF-324-BLDG-17-0086, Rev. 0, Table 43 |
| | Rm 7 Zone 2 Exhaust Plenum HEPAs | 1.69E-02 | 0.06% | ECF-324-BLDG-17-0086, Rev. 0, Table 43 |
| | Rm 9 Zone 1 Exhaust Plenum HEPAs | 1.25E+00 | 4.53% | ECF-324-BLDG-17-0086, Rev. 0, Table 42 |
| | Rm 10 Zone 1 Exhaust Plenum HEPAs | 2.10E+00 | 7.61% | ECF-324-BLDG-17-0086, Rev. 0, Table 42 |
| | Rm 11 POG & VV Room F-102 HEPA | 6.59E+00 | 23.89% | ECF-324-BLDG-17-0086, Rev. 0, Table 42 |
| | Rm 11 POG & VV Room F-104 HEPA | 1.53E+01 | 55.65% | ECF-324-BLDG-17-0086, Rev. 0, Table 42 |
| | Rm 11 POG & VV Room F-106 HEPA | 1.45E+00 | 5.26% | ECF-324-BLDG-17-0086, Rev. 0, Table 42 |
| | Rm 134 C-Cell Exhaust Plenum Roughing Filter | 2.79E-01 | 1.01% | ECF-324-BLDG-17-0086, Rev. 0, Table 42 |
| | Rm 135 REC Airlock Exhaust Plenum Roughing Filter | 5.46E-01 | 1.98% | ECF-324-BLDG-17-0086, Rev. 0, Table 43 |
| | Rm 309A Hood Exhaust HEPA | 1.37E-05 | 0.00% | ECF-324-BLDG-17-0086, Rev. 0, Table 43 |
| | Rm 316 Filter Room 306/309 VV Exhaust | 2.74E-04 | 0.00% | ECF-324-BLDG-17-0086, Rev. 0, Table 43 |
| | Rm 317 Bldg Vacuum Air Sample Supply HEPA | 1.10E-04 | 0.00% | ECF-324-BLDG-17-0086, Rev. 0, Table 43 |
| | | HEPA Filter Total | 2.76E+01 | 100.00% |
| Piping | POG/VV | 2.05E+00 | 99.81% | ECF-324-BLDG-17-0086, Rev. 0, Table 46 |
| | RLWS | 1.92E-03 | 0.09% | ECF-324-BLDG-17-0086, Rev. 0, Table 50 |
| | RRLWS/CBWS | 1.92E-03 | 0.09% | ECF-324-BLDG-17-0086, Rev. 0, Table 50 |
| | | Piping Total | 2.06E+00 | 100.00% |
| 300-296 Waste Site | Point Source Zone | 2.84E+05 | 88.40% | ECF-324-BLDG-17-0086, Rev. 0, Table 54 |
| | Fugitive Source Zone | 3.73E+04 | 11.60% | ECF-324-BLDG-17-0086, Rev. 0, Table 55 |
| | | 300-296 Total | 3.22E+05 | 100.00% |
| | Grand Total | 3.64E+05 | 100.00% | |

a. Reproduced from TE-WL-17-001, 324 Building Characterization, Workplace Air Monitoring and Dosimetry Technical Evaluation, Revision 7, Table 1.

5 Dose Rates

Dose rates range from background levels (e.g., <0.5 mrem/hr) to several thousand rad/hr. Known dose rates are presented in this section.

5.1 REC

The Radiochemical Engineering Complex (REC) is comprised of four monolithic hot cells, a common airlock, and pipe trench. High- and Low-Level vaults (HLV and LLV) each contain 4 tanks and associated piping to contain and transfer process solutions between the vaults and REC. REC ventilation exhausts these areas through high efficiency particulate air (HEPA) filters, referred to as A-Frame filters because of physical attributes of the filter assemblies.

5.1.1 A-Cell

A comprehensive dose rate profile of A-Cell was performed in 2009.¹ Several items from B- and D-Cells have since been moved into A-Cell. An updated dose rate profile has not been performed. Unknown radiological conditions prohibit personnel entry into A-Cell.

