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**Department of Energy**
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

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Mr. John B. Price
Project Manager
State of Washington
Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99354

Dear Mr. Price:

TRANSMITTAL OF THE AIR MONITORING PLAN FOR THE 100-D/DR AREA REMAINING SITES AND BURIAL GROUNDS REMEDIAL ACTION

Attached for your approval is the 100-D/DR Area Remaining Sites and Burial Grounds Remedial Action Air Monitoring Plan (AMP). The AMP is required by the Remedial Design Report/Remedial Action Work Plan for the 100 Area, DOE/RL-96-17, Rev. 5.

Your comments on the draft AMP were addressed, and the AMP reflects those revisions. If you have any questions, please call Jamie Zeisloft, of my staff, on (509) 372-0188.

Sincerely,

David T. Evans, Acting Assistant Manager
for the River Corridor

AMRC:JHZ

Enclosure

cc w/encl:
J. W. Donnelly, WCH
J. G. Woolard, WCH
Administrative Record (100-DR-1, 100-DR-2)

cc w/o encl:
S. Harris, CTUIR
R. Jim, YN
P. Sobotta, NPT

# AIR MONITORING PLAN FOR THE 100-D/DR AREA REMAINING SITES AND BURIAL GROUNDS REMEDIAL ACTION
**September 2005**

## 1.0 INTRODUCTION

Remedial action (i.e., cleanup) of the remaining sites and burial grounds located in the 100-D Area has the potential to emit radioactive particulates. This activity is being conducted under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), and other documents approved by the U.S. Department of Energy, Richland Operations Office (RL); U.S. Environmental Protection Agency (EPA), and State of Washington Department of Ecology (Ecology). Quantification of radioactive emissions, implementation of best available radionuclide control technology (BARCT), and air monitoring have been identified as substantive requirements (i.e., applicable or relevant and appropriate requirements) for the remedial action. A BARCT compliance demonstration is determined by the regulatory agency on a case-by-case basis.

This air monitoring plan is prepared to demonstrate compliance with these substantive requirements in accordance with *Washington Administrative Code* (WAC) 246-247.

### 1.1 PLANNED ACTIVITIES

This remedial action workscope is for the removal and disposal of waste material and associated soil and debris from burial grounds and remaining waste sites located in the 100-DR-1 and 100-DR-2 Operable Units. The remedial action operations include characterizing, excavating, sorting, size reducing, stockpiling, treating (if necessary), decontaminating, containerizing, staging, loading, and transporting materials from the waste sites. The equipment being used is considered standard equipment for excavating, size reduction (e.g., shears, cutting torch), segregating, loading, and hauling. Decontamination activities such as scabbling (e.g., removal of the surface layer) may be employed to remove radioactive contamination. Characterization activities may include, but are not limited to sampling, test pitting, trenching, and drilling to further define the waste and/or determine the limits of some of the waste sites. Characterization activities may begin before remediation to assist in verifying design parameters, and will continue for the life of the remediation project.

The loading of contaminated soil and debris into waste containers may result in soil spilled on the waste containers and/or haul trucks. Haul trucks with loaded containers will be surveyed to detect exterior contamination. A decontamination station may be established to decontaminate containers, haul trucks, and equipment, as required. Waste containers, haul trucks, and/or equipment will be decontaminated by conventional means such as brushing or wiping, or with high-efficiency particulate air (HEPA)-filtered vacuum cleaners. The HEPA-filtered vacuum cleaners may also be used (as needed) to decontaminate other equipment or to pick up other loose contaminated materials. More aggressive decontamination methods (e.g., grinding or wet-grit blasting) may be used for decontamination if the other methods fail. Decontaminated trucks and containers will then proceed to the container staging area where the transportation subcontractor will pick up the containers for transport to the Environmental Restoration

Disposal Facility (ERDF) or other approved disposal location.

The workscope includes, but is not limited to, remediation of the following burial grounds in the 100-D Area: 100-D-32, 100-D-33, 100-D-35, 100-D-40, 100-D-41, 100-D-43, 100-D-45, 100-D-47, 118-D-1, 118-D-2, 118-D-3, 118-D-4, 118-D-5, 118-DR-1, 126-D-2, 126-DR-1 (Figure 1). The workscope includes, but is not limited to, remediation of the following remaining sites in the 100-D Area: 100-D-1, 100-D-3, 100-D-29, 100-D-31, 116-D-5, 116-DR-5, 116-D-8, UPR-100-D-5, and 1607-D2 (Figure1). Additional sites may be added to this air monitoring plan through agreement in the Unit Managers' Meeting. Additionally, if any of the nonradioactive sites in 100-D Area contain radioactive contamination based on additional information, this air monitoring plan will cover those sites based on concurrence from Ecology.

