AIR MONITORING PLAN FOR THE 100-IU-2 AND 100-IU-6 AREAS REMAINING SITES REMEDIAL ACTION
April 2011

1.0 INTRODUCTION

Remedial action (i.e., cleanup) of the remaining sites located in the 100-IU-2 and 100-IU-6 Areas 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 the associated *Remedial Design Report/Remedial Action Work Plan for the 100 Area,* approved by the U.S. Environmental Protection Agency (EPA) (DOE-RL 2009). Quantification of radioactive emissions, implementation of best available radionuclide control technology (BARCT) pursuant to *Washington Administrative Code* (WAC) 246-247(3), and air monitoring pursuant to WAC 246-237-075(3) and (8) have been identified as substantive requirements (i.e., applicable or relevant and appropriate requirements) for the remedial action. This air monitoring plan describes how the substantive portions of these requirements will be implemented for this removal action.

1.1 PLANNED ACTIVITIES

This remedial action work scope is for the removal and disposal of waste material and associated soil and debris from remaining waste sites located in the 100-IU-2 and 100-IU-6 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. 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. A portable temporary radioactive air emissions unit (PTRAEU) may be used in the characterization of anomalies.

The work scope includes remediation of the following waste sites in the 100-IU-2 Operable Unit: 600-5, 600-100, 600-120, 600-124, 600-125, 600-127, 600-176, 600-182, and 600-188. In the 100-IU-6 Operable Unit, the work scope includes the following waste sites: 600-3, 600-108, 600-109, 600-111, 600-146, 600-178, 600-186, 600-202, 600-205, 600-213, 600-239, 600-257, and 600-280. However, of all these waste sites, only four are radioactively contaminated: 600-108, 600-111/UPR-600-16, 600-257, and 600-3 which are all located in the 100-IU-6 Operable Unit (Figures 1 and 2). Waste site 600-111 has already been remediated, so only three radioactively contaminated waste sites remain. Currently, no waste sites in the 100-IU-2 Operable Unit are believed to contain radioactivity. Additionally, any nonradioactive sites in 100-IU-2 or 100-IU-6 that are discovered to contain radioactivity (based on new information), will use/ follow this air monitoring plan during remediation once concurrence is obtained from EPA.

Characterization sampling (e.g. confirmatory sampling, remedial investigation sampling) at radiologically contaminated or potentially contaminated sites is included in the scope of this plan since the emissions from these activities (e.g., surface sampling, potholing) could generate negligible emissions. The U.S. Environmental Protection Agency will be notified of confirmatory sampling activities at 100-IU-2/6 areas via the confirmatory sampling work instruction approval process.

2.0 AIRBORNE SOURCE INFORMATION

There is a potential for particulate radioactive airborne emissions to result from remediation of the waste sites in the 100-IU-2 and 100-IU-6 Operable Units. The primary radiological isotopes include americium-241, cobalt-60, plutonium-238, and plutonium-239/240. The concentrations of the isotopes listed in Attachment 1 represent those that were determined to exist in the remaining waste sites. Other isotopes may also be encountered in negligible amounts 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 600-257 and 600-108 waste sites consist of two adjacent concrete storage vaults built into the south side of Gable Mountain (see Figure 1). The 600-257 waste site is the 213-J vault and the 600-108 waste site is the 213-K vault. The vaults were originally built to store containers of processed plutonium product and waste boxes. Later, they were used to store explosives and ammunition and for seismic testing.

The 600-3 waste site consists of a shallow trench that appears to be an old borrow pit,

approximately 37 by 27 by 1.2 meters, and a dumping area spread out over an area approximately 280 by 490 meters. The site consists mainly of nonradionuclide debris, paint chips and surface debris. During initial excavation cylinder with enriched uranium contamination was unearthed and sampled to develop a radiological inventory.