About 80 percent of the estimated radioactive material inventory in A-Cell is in Grout Container 168 (GC-168) and on a brick from B-Cell coated from refractory glass from nuclear waste vitrification studies. Maximum and average dose rates on GC-168 were 13.7 and 24.2 R/hr at five feet in 2003.² Dose rates 2-inches and 5-feet from the glass face of the refractory brick were 13,000 and 160 R/hr, respectively, when measured in 2009.³

5.1.2 B-Cell

A comprehensive dose rate profile of B-Cell was performed in 2010 after grout/source term removal from the cell trench and sump.^{4,5,6} Maximum and average photon dose rates inside of B-Cell were 18,500 and 956 R/hr, respectively, at that time. Approximately 10 yd³ of grout were added to the B-Cell floor to stabilize material at risk on the floor and in the sump and trench. Grout addition reduced general area dose rates by approximately 90%.⁷ B-Cell surfaces have been coated with fixative. Personnel entry into B-Cell is prohibited.

¹ Washington Closure Hanford (WCH) Radiological Survey Record (RSR) 300PS-09-1929, *Dose Profile of A-Cell*, dated June 30, 2009.

² 0300X-CA-N0115, *Revised Radiological Inventory of the 324 Building REC Cells, Airlock and Pipe Trench*, Revision 0, Appendix B.

³ WCH RSR 300PS-09-3428, *Dose Rate Survey of Brick in B-Cell*, dated December 21, 2009.

⁴ WCH RSR 300PS-10-0007, *Dose Profile of B-Cell After Grout Removal from the Sump and Trench*, dated January 05, 2010.

⁵ WCH RSR 300PS-10-0966, *Dose Profile of B-Cell Using Mid-Range RO-7 Probe*, dated March 22, 2010.

⁶ WCH RSR 300PS-10-0991, *Dose Profile of B-Cell Using High-Range RO-7 Probe*, dated March 23, 2009.

⁷ WCH RSR 300PS-12-1495, *Dose Profile of B-Cell After Grouting Floor*, dated May 02, 2012.

5.1.3 C-Cell

A comprehensive dose rate profile of C-Cell was performed in 2008.⁸ Maximum and average photon dose rates inside of C-Cell were 1.1 and 0.07 R/hr, respectively, at that time. Several personnel entries into C-Cell have been made since, with maximum and average 30 cm dose rates of 0.6 and 0.07 R/hr being observed, respectively.⁹

5.1.4 D-Cell

A comprehensive dose rate profile of D-Cell was performed in 2008.¹⁰ Maximum and average photon dose rates inside of D-Cell were 20.6 and 7.2 R/hr, respectively, at that time. 4 debris bins containing waste from B-Cell have been placed in D-Cell since. Maximum and average dose rates one foot from the sides of the highest activity bin (bin # 022) are 20 and 11 R/hr 1 foot, respectively, in 2019.¹¹ D-Cell surfaces and the east exhaust duct have been coated with fixative. Waste bins in D-Cell have been filled with grout. Personnel entry into D-Cell is prohibited.

5.1.5 Airlock

A comprehensive dose rate profile of the REC Airlock was performed in 2012.¹² Maximum and average photon dose rates inside of the Airlock were 0.8 and 0.15 R/hr, respectively, at that time. Photon plus beta dose rates were obtained, too. Maximum and average photon plus beta dose rates inside of the Airlock were 53 and 1.9 R/hr, respectively, at that time.

Several personnel entries into the Airlock have been made since, with maximum and average 30 cm photon dose rates of 2.0 and 0.13 R/hr being observed, respectively. Maximum and average 30 cm beta dose rates of 9.7 and 0.4 rad/hr, respectively have been observed.¹³

5.1.6 Pipe Trench

A comprehensive dose rate profile of the REC Pipe Trench was performed in 2001 after cleanout.¹⁴ Maximum and average dose rates inside the Pipe Trench were 99.6 and 27.5 R/hr, respectively, at that time. Pipe trench surfaces have been coated with fixative.