## 2.0 AIRBORNE SOURCE INFORMATION

There is a potential for particulate radioactive airborne emissions to result from remediation of waste sites in the 100-D Area. The concentrations of the isotopes listed in Attachments 1 represent those that were determined to exist in the waste sites. Other isotopes may also be encountered during remedial action activities; however, it is expected that the isotopic concentrations listed in Attachment 1 represent the upper bound of what will actually be found during remedial actions, and the estimates provided are conservative.

### 2.1 INVENTORY

The radionuclide inventory and subsequent potential emission calculations are summarized in Attachment 1. The inventory was developed based on the *Determination of Material-At-Risk (MAR) for Remediation of 100-D Remaining Sites and Burial Grounds*, Calculation 0100D-CA-N0049, Rev. 0 (BHI 2005a).

The remaining sites are likely to contain contaminated soil or soil mixed with debris. For conservatism, it was assumed that the inventory for this material is generally in the form of particulates (soil, debris, oxides). The particulate form of the inventory, for calculation purposes, is assumed to have rubbed off into the soil and a release fraction of $1.0 \times 10^{-3}$ is applied. For calculation purposes, it is conservatively assumed that tritium is present as a gas and a release fraction of 1 is applied. There is the potential that objects may need to be size-reduced prior to transportation to ERDF. For calculation purposes, it is conservatively assumed that all size reduction will be accomplished with cutting torch or shears, and a release fraction of 1 is applied for torch cutting and would represent 0.21% of the overall inventory.

It is assumed at this time that no scabbling will be performed, but is an activity that may be necessary. Should this be necessary, concurrence from Ecology will be necessary. In addition, it is assumed that 0.1% of the particulate inventory will be picked up through a HEPA-filtered vacuum. A release fraction of 1 is applied to the HEPA vacuum inventory.

The potential for spent nuclear fuel elements is possible. It is assumed that 99.9% of the fuel element is metal, which has release fraction of $1.0 \times 10^{-6}$; and the other 0.1% is assumed to be an oxide with a release fraction of $1 \times 10^{-3}$.

The CAP88-PC model (Version 2.0) was used to determine the annual total effective dose equivalent (TEDE) to the maximally exposed individual (MEI). The appropriate release fraction was applied to the inventory of the various wastes to calculate the potential-to-emit. The calculated potential-to-emit (curies per year) was the input used for the computer model, and the model generated the annual unabated dose. The distance to the MEI used in the model was approximately 9,713 meters west northwest. The CAP88-PC model summary and synopsis for are presented in the *Total Effective Does Equivalent for the Remedial Action of the 100-D/DR Area Burial Grounds and Remaining Sites* Calculation 0100D-CA-V0267 (BHI 2005b). The calculated total unabated annual TEDE to the MEI is $5.79 \times 10^{-1}$ mrem/year.

## 3.0 BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

The following is the BARCT to be implemented during the remedial actions:

- Water will be applied during excavation, container loading, and backfilling processes to minimize and control airborne releases.

- Soil fixatives will be applied to any contaminated soils and debris that will be inactive for more than 24 hours. Periodic monitoring (visual observation) shall be performed, as determined by the project, of the contaminated soils and debris that remain inactive for greater than one (1) month. Re-application of fixatives or other control measures shall be performed if warranted by the periodic monitoring.

- Fixatives will be applied to contaminated soils and debris that will be inactive less than 24 hours at the end of work operations if the sustained wind speed is predicted overnight to be greater than 32 km/hr (20 mph) based on the Hanford Meteorological Station morning forecast. This will allow the project enough time, if necessary, to prepare for the application of dust control measures. If a soil fixative has already been applied and the soil will remain undisturbed, further use of fixatives will not be needed. The fixatives or other controls will not be applied when the contaminated soils are frozen, or it is raining, snowing, or other freezing precipitation is falling at the end of work operations.

- Appropriate documentation on the application of fixatives to comply with BARCT shall be maintained (e.g., logbook or other project-specific documentation).

