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Revision 0

Air Monitoring Plan for the Fast Flux Test Facility Complex Removal Action

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

P.O. Box 550
Richland, Washington 99352

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Terms

AOP	Air Operating Permit
APQ	annual possession quantity
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DHX	Dump Heat Exchanger
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FFTF	Fast Flux Test Facility
FSF	Fuel Storage Facility
HEPA	high-efficiency particulate air (filter)
HTS	Heat Transport System
MEI	maximally exposed individual
NFM	near-facility monitoring
NESHAP	National Emission Standards for Hazardous Air Pollutants (40 CFR 61)
NTCRA	non-time-critical removal action
PTE	potential-to-emit
RCB	Reactor Containment Building
RSB	Reactor Service Building
S&M	surveillance and maintenance
TEDE	total effective dose equivalent
WDOH	Washington State Department of Health

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1 Introduction

This air monitoring plan supports DOE/RL-2023-16, *Removal Action Work Plan for the Fast Flux Test Facility Complex*, for a non-time-critical removal action (NTCRA) at the Fast Flux Test Facility (FFTF) Complex. The structures addressed by this NTCRA are chemically and/or radiologically contaminated. The FFTF Complex structures addressed in this NTCRA are as follows (Figure 1):

- 403 Fuel Storage Facility (FSF)
- 405 Reactor Containment Building (RCB)
- 408A Dump Heat Exchanger (DHX), East
- 408B Dump Heat Exchanger, South
- 408C Dump Heat Exchanger, West
- 491E Heat Transport System (HTS) Service Building, East
- 491S Heat Transport System Service Building, South
- 491W Heat Transport System Service Building, West
- 4717 Reactor Service Building (RSB).

Figure 1. Location of the FFTF Complex Structures

The selected NTCRA scope for the FFTF Complex structures includes the following activities:

- Continued surveillance and maintenance (S&M) of the FFTF Complex
- Hazard abatement of nine structures
- Disposal of wastes generated from the removal activities
- Clean up of miscellaneous debris
- Equipment decontamination
- Stabilization of the affected structures and immediately adjacent areas

Included in this NTCRA are characterization activities of remaining hazardous substances to facilitate waste disposal, as well as to document post-removal conditions for future removal or remedial action. For emissions calculations, activities addressed in this removal action are conservatively assumed to take 1 year to complete.

The implementation of the NTCRA requires that the FFTF Complex stacks be transitioned from the Hanford Site Air Operating Permit (AOP) into the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) as part of DOE/RL-2023-16. A notice of transition will be submitted after finalization of this air monitoring plan, DOE/RL-2023-16, and notification of fieldwork commencement date. The following emission units are associated with the buildings/structures within the scope of this removal action:

- The FFTF-RE-SB Stack for 4717 RSB, Emission Unit 395
- The FFTF-HT-TR Stack for 491S HTS, Emission Unit 396
- The FFTF-CB-EX Stack for 405 RCB, Emission Unit 397

The stacks are covered within the radiological air emissions license number FF-01 (WDOH, 2017, *Radioactive Air Emissions For The Department of Energy Richland Office Hanford Site License*) for radiological air emissions associated with S&M activities. The change in the operational scope from S&M to removal activities required a reevaluation of the potential-to-emit (PTE) to determine if the existing control and monitoring technology would continue to meet the regulatory requirements of WAC 246-247, "Radiation Protection—Air Emissions."

In 2015, an agreement was made with the Washington State Department of Health (WDOH) to remove Emission Units 395 and 396 from the AOP. Power to the fan motors for these two emission units has been disconnected. However, these units remain in the permit until the deactivation and demolition methods are defined and their needs are re-evaluated. Re-evaluation has not been performed to date.

This air monitoring plan updates the abatement and monitoring methods required to meet the substantive requirements of the WAC 246-247 regulation for radioactive emissions; the WAC 173-400, "General Regulations for Air Pollution Sources," regulation for criteria emissions; and the WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," regulation for toxic emissions. Collectively, these regulations allow for CERCLA authority of the FFTF Complex through development of work documents that provide compliance with the substantive provisions of the regulations during the NTCRA. All substantive portions of each of these regulations will be identified in the following chapters, which also provide for the abatement and monitoring methods associated with the hazard abatement of structures that are included in the NTCRA.