5.1.7 HLV & LLV

Dose rates in the HLV and LLV were measured in 1998 by feeding thermoluminescent dosimeter (TLD) chip strings into thermocouple risers of each of the HLV and LLV tanks.

Maximum and average dose rates in the HLV were 21,063 and 521 R/hr, respectively. Maximum and average dose rates in the LLV were 32 and 5 R/hr, respectively.¹⁵

⁸ WCH RSR 300PS-08-3455, *324 C-Cell Dose Profile*, dated November 06, 2008.

⁹ Central Plateau Cleanup Company (CPCC) ALARA Management Worksheet (AMW) AMW-24-WL-001, dated December 1, 2025.

¹⁰ WCH RSR 300PS-08-3611, *324 D-Cell Dose Profile After Decon of Source Term*, dated November 24, 2008.

¹¹ CPCC RSR WL-1901060, dated July 15, 2019.

¹² WCH RSR 300PS-12-1437, *Dose Profile for CHA Airlock*, dated April 25, 2012.

¹³ CPCC AMW-24-WL-001, dated December 1, 2025.

¹⁴ Project Hanford RSR M-15872, *Dose Profile Pipe Trench*, dated October 11, 2001.

¹⁵ Pacific Northwest National Laboratory (PNNL) letter *324 Building Dosimetry Support (Contract 619, Release 9)* from Bruce Rathbone to Armin Vogt, dated February 2, 1999.

5.1.8 A-Frame Filters

A-Frame filter dose rates are determined monthly via dose rate monitoring thimbles (drawing H-3-20433, Section F-F and H-H). Survey results from January 2026 and estimated Cs-137 activity are listed in Table 2:

Table 2. A-Frame Filter Dose Rates and Cs-137 Inventory (January 8, 2026)

| Filter Assembly | R/hr (a) | Cs-137 Ci (b) |
|-----------------|-------------|---------------------|
| Bypass | 2.9 | 1.51E+00 |
| Vault #1 | 1.0 | 0.00E+00 |
| Vault #2 | 1.2 | 0.00E+00 |
| D-Cell | 3.7 | 1.13E-01 |
| B-Cell | 13.1 | 7.75E+00 |
| C-Cell | 3.1 | 0.00E+00 |
| Airlock | 2.0 | 4.93E-01 |
| A-Cell | 0.5 | 0.00E+00 |

- a. CPCC RSR WL-2600029, dated January 8, 2026.
- b. Cs-137 activity calculated using the method described in CPCC-RP-71614, *324 Facility Material-at-Risk Stabilization Radiological Design Review*, Revision 0.

5.2 SMF

The Shielded Materials Facility (SMF) is comprised of two monolithic hot cells (South Cell and East Cell), and a common airlock.

5.2.1 South Cell

A comprehensive dose rate profile of the SMF South Cell was performed in 2010.¹⁶ Maximum and average photon dose rates inside of South Cell, but outside of Compartment 1 were 10.0 and 2.7 R/hr, respectively, at that time. Maximum and average dose rates inside Compartment 1 were 6,200 and 1,153 R/hr, respectively, at that time.

An earlier survey of South Cell Compartment 1 identified a Cs-137 capsule fragment that read >19,000 and 2,070 R/hr at 1 inch and at 30 cm, respectively.¹⁷ The fragment was placed inside of a threaded pipe nipple, capped on both ends, and relocated to the east Material Open Test Assembly (MOTA) shielded vault in South Cell.

South Cell outside of Compartment 1 has been grout filled to the bottom of the viewing windows. High dose rate items in this area were placed on the SMF South Cell floor prior to grouting. Compartment 1 has been grout filled to the top of its viewing windows.

A dose rate check inside of South Cell outside of Compartment 1 after grout fill identified maximum and average dose rates of 0.5 and 0.4 R/hr, respectively.¹⁸

SMF South Cell is inaccessible for personnel entry.

¹⁶ WCH RSR 300PS-10-0511, *Dose Profile of SMF Compartment 1 and South Cell Proper*, dated February 16, 2010.

¹⁷ WCH RSR-324PS-07-1156, *Dose Profile of SMF Compartments 1, 2, 3, and 4*, dated July 23, 2007.