- The haul trucks will be covered to contain the materials while in transit to ERDF.

In addition, the vacuum cleaners are equipped with HEPA filters, which are considered BARCT for radioactive emissions at the Hanford Site. The HEPA filters will be efficiency tested.

## 4.0 MONITORING

Monitoring activities will consist of establishing near-facility air monitoring stations upwind and downwind of the 100-D Area. There will be four (4) downwind air monitors. The locations of these monitors, as identified in Figure 1, are based on the predominant wind directions. The existing air monitoring station at the Yakima Barricade (not shown in Figure 1), will be used as the upwind air monitoring station.

Near-facility air monitoring is the means/methods to measure emissions. These monitors will be operated in accordance with Hanford Site protocol established for near-facility monitors (DOE-RL 2000a). The air samples will be collected every two weeks and analyzed for total alpha and total beta. The samples will be composited semi-annually and analyzed for gross energy analysis (GEA), strontium-90, plutonium-238, plutonium 239/240, and isotopic uranium. Environmental soil samples will be collected before, during, and after remediation near each downwind air monitor, and analyzed for GEA, strontium-90, isotopic plutonium, and isotopic uranium. The soil samples will be taken to evaluate the long-term trends in the environmental accumulation of radioactivity. The data from these activities will be included in the appropriate annual reports prepared for the Hanford Site.

Air monitor downtime will be minimized and all air monitors shall be operated as described below. However, if a downwind air monitor is out of operation for more than 48 hours during normal work operations (e.g., excavating and loading radioactive contaminated material), Ecology will be notified. If two or more than two at a site) air monitors are out of operation during normal work operations, excavation and loading activities shall be temporarily suspended until operation of at least 2 downwind air monitors are restored or backup equipment is deployed. Normal work operations are not allowed if two downwind monitors are not operating.

Air monitoring will no longer be required when excavation of the waste sites has been completed.

Characterization (test pitting and trenching, possibly with soil sampling) may be conducted prior to the start of remediation for the purpose of confirming interpretations of geophysical data. These characterization activities will be conducted in areas identified by geophysical methods as being outside the limits of buried debris. If near-facility air monitoring is not being conducted during this pre-remediation characterization, then only routine radiological control surveys will be performed.

## 5.0 REFERENCES

BHI, 2005a, *Determination of Material at Risk for 100-D/DR Burial Grounds and Remaining Sites,* Calculation 0100D-CA-N0049, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2005b, *Total Effective Dose Equivalent Calculation for the Remedial Action of the 100-D/DR Area Burial Grounds and Remaining Sites*, Calculation 0100D-CA-V0267, Rev. 0, Bechtel Hanford,