The radionuclide inventory and subsequent potential emission calculation for the 600-257 and 600-3 waste site is summarized in Attachment 1. The inventory for 600-257 was developed based on the *Determination of Material at Risk for the 100-IU-6 Operable Units Remaining Sites*, Calculation 0600X-CA-N0027, Rev. 0 (WCH 2008a). Inventory for 600-3 was developed based on analytical data from the contaminated cylinder, which is also captured in this same calculation.

The CAP88-PC model 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 input to the computer model, and the model generated the annual unabated dose. The distance to the MEI used in the model was approximately 10,736 meters east. The CAP88-PC model summary and synopsis are presented in calculation 0600X-CA-V0064, rev. 1 (WCH 2010). The calculated total unabated annual TEDE to the MEI from 600-257 and 600-3 is 3.13×10^{-3} mrem/year.

The calculated total unabated annual TEDE to the MEI from 600-108 is assumed to be the same as that for 600-257. The CAP-88-PCrun was notseparated for 600-257 and 600-3, so conservatively doubling the output to account for 600-108 inventory results in acombined total from all three sites of 6.26×10^{-3} 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) should be performed of the contaminated soils and debris that remain inactive for greater than 1 month. Re-application of fixatives 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 to support a compliance demonstration (e.g., logbook or other project-specific documentation).

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

- Vacuum cleaners and PTRAEU's will be used when needed and are equipped with HEPA filters, which are considered BARCT for radioactive emissions at the Hanford Site. HEPA filters are efficiency tested upon installation and on an annual basis thereafter and must be demonstrated to have a 99.95% removal efficiency.

4.0 MONITORING

The *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE-RL 2009) in section 3.4.6, "Air Monitoring Plans," notes the following:

"The substantive requirements applicable to radioactive air emissions resulting from remediation activities are to quantify potential emissions, monitor the emissions, and identify and employ best available radionuclide control technology. Exemptions from these requirements may be requested if the potential-to-emit for the activity or emission unit would result in a total effective dose equivalent of less than 0.1 mrem/year."

Section 2.1 above quantifies the potential emissions that may result from this remediation activity. Because the calculated total unabated annual TEDE to the MEI from the 100-IU-6 Area remedial action is 2.62×10^{-3} mrem/yr, which is less than 0.1 mrem/year, the remediation of the 600-3, 600-108 and 600-257 sites is exempt from the requirement to monitor emissions. The best available radionuclide control technology specified in section 3.0 above shall be implemented to control any emissions that may result from the remedial activity.

5.0 REFERENCES

BHI, 2005, *Determination of Material at Risk for Remediation of 100-IU-2 and 100-IU-6 Operable Units Remaining Sites*, Calculation 0000X-CA-N0001, Rev. 3, Bechtel Hanford, Inc., Richland, Washington.

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

DOE-RL, 2009, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, DOE/RL-96-17, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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

WCH 2008a, *Determination of Material at Risk for the 100-IU-6 Waste Sites*, Calculation 0600X-CA-N0027, Rev. 0, Washington Closure Hanford, Richland, Washington.

WCH 2010, *Total Effective Dose Equivalent Calculation for Remedial Action of the 600-257 Waste Site*, Calculation No. 0600X-CA-V0064, Revision 1, Washington Closure Hanford, Richland, Washington.

WDOH, 1994, Letter AIR 94-802, A. W. Conklin to S. H. Wisness, August 1, 1994, Washington Department of Health.