¹⁸ WCH RSR 300PS-10-2784, *Dose Profile of SMF South Cell Proper After Grout*, dated August 26, 2010.

5.2.2 East Cell

A comprehensive dose profile of SMF East Cell was performed in 2010.¹⁹ Maximum and average dose rates inside of East Cell were 6.0 and 0.5 mR/hr, respectively. East cell surfaces have been coated with fixative.

5.2.3 Airlock

A comprehensive dose profile of the SMF Airlock has not been performed. However, airlock entries made to support South Cell grouting and East Cell fixative application show general area dose rates are generally ≤ 0.5 mR/hr, with up to 40 mR/hr 30 cm above the SMF Airlock trench.^{20, 21, 22} The airlock contains several pieces of equipment from historical SMF operations.

The SMF Airlock is accessible for personnel entry.

5.3 300-296 Casings

Several pipe casings were installed under the 324 REC to characterize the 300-296 Waste Site and stabilize the facility. Characterization casings were termed Geoprobe®²³ and hydraulic hammer units (HHU).

5.3.1 Geoprobe & HHU Casings

Measured dose rates inside Geoprobe and HHU casings are presented in Table 3.

5.3.2 Stabilization Casings

Measured dose rates inside stabilization casings are presented in Table 4.

¹⁹ WCH RSR 300PS-10-4166, *SMF East Cell Profile Survey*, dated December 7, 2010.

²⁰ WCH RSR 300PS-08-0476, *Provided Coverage to Enter the SMF Airlock*, dated February 13, 2008.

²¹ WCH RSR 300PS-08-0572, *SMF Airlock Entry to Remove Personnel Door into East Cell*, dated February 21, 2008.

²² WCH RSR 300PS-10-1514, *324 SMF Water Removal*, dated May 4, 2010.

²³ Geoprobe® is a registered trademark of Geoprobe Systems, Salina, Kansas.

Table 3. Measured Geoprobe & HHU Exposure Rates

| Cap ID | Peak (R/hr) | Average (R/hr) | References |
|----------------|------------------------|---------------------------|-----------------------|
| C8207 | 5,450 | 1,323 | WCH RSR 324PS-14-0538 |
| C8208 | 6,456 | 2,076 | WCH RSR 324PS-14-0538 |
| C8209 | 620 | 226 | WCH RSR 324PS-14-0538 |
| C8210 | 9,646 | 2,656 | WCH RSR 324PS-14-0538 |
| C8211 | 7,073 | 3,290 | WCH RSR 324PS-14-0538 |
| C8212 | 40 | 15 | WCH RSR 324PS-14-0557 |
| C8213 | 250 | 60 | WCH RSR 324PS-14-0557 |
| C8214 | 7,992 | 1,026 | WCH RSR 324PS-14-0561 |
| C8215 (HHU) | 0.105 | 0.012 | WCH RSR 300PS-11-1990 |
| C8216 (HHU) | 1.76E-05 | 1.27E-05 | WCH RSR 300PS-11-1990 |
| C9433 | 747 | 300 | WCH RSR 324PS-14-0530 |
| C9434 | 6,925 | 2,702 | WCH RSR 324PS-14-0530 |
| C9435 | 7,290 | 2,097 | WCH RSR 324PS-14-0530 |
| C9436 | 3,909 | 1,427 | WCH RSR 324PS-14-0547 |
| C9437 | 4.10E-05 | 2.17E-05 | WCH RSR 324PS-14-0556 |
| C9438 | 12,870 | 4,052 | WCH RSR 324PS-14-0573 |
| Overall | 12,870 | 1,944 | |