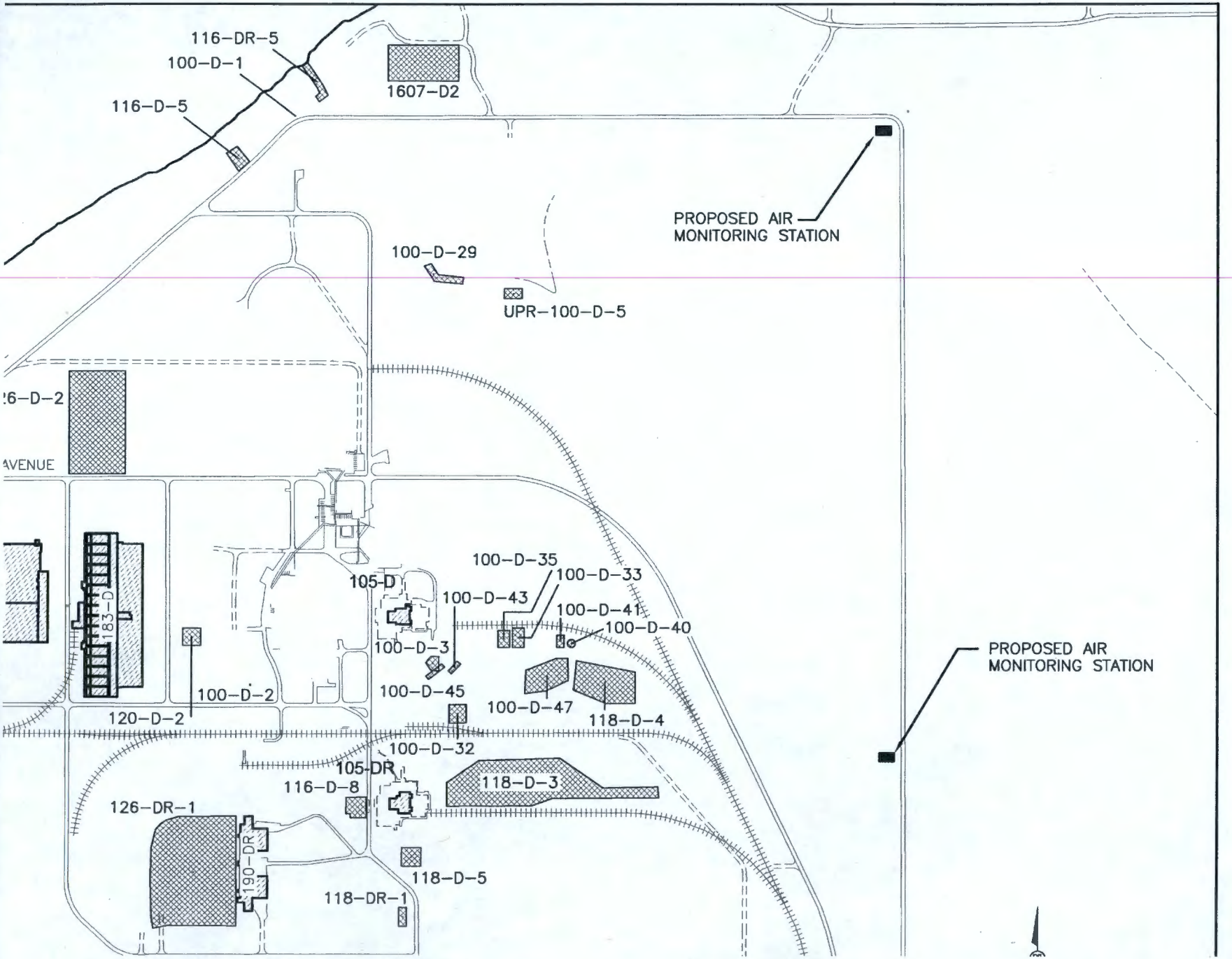
Inc., Richland, Washington.

*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 U.S.C. 9601, et seq.

DOE-RL, 2000a, *Environmental Monitoring Plan*, DOE/RL-91-50, Rev. 3, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

WAC 246-247, "Radiation Protection – Air Emissions," *Washington Administrative Code*, as amended.