Figure 1. Top view of 600-108 and 600-257 Waste Sites

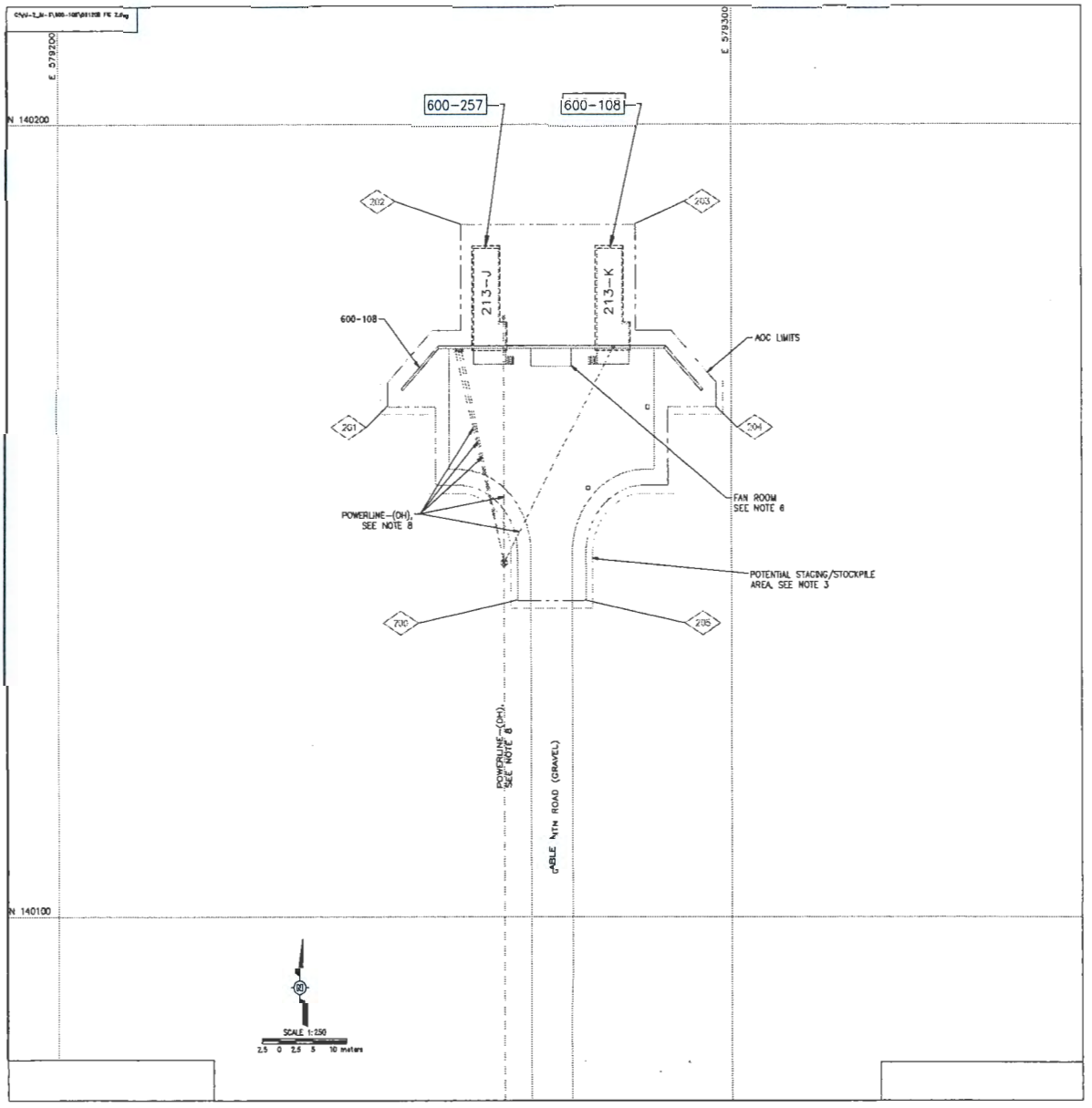
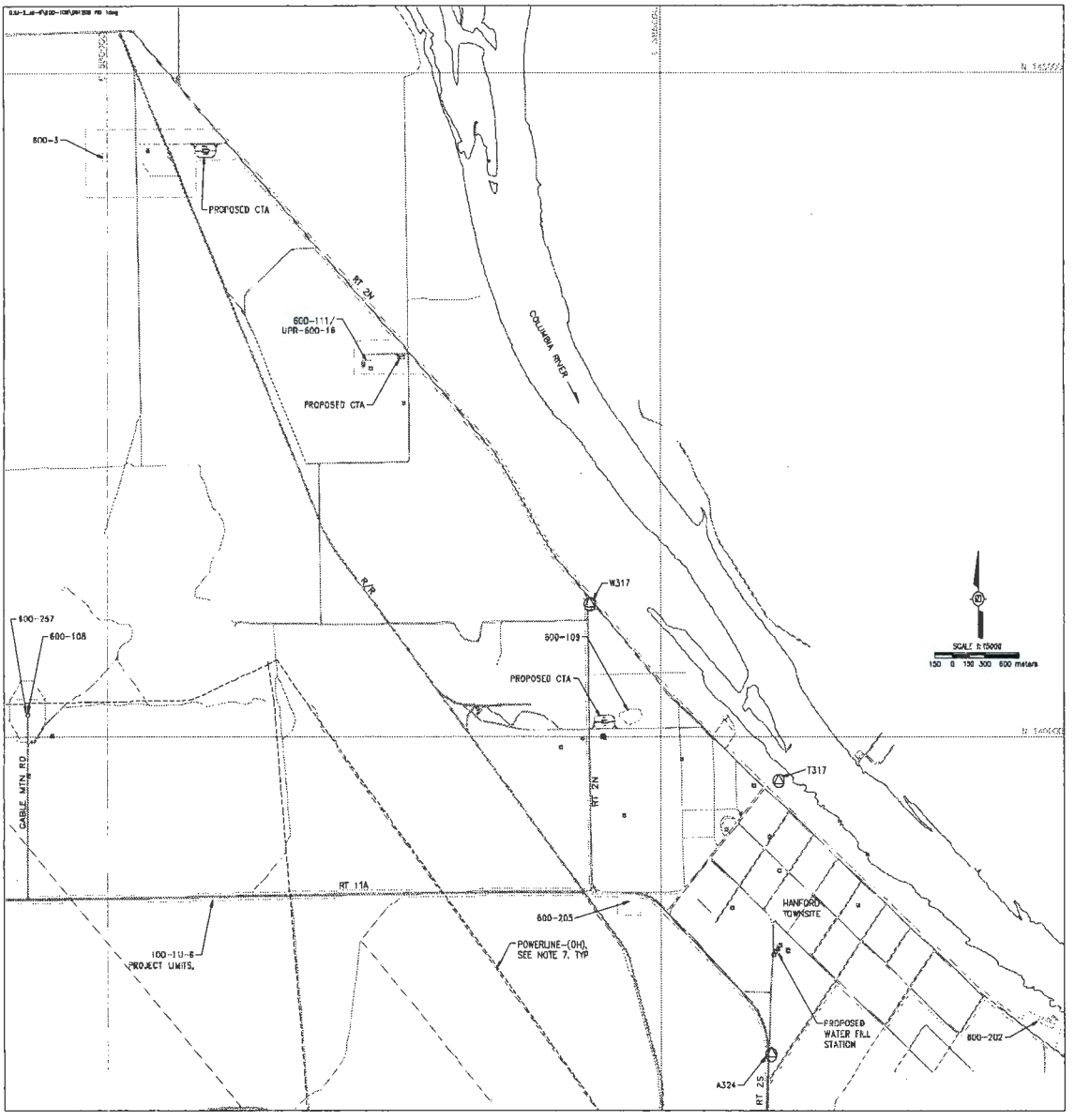