Table 4. Measured Stabilization Casing Exposure Rates

| Casing ID | Peak (R/hr) | Average (R/hr) | References |
|------------------|--------------------|-----------------------|---------------------|
| E-01 | 0.07 | 0.01 | CPCC RSR WL-2201827 |
| E-02 | 0.42 | 0.03 | CPCC RSR WL-2201821 |
| E-03 | 0.55 | 0.10 | CPCC RSR WL-2201827 |
| E-07B | 0.58 | 0.04 | CPCC RSR WL-2300432 |
| E-08 | 0.64 | 0.10 | CPCC RSR WL-2201815 |
| E-09 | 0.65 | 0.08 | CPCC RSR WL-2201821 |
| E-10 | 0.00 | 0.00 | CPCC RSR WL-2300105 |
| E-11 | 0.00 | 0.00 | CPCC RSR WL-2300250 |
| E-14 | 0.25 | 0.03 | CPCC RSR WL-2300432 |
| E-15 | 0.14 | 0.01 | CPCC RSR WL-2300001 |
| E-16 | 0.73 | 0.03 | CPCC RSR WL-2201794 |
| E-17 | 984 | 155 | CPCC RSR WL-2201414 |
| E-18B | 2.53 | 0.55 | CPCC RSR WL-2300315 |
| E-19B | 3.34 | 0.20 | CPCC RSR WL-2300315 |
| E-21 | 1.04 | 0.13 | CPCC RSR WL-2300432 |
| E-22 | 0.00 | 0.00 | CPCC RSR WL-2201359 |
| E-23 | 0.00 | 0.00 | CPCC RSR WL-2201359 |
| E-24C | 0.00 | 0.00 | CPCC RSR WL-2300315 |
| E-28 | 0.00 | 0.00 | CPCC RSR WL-2300389 |
| E-29 | 0.00 | 0.00 | CPCC RSR WL-2201359 |
| E-30 | 0.00 | 0.00 | CPCC RSR WL-2201359 |
| E-35 | 0.00 | 0.00 | CPCC RSR WL-2300402 |
| E-36 | 0.00 | 0.00 | CPCC RSR WL-2201359 |
| E-37 | 0.00 | 0.00 | CPCC RSR WL-2201612 |
| E-38 | 0.01 | 0.00 | CPCC RSR WL-2300327 |
| E-42 | 0.01 | 0.00 | CPCC RSR WL-2300402 |
| S-32 | 0.00 | 0.00 | CPCC RSR WL-2300284 |
| S-37 | 0.00 | 0.00 | CPCC RSR WL-2300193 |
| S-41 | 0.00 | 0.00 | CPCC RSR WL-2300173 |
| W-18 | 0.00 | 0.00 | CPCC RSR WL-2300173 |
| W-24 | 0.00 | 0.00 | CPCC RSR WL-2300173 |

Table 4. Measured Stabilization Casing Exposure Rates

| Casing ID | Peak (R/hr) | Average (R/hr) | References |
|------------------|------------------------|---------------------------|---------------------|
| W-27 | 0.00 | 0.00 | CPCC RSR WL-2300167 |
| N-02 | 0.00 | 0.00 | CPCC RSR WL-2300022 |
| N-08 | 0.00 | 0.00 | CPCC RSR WL-2300022 |
| N-11 | 0.00 | 0.00 | CPCC RSR WL-2300048 |
| N-15 | 0.00 | 0.00 | CPCC RSR WL-2201853 |
| N-16 | 0.05 | 0.00 | CPCC RSR WL-2201841 |
| N-30 | 0.00 | 0.00 | CPCC RSR WL-2300062 |
| N-38 | 0.00 | 0.00 | CPCC RSR WL-2300099 |
| N-39 | 0.30 | 0.01 | CPCC RSR WL-2201841 |
| Overall | 984 | 3.91 | |

6 300-296 Soil Concentrations

This section presents measured and estimated peak radionuclide concentrations in 300-296 soil.

6.1 Measured Concentrations

Two soil samples were obtained under the B-Cell sump area in 2011 for radiochemical analysis. Radiological analysis results are summarized in Table 5.