**Figure 1. 100-D/DR Area Overall Area Site Plan.**



# Attachment 1
# Potential-to-Emit Values for the 100-D/DR Area Burial Grounds and Remaining Sites.

| | Inventory[1], Ci/yr | | | | Potential to Emit, Ci/yr | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Isotope | Soil/Debris and Fuel Oxide | Torch Cutting | HEPA Vacuum | Fuel Metal | Soil/Debris and Fuel Oxide (1E-3 RF)[2] | Torch Cutting (1 RF) | HEPA Vacuum (1RF) | Fuel Metal (1E 6 RF) | Total | TEDE to the MEI[3] (mrem/yr) |
| H-3 | 1.26E+01 | 2.64E-02 | 1.26E-02 | 0.00E+00 | 1.26E+01 | 2.64E-02 | 1.26E-02 | 0.00E+00 | 1.26E+01 | 4.45E-04 |
| C-14 | 6.14E+00 | 1.29E-02 | 6.14E-03 | 0.00E+00 | 6.14E-03 | 1.29E-02 | 6.14E-03 | 0.00E+00 | 2.52E-02 | 4.93E-05 |
| Na-22 | 3.58E-03 | 7.51E-06 | 3.58E-06 | 0.00E+00 | 3.58E-06 | 7.51E-06 | 3.58E-06 | 0.00E+00 | 1.47E-05 | 1.18E-06 |
| K-40 | 1.55E+00 | 3.26E-03 | 1.55E-03 | 0.00E+00 | 1.55E-03 | 3.26E-03 | 1.55E-03 | 0.00E+00 | 6.36E-03 | 7.09E-04 |
| Ca-41 | 1.10E-01 | 2.32E-04 | 1.10E-04 | 0.00E+00 | 1.10E-04 | 2.32E-04 | 1.10E-04 | 0.00E+00 | 4.52E-04 | 3.34E-09 |
| Ni-59 | 2.22E+01 | 4.66E-02 | 2.22E-02 | 0.00E+00 | 2.22E-02 | 4.66E-02 | 2.22E-02 | 0.00E+00 | 9.09E-02 | 2.40E-05 |
| Co-60 | 8.24E+02 | 1.73E+00 | 8.24E-01 | 0.00E+00 | 8.24E-01 | 1.73E+00 | 8.24E-01 | 0.00E+00 | 3.38E+00 | 4.78E-01 |
| Ni-63 | 2.63E+03 | 5.52E+00 | 2.63E+00 | 0.00E+00 | 2.63E+00 | 5.52E+00 | 2.63E+00 | 0.00E+00 | 1.08E+01 | 3.13E-03 |
| Se-79 | 3.00E-06 | 0.00E+00 | 0.00E+00 | 3.00E-03 | 3.00E-09 | 0.00E+00 | 0.00E+00 | 3.00E-09 | 6.00E-09 | 0.00E+00 |
| Kr-85 | 4.29E-03 | 0.00E+00 | 0.00E+00 | 4.29E+00 | 4.29E-06 | 0.00E+00 | 0.00E+00 | 4.29E-06 | 8.58E-06 | 6.68E-13 |
| Sr-90 | 8.83E+00 | 1.79E-02 | 8.53E-03 | 2.93E+02 | 8.83E-03 | 1.79E-02 | 8.53E-03 | 2.93E-04 | 3.56E-02 | 3.40E-03 |
| Y-90 | 8.83E+00 | 1.79E-02 | 8.53E-03 | 2.93E+02 | 8.83E-03 | 1.79E-02 | 8.53E-03 | 2.93E-04 | 3.56E-02 | 7.42E-06 |
| Zr-93 | 3.00E-05 | 0.00E+00 | 0.00E+00 | 3.00E-02 | 3.00E-08 | 0.00E+00 | 0.00E+00 | 3.00E-08 | 6.00E-08 | 7.82E-11 |
| Nb-94 | 1.20E-05 | 0.00E+00 | 0.00E+00 | 1.20E-02 | 1.20E-08 | 0.00E+00 | 0.00E+00 | 1.20E-08 | 2.40E-08 | 1.47E-08 |
| Tc-99 | 1.50E-02 | 0.00E+00 | 0.00E+00 | 1.50E+01 | 1.50E-05 | 0.00E+00 | 0.00E+00 | 1.50E-05 | 3.00E-05 | 6.02E-07 |
| Pd-107 | 3.00E-07 | 0.00E+00 | 0.00E+00 | 3.00E-04 | 3.00E-10 | 0.00E+00 | 0.00E+00 | 3.00E-10 | 6.00E-10 | 2.22E-13 |
| Ag-108m | 9.19E+01 | 1.93E-01 | 9.19E-02 | 0.00E+00 | 9.19E-02 | 1.93E-01 | 9.19E-02 | 0.00E+00 | 3.77E-01 | 0.00E+00 |
| Cd-113m | 7.23E-06 | 0.00E+00 | 0.00E+00 | 7.22E-03 | 7.23E-09 | 0.00E+00 | 0.00E+00 | 7.22E-09 | 1.45E-08 | 0.00E+00 |
| Ba-133 | 1.86E+00 | 3.91E-03 | 1.86E-03 | 0.00E+00 | 1.86E-03 | 3.91E-03 | 1.86E-03 | 0.00E+00 | 7.63E-03 | 3.10E-04 |
| Cs-134 | 3.89E-05 | 8.17E-08 | 3.89E-08 | 0.00E+00 | 3.89E-08 | 8.17E-08 | 3.89E-08 | 0.00E+00 | 1.60E-07 | 1.24E-08 |
| Cs-137 | 1.07E+01 | 2.19E-02 | 1.04E-02 | 3.00E+02 | 1.07E-02 | 2.19E-02 | 1.04E-02 | 3.00E-04 | 4.33E-02 | 1.47E-03 |