2 Radiological Air Emissions

WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," sets state standards that are as stringent (or more so) as the federal standards under the *Clean Air Act Amendments of 1990* and subsequent amendments and under the federal implementing regulation, 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants" (NESHAP), Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." U.S. Environmental Protection Agency (EPA) delegation of the 40 CFR 61 authority to the State of Washington includes all substantive emissions monitoring, abatement, and reporting aspects of the federal regulation. The state standards protect the public by conservatively establishing exposure standards applicable to a maximally exposed individual (MEI), be that individual real or hypothetical. Therefore, the standards address any member of the public at the point of maximum annual air concentration in an unrestricted area where any member of the public may be. All combined radionuclide airborne emissions from the U.S. Department of Energy (DOE) Hanford Site "facility" are not to exceed amounts that would cause an exposure to any member of the public of greater than 10 mrem/yr effective dose equivalent, per the WAC 173-480-040, "Ambient Standard," requirement. Adopting the specific substantive standards of WAC 173-480 and 40 CFR 61 (Subpart H), WAC 246-247 requires verification of compliance with the 10 mrem/yr standard and is applicable or relevant and appropriate to this NTCRA.

WAC 246-247-075, "Monitoring, Testing, and Quality Assurance," addresses sources emitting fugitive or diffuse radioactive airborne emissions by requiring monitoring of such sources. Such monitoring requires physical measurement of the effluent or ambient air and quality assurance of environmental measures to assure precision, accuracy, and completeness. The substantive provisions of WAC 246-247 that require monitoring of radioactive airborne emissions are applicable or relevant and appropriate to this NTCRA.

The above state-implementing regulations further address control of radioactive airborne emissions where economically and technologically feasible (WAC 246-247-040 [3] and [4], "General Standards," and associated definitions). To meet the substantive aspect of these requirements, best or reasonably achieved control technology will be applied by ensuring that demonstrated emission control technologies (those successfully operated in similar applications) will be used when economically and technologically feasible (i.e., based on cost/benefit). If it is determined that there are substantive aspects of the requirement for control of radioactive airborne emissions, then controls will be administered as appropriate.

3 Criteria/Toxic Air Emissions

Requirements are established under WAC 173-400 and WAC 173-460 for the regulation of emissions of criteria/toxic air pollutants, or "nonradioactive" air pollutants. The primary nonradioactive emissions resulting from hazard abatement of buildings/structures during this NTCRA will be fugitive particulate matter. In accordance with WAC 173-400-040, "General Standards for Maximum Emissions," reasonable precautions must be taken to prevent the release of air contaminants associated with fugitive emissions resulting from materials handling, or other operations, and to prevent fugitive dust from becoming airborne from fugitive sources of emissions.

The use of treatment technologies that would result in emissions of toxic air pollutants that would be subject to the substantive applicable requirements of WAC 173-460 are not anticipated to be a part of this NTCRA. Treatment of some waste encountered during this NTCRA may be required to meet acceptance criteria for the Environmental Restoration Disposal Facility (ERDF-00011, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*) or the Integrated Disposal Facility (IDF-00002, *Waste Acceptance Criteria for the Integrated Disposal Facility*). In most cases, the type of treatment

anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting, which is analyzed in the Environmental Restoration Disposal Facility waste acceptance criteria (ERDF-00011), and the Integrated Disposal Facility waste acceptance criteria (IDF-00002). Therefore, WAC 173-460-150, "Table of ASIL, SQER and de minimis emission values," requirements would not be considered an applicable or relevant and appropriate requirement as all criteria and toxic emissions will be below de minimis. This, in turn, fulfills the applicable requirement of WAC 173-460-070, "Ambient Impact Requirement," and thus, WAC 173-460-060, "Control Technology Requirements." If additional treatment is deemed necessary that would result in the emission of regulated air pollutants, the substantive requirements of WAC 173-400-113(2), "New Sources in Attainment or Unclassifiable Areas—Review for Compliance with Regulations," and WAC 173-460-060 would be evaluated to determine applicability.