Table 5. Soil Sample Analytical Results ^(a)

| Analyte | J1JD49 (387.97 MSL) ^(b) | | | J1JD50 (390.83 MSL) ^(c) | | |
|------------|------------------------------------|-----------|----------|------------------------------------|-----------|----------|
| | Original | Duplicate | Average | Original | Duplicate | Average |
| | μCi/g | μCi/g | μCi/g | μCi/g | μCi/g | μCi/g |
| Co-60 | 8.21E-03 | 5.12E-03 | 6.67E-03 | -- | -- | -- |
| Sr-90 | 2.88E+02 | 2.95E+02 | 2.92E+02 | 3.87E+02 | 3.68E+02 | 3.78E+02 |
| Cs-137 | 4.93 | 3.93 | 4.43 | 8.19E+03 | 7.78E+03 | 7.99E+03 |
| U-233/234 | 3.32E-06 | 2.56E-06 | 2.94E-06 | 1.34E-05 | 1.23E-05 | 1.29E-05 |
| U-235/236 | -- | -- | -- | 1.91E-06 | 2.35E-06 | 2.13E-06 |
| U-238 | 2.10E-06 | 2.57E-06 | 2.34E-06 | 1.10E-05 | 1.09E-05 | 1.10E-05 |
| Pu-238 | 2.31E-03 | 1.26E-03 | 1.79E-03 | 1.59E-01 | 1.36E-01 | 1.48E-01 |
| Pu-239/240 | 9.03E-04 | 6.17E-04 | 7.60E-04 | 2.72E-02 | 2.13E-02 | 2.43E-02 |
| Am-241 | 1.72E-03 | 1.05E-03 | 1.39E-03 | 9.62E-02 | 8.18E-02 | 8.90E-02 |
| Cm-242 | 9.54E-06 | 3.53E-06 | 6.54E-06 | 4.65E-04 | 5.07E-04 | 4.86E-04 |
| Cm-243/244 | 2.99E-03 | 1.73E-03 | 2.36E-03 | 1.87E-01 | 1.69E-01 | 1.78E-01 |

- a. PNNL Letter 60965-2011-L1, *Transmittal of Analytical Data Reports in Support of 324 Soils Analysis*, from Karl Pool to Rich Weiss, dated September 27, 2011 (WCH CCN 61417).
- b. "Lower" sample.
- c. "Upper" sample.

6.2 Peak Concentration Estimates

Radionuclide concentrations will vary as they travel through and are absorbed by soil. Estimated peak concentrations in 300-296 soil vary from those identified in the radiochemical analysis and are presented in Table 6.

Table 6. Estimated Peak Isotope Concentrations in B-Cell Soil ^(a)

| Isotopes in Sample | Peak Concentration ($\mu\text{Ci/g}$) |
|--------------------|--|
| Sr-90 | 6.00E+03 |
| Cs-137 | 1.41E+04 |
| U-233/234 | 1.44E-05 |
| U-235/236 | 2.39E-06 |
| U-238 | 1.23E-05 |
| Pu-238 | 2.06E-01 |
| Pu-239/240 | 3.15E-02 |
| Am-241 | 1.22E-01 |
| Cm-242 | 6.73E-04 |
| Cm-243/244 | 2.47E-01 |

a. PRC-SRP-CN-N-00098, 324 Building Remote Soil Excavation Accident Analysis, Revision 8, Table A-4.

Contamination Levels

A characterization study was performed in 1998 to create a baseline of radiological contamination conditions in the 324 Building hot cells and hoods. Results of the study are summarized in Tables 7, 8, and 9.

Table 7. Estimated Maximum Removable and Total Contamination – Room 147 Hoods ^(a)