Figure 2. Locations of the 600-3, 600-108 and 600-257 Waste Sites



ATTACHMENT 1

Summary of radionuclide inventory and potential emission calculations For remediation of 100-IU-2 and 100-IU-6 Waste Sites

Isotope	Inventory[1], Ci	Potential to Emit, Ci/yr		Unabated TEDE to the MEI[2] (mrem/yr)
		Release Fraction	Total	
Ag-108m	5.50E-10	1.00E+00	5.50E-10	0.00E+00
Am-241	2.19E-04	1.00E+00	2.19E-04	9.52E-04
Bi-210				3.83E-11
Bi-212				1.15E-09
Bi-214				7.90E-08
Ba-137m	9.12E-04	1.00E+00	9.12E-04	2.91E-06
C-14	4.23E-06	1.00E+00	4.23E-06	4.28E-09
Co-60	1.59E-02	1.00E+00	1.59E-02	6.57E-04
Cs-137	9.64E-04	1.00E+00	9.64E-04	1.46E-04
Eu-152	3.98E-03	1.00E+00	3.98E-03	4.30E-05
Eu-154	1.20E-03	1.00E+00	1.20E-03	1.53E-05
Eu-155	7.06E-05	1.00E+00	7.06E-05	8.10E-08
K-40	1.17E-04	1.00E+00	1.17E-04	1.03E-05
Nb-94	1.08E-04	1.00E+00	1.08E-04	1.11E-06
Ni-63	6.09E-03	1.00E+00	6.09E-03	4.98E-06
Pa-234m				4.72E-09
Pb-210				2.72E-08
Pb-212	5.92E-09	1.00E+00	5.92E-09	7.92E-10
Pb-214				1.32E-08
Po-210				1.97E-09
Po-214				4.34E-12
Po-216				8.25E-14
Po-218				4.74E-13
Pu-238	4.51E-05	1.00E+00	4.51E-05	2.17E-04
Pu-239/240[3]	1.71E-04	1.00E+00	1.71E-04	8.94E-04
Pu-241	5.25E-04	1.00E+00	5.25E-04	4.93E-05
Ra-224				3.44E-09
Ra-226	1.02E-05	1.00E+00	1.02E-05	6.75E-06
Rn-222				1.47E-16
Th-228	1.05E-06	1.00E+00	1.05E-06	4.29E-06
Th-231				1.35E-11
Th-232	2.90E-09	1.00E+00	2.90E-09	7.36E-09
Th-234				5.39E-09
Sr-90	2.16E-05	1.00E+00	2.16E-05	5.84E-06
Tc-99	2.25E-03	0.00E+00	2.25E-03	1.09E-04
Tl-208				5.44E-09
U-234	8.74E-06	0.00E+00	8.74E-06	3.31E-06
U-235	1.57E-07	0.00E+00	1.57E-07	5.31E-08
U-238	9.83E-06	0.00E+00	9.83E-06	3.07E-06
Y-90	2.16E-05	0.00E+00	2.16E-05	1.63E-08
Total				3.13E-03

[1] Inventory taken from Determination of Material at Risk for 100-IU-6 Operable Unit Waste Sites, 0600X-CA-N0027 (WCH 2008).

[2] The annual unabated total effective dose equivalent was determined using the CAP88-PC, Version 3 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-IU-6 Operable Unit Waste Sites is 10,736 m East. The CAP88-PC model summary and synopsis are presented in Calculation 0600X-CA-V0064, Total Effective Dose Equivalent for the Remedial Action of the 100-IU-6 Operable Unit Waste Sites, Rev. 1.

[3] For some sites, the MAR calcs presented combined data (i.e., Pu-239/Pu-240). For this TEDE, the Pu-239/Pu-240 combined value is assumed to be Pu-239.

For some nuclides, results of other chain constituents were also calculated. Only those with a value greater than 1.0 are included in this table.

MEI = Maximally exposed individual

TEDE = Total effective dose equivalent

RF = Release fraction

APPROVAL PAGE

Title: Air Monitoring Plan for the 100 IU-2 and 100-IU-6 Areas Remaining Sites Remedial Action, April 2011

Approval:

J. Zeisloft
U.S. Department of Energy
Richland Operations Office

Signature Date 4/13/11

C. Guzzetti
U.S. Environmental Protection Agency

Signature Date 4/13/11

AIR MONITORING PLAN FOR THE 100-IU-2 AND 100-IU-6 AREAS
REMAINING SITES REMEDIAL ACTION
April 2011

Distribution

Administrative Record	H6-08
Darrin Faulk	N2-02
Dean Strom	X3-40
Chris Beach	X3-40
Joan Woolard	H4-21