| Ba-137m | 1.01E+01 | 2.07E-02 | 9.86E-03 | 2.84E+02 | 1.01E-02 | 2.07E-02 | 9.86E-03 | 2.84E-04 | 4.10E-02 | 4.89E-03 |
| Sm-151 | 4.77E-03 | 0.00E+00 | 0.00E+00 | 4.77E+00 | 4.77E-06 | 0.00E+00 | 0.00E+00 | 4.77E-06 | 9.54E-06 | 7.11E-09 |
| Eu-152 | 6.00E+01 | 1.26E-01 | 6.00E-02 | 9.53E-04 | 6.00E-02 | 1.26E-01 | 6.00E-02 | 9.53E-10 | 2.46E-01 | 3.34E-02 |
| Eu-154 | 6.08E+01 | 1.28E-01 | 6.08E-02 | 0.00E+00 | 6.08E-02 | 1.28E-01 | 6.08E-02 | 0.00E+00 | 2.49E-01 | 2.73E-02 |
| Eu-155 | 1.36E-01 | 2.86E-04 | 1.36E-04 | 0.00E+00 | 1.36E-04 | 2.86E-04 | 1.36E-04 | 0.00E+00 | 5.58E-04 | 2.70E-06 |
| Ra-224 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Ra-226 | 9.30E-02 | 1.95E-04 | 9.30E-05 | 0.00E+00 | 9.30E-05 | 1.95E-04 | 9.30E-05 | 0.00E+00 | 3.81E-04 | 1.69E-04 |
| Ra-228 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Th-228 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Th-232 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| U-233/234 | 9.74E-02 | 2.05E-04 | 9.74E-05 | 0.00E+00 | 9.74E-05 | 2.05E-04 | 9.74E-05 | 0.00E+00 | 4.00E-04 | 1.22E-03 |
| U-235 | 2.06E-02 | 4.32E-05 | 2.06E-05 | 0.00E+00 | 2.06E-05 | 4.32E-05 | 2.06E-05 | 0.00E+00 | 8.43E-05 | 2.41E-04 |
| U-238 | 9.52E-01 | 2.00E-03 | 9.52E-04 | 8.99E-02 | 9.52E-04 | 2.00E-03 | 9.52E-04 | 8.99E-08 | 3.90E-03 | 1.05E-02 |
| Pu-239 | 2.82E-01 | 5.55E-04 | 2.64E-04 | 1.80E+01 | 2.82E-04 | 5.55E-04 | 2.64E-04 | 1.80E-05 | 1.12E-03 | 8.97E-03 |
| Pu-240 | 4.50E-03 | 0.00E+00 | 0.00E+00 | 4.50E+00 | 4.50E-06 | 0.00E+00 | 0.00E+00 | 4.50E-06 | 9.00E-06 | 7.20E-05 |
| Pu-241 | 8.50E-02 | 1.02E-04 | 4.84E-05 | 3.66E+01 | 8.50E-05 | 1.02E-04 | 4.84E-05 | 3.66E-05 | 2.72E-04 | 3.42E-05 |
| Am-241 | 6.18E-02 | 1.10E-04 | 5.23E-05 | 9.47E+00 | 6.18E-05 | 1.10E-04 | 5.23E-05 | 9.47E-06 | 2.34E-04 | 2.88E-03 |
| Pu-238 | 6.50E-02 | 1.36E-04 | 6.48E-05 | 2.36E-01 | 6.50E-05 | 1.36E-04 | 6.48E-05 | 2.36E-07 | 2.66E-04 | 1.98E-03 |
| Total | | | | | | | | | | 5.79E-01 |

[1] Radionuclide inventories are presented in ERC Calculation 0100D-CA-V0267, *Total Effective Dose Equivalent for the Remedial Action of the 100-D/DR Area Burial Grounds and Remaining Sites,* Rev. 0, August 2005.

[2] Release fraction for H-3 is assumed to be 1 in all cases.

[3] The annual unabated total effective dose equivalent was determined using the CAP88-PC, Version 2 model. The potential to emit (Ci/yr) was input to the model, and the model generated the annual unabated dose. The distance to the MEI for the 100-D/DR Area Burial Grounds and Remaining Sites Remedial Action is 9,713 m west northwest. The CAP88-PC model summary and synopsis are presented in ERC Calculation 0100D-CA-V0267, *Total Effective Dose Equivalent for the Remedial Action of the 100-D/DR Area Burial Grounds and Remaining Sites,* Rev. 0, August 2005.

MEI = Maximally exposed individual
TEDE = Total effective dose equivalent
RF = Release fraction