| Radionuclide | Removable ($\mu\text{Ci}/100 \text{ cm}^2$) | | | Total ($\mu\text{Ci}/100 \text{ cm}^2$) | | |
|----------------|---|----------|----------|---|----------|----------|
| | Hood #1 | Hood #2 | Hood #3 | Hood #1 | Hood #2 | Hood #3 |
| Mn-54 | ND | ND | 1.05E-05 | ND | ND | 3.15E-04 |
| Co-60 | ND | 9.11E-04 | 5.97E-04 | ND | 2.73E-02 | 1.79E-02 |
| Se-79 | --- | 1.79E-09 | --- | --- | 5.37E-08 | --- |
| Sr-90 | 8.46E-03 | 1.16E-02 | 1.44E-03 | 2.54E-01 | 3.47E-01 | 4.32E-02 |
| Tc-99 | --- | 5.94E-08 | --- | --- | 1.78E-06 | --- |
| Ag-108m | --- | --- | --- | --- | --- | --- |
| Sb-125 | ND | ND | ND | ND | ND | ND |
| Cs-134 | ND | ND | ND | ND | ND | ND |
| Cs-137 | 1.41E-02 | 1.93E-02 | 3.61E-03 | 4.23E-01 | 5.79E-01 | 1.08E-01 |
| Eu-154 | ND | ND | ND | ND | ND | ND |
| Eu-155 | ND | ND | ND | ND | ND | ND |
| Pu-238 | --- | 1.72E-06 | --- | --- | 5.17E-05 | --- |
| Pu-239 | --- | --- | --- | --- | --- | --- |
| Pu-240 | --- | --- | --- | --- | --- | --- |
| Pu-241 | --- | --- | --- | --- | --- | --- |
| Pu-242 | --- | --- | --- | --- | --- | --- |
| Am-241 | --- | 7.59E-06 | --- | --- | 2.28E-04 | --- |
| Cm-242 | ND | ND | ND | ND | ND | ND |
| Cm-243 | --- | --- | --- | --- | --- | --- |
| Cm-244 | --- | --- | --- | --- | --- | --- |
| Alpha | ND | 1.49E-05 | ND | ND | 4.47E-04 | ND |
| Beta-Gamma | 2.26E-02 | 3.10E-02 | 4.45E-03 | 6.77E-01 | 9.31E-01 | 1.33E-01 |
| Total Activity | 2.26E-02 | 3.11E-02 | 4.45E-03 | 6.77E-01 | 9.32E-01 | 1.33E-01 |

a. Reproduced from WCH-412, *324 Building Baseline Radiological Characterization*, Revision 0, Table 5.
 ND = not detected
 --- = not reported

Table 8. Estimated Maximum Removable Contamination Levels – SMF (a)

| Radionuclide | Removable Contamination ($\mu\text{Ci}/100 \text{ cm}^2$) | | | | | | |
|----------------|---|-----------|------------|----------|----------|----------|----------|
| | Airlock | East Cell | South Cell | Comp. #1 | Comp. #2 | Comp. #3 | Comp. #4 |
| Mn-54 | ND | ND | 1.93E-01 | ND | ND | 3.59E-04 | 9.22E-04 |
| Co-60 | ND | 1.81E-05 | 1.34E+01 | ND | 1.49E-03 | 9.58E-03 | 3.21E-02 |
| Se-79 | --- | --- | --- | --- | --- | --- | --- |
| Sr-90 | --- | 4.59E-02 | 8.34E+00 | 4.81E+00 | 1.30E-03 | 1.09E-03 | 4.90E-03 |
| Tc-99 | --- | --- | --- | --- | --- | --- | --- |
| Ag-108m | --- | --- | --- | --- | --- | --- | --- |
| Sb-125 | ND | ND | ND | ND | ND | ND | 2.47E-03 |
| Cs-134 | ND | 1.53E-05 | 2.21E+00 | ND | 2.11E-04 | 5.63E-04 | 3.48E-03 |
| Cs-137 | ND | 1.53E-03 | 2.76E+02 | 1.04E+03 | 1.49E-01 | 2.08E-01 | 2.19E-01 |
| Eu-154 | ND | ND | ND | ND | ND | ND | ND |
| Eu-155 | ND | ND | ND | ND | ND | ND | ND |
| Pu-238 | --- | --- | --- | --- | --- | --- | --- |
| Pu-239 | --- | --- | --- | --- | --- | --- | --- |
| Pu-240 | --- | --- | --- | --- | --- | --- | --- |
| Pu-241 | --- | --- | --- | --- | --- | --- | --- |
| Pu-242 | --- | --- | --- | --- | --- | --- | --- |
| Am-241 | --- | --- | --- | --- | --- | --- | --- |
| Cm-242 | --- | --- | --- | --- | --- | --- | --- |
| Cm-243 | --- | --- | --- | --- | --- | --- | --- |
| Cm-244 | --- | --- | --- | --- | --- | --- | --- |
| Alpha | ND | 1.03E-05 | 4.81E-03 | 4.06E-03 | ND | ND | ND |
| Beta-Gamma | ND | 4.72E-02 | 2.88E+02 | 1.04E+03 | 1.50E-01 | 2.16E-01 | 2.25E-01 |
| Total Activity | ND | 4.73E-02 | 2.88E+02 | 1.04E+03 | 1.50E-01 | 2.16E-01 | 2.25E-01 |

a. Reproduced from WCH-412, Revision 0, Table 6.
 ND = not detected
 --- = not reported

Table 9. Estimated Maximum Removable Contamination Levels – REC ^(a)

| Radionuclide | Removable Contamination ($\mu\text{Ci}/100 \text{ cm}^2$) | | | | |
|----------------|---|----------|----------|----------|----------|
| | A-Cell | B-Cell | C-Cell | D-Cell | Airlock |
| Mn-54 | ND | ND | ND | ND | ND |
| Co-60 | 1.25E-04 | 6.50E-02 | 8.49E-04 | 1.31E+00 | 5.19E-03 |
| Se-79 | 3.29E-08 | 1.53E-04 | 8.66E-07 | 1.79E-04 | 6.37E-06 |
| Sr-90 | 1.47E-01 | 1.97E+02 | 6.60E-01 | 2.50E+02 | 1.55E+01 |
| Tc-99 | 1.09E-06 | 5.08E-03 | 2.87E-05 | 5.93E-03 | 2.11E-04 |
| Ag-108m | --- | --- | --- | 1.59E-02 | --- |
| Sb-125 | ND | ND | ND | ND | ND |
| Cs-134 | ND | 1.09E-01 | 5.55E-03 | 2.17E-01 | 1.46E-03 |
| Cs-137 | 3.46E-01 | 3.29E+02 | 1.10E+00 | 1.25E+03 | 3.76E+01 |
| Eu-154 | ND | 5.25E-01 | 6.98E-03 | 6.99E+00 | 1.72E-02 |
| Eu-155 | ND | ND | 2.10E-03 | ND | ND |
| Pu-238 | 3.16E-05 | 4.70E-02 | 1.70E-03 | 1.72E-01 | 6.12E-03 |
| Pu-239 | ND | 9.04E-03 | 3.61E-04 | 7.02E-02 | 2.19E-03 |
| Pu-240 | ND | 8.86E-03 | 3.53E-04 | 6.88E-02 | 2.15E-03 |
| Pu-241 | ND | 4.42E-01 | 1.76E-02 | 3.43E+00 | 1.07E-01 |
| Pu-242 | ND | 1.48E-05 | 5.91E-07 | 1.15E-04 | 3.59E-06 |
| Am-241 | 1.39E-04 | 6.49E-01 | 3.67E-03 | 7.57E-01 | 2.70E-02 |
| Cm-242 | ND | ND | ND | 5.75E-03 | 9.01E-05 |
| Cm-243 | 1.25E-06 | 1.18E-03 | 4.15E-04 | 2.20E-02 | 1.40E-04 |
| Cm-244 | 8.60E-05 | 8.11E-02 | 2.86E-02 | 1.52E+00 | 9.64E-03 |
| Alpha | 1.48E-03 | 1.16E+00 | 7.90E-02 | 2.28E+00 | 5.36E-02 |
| Beta-Gamma | 4.32E-01 | 5.27E+02 | 1.77E+00 | 1.51E+03 | 5.05E+01 |
| Total Activity | 4.32E-01 | 5.27E+02 | 1.78E+00 | 1.51E+03 | 5.06E+01 |

a. Reproduced from WCH-412, Revision 0, Table 8.
 ND = not detected
 --- = not reported

7 References

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- PNNL Letter, 324 Building Dosimetry Support (Contract 619, Release 9) from Bruce Rathbone to Armin Vogt, dated February 2, 1999. Pacific Northwest National Laboratory, Richland, Washington.
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