Emissions to the air will be minimized during implementation of this NTCRA through use of standard industry practices such as the application of fixatives. This technique is typically considered to be a reasonable precaution to control fugitive emissions as required by regulatory standards.

4 Radiological Airborne Source Information

There is a potential for particulate radionuclide airborne emissions resulting from the NTCRA activities. Radiological inventory values for the 405 RCB and 4717 RSB exhausting via the FFTF-CB-EX Stack are provided in Table 1.

Table 1. Estimated FFTF-CB-EX Point Source Inventory

Isotope	Structure Inventory* (Ci)		Total Inventory (Ci)
	405	4717	
Pu-239	---	2.33E-03	2.33E-03
Cs-137	2.70E+01	1.17E-01	2.71E+01
Ba-137m	2.55E+01	1.10E-01	2.57E+01

* Inventories calculated in Appendix A of ECF-HANFORD-23-0010, *Radiological and Toxic Air Emissions for the Fast Flux Test Facility Complex.*

Radiological inventory values for the FFTF Complex structures that are diffuse and fugitive area sources are provided in Table 2.

Table 2. Estimated Diffuse and Fugitive Area Source Inventories

Structure No.	Radiological Inventory* (Ci)			
	Pu-239	Cs-137	Ba-137m	H-3
403	---	3.20E+00	3.03E+00	---
408A	1.17E-03	5.83E-02	5.51E-02	1.67E-02
408B	1.17E-03	5.83E-02	5.51E-02	1.67E-02
408C	1.17E-03	5.83E-02	5.51E-02	1.67E-02
491E	1.57E-03	7.85E-02	7.43E-02	---

Table 2. Estimated Diffuse and Fugitive Area Source Inventories

Structure No.	Radiological Inventory* (Ci)			
	Pu-239	Cs-137	Ba-137m	H-3
491S	---	4.80E+01	4.54E+01	---
491W	1.51E-03	7.57E-02	7.16E-02	---

* Inventories calculated in Appendix A of ECF-HANFORD-23-0010, *Radiological and Toxic Air Emissions for the Fast Flux Test Facility Complex.*

An estimate of potential airborne emissions from the NTCRA work was conducted using the WAC 246-247-030(21)(a), "Definitions, Abbreviations, and Acronyms," annual possession quantity (APQ) method.[1] The release fraction[2] for gases (1.0) and liquids or particulate solids (10^{-3}) was applied, as appropriate, to the APQ for the structures within the scope of the FFTF Complex removal action. The unabated total effective dose equivalent (TEDE) to the MEI[3] was then calculated using CAP-88-PC[4] software (version 4.0) and documented in the calculation ECF-HANFORD-23-0010, *Radiological and Toxic Air Emissions for the Fast Flux Test Facility Complex*. For all cases, the offsite MEI is located to the southeast at the Hanford Site boundary, and the onsite MEI is located to the north-northeast at Energy Northwest. TEDE to the onsite MEI is provided in accordance with the agreement reached between DOE, Richland Operations Office; EPA; and WDOH (AIR 00-1012, "New Maximally Exposed Individual Definition"). The distance to the onsite and offsite MEIs are provided in Table 3.

The representative radionuclides used for the calculation were plutonium-239 for alpha and cesium-137 and barium-137m for beta/gamma, with these radionuclides contributing greater than 10% of the TEDE to the MEI for both point source and diffuse and fugitive emissions (note: plutonium-239 contributes less than 10% for the FFTF-CB-EX Stack and is not present in the 403 FSF and 491S HTS cases). These isotopes were chosen to conservatively estimate the TEDE based upon their presence in the source material and their potential dose consequence compared to the rest of radioisotopes in the source material. It is also conservatively assumed that all the APQ for the areas within the scope of the removal action would be released within 1 year.

The unabated TEDE to the offsite MEI for the point source from the 405 RCB and 4717 RSB structures which utilize the FFTF-CB-EX Stack is less than 0.1 mrem/yr; therefore, annual periodic confirmatory

[1] The APQ method looks at a given isotopic source term, multiplied by the associated release fraction provided in WAC 246-247-030(21)(a), in order to determine a dose to a hypothetical MEI.

[2] When calculating PTE, a WAC 246-247-030(21)(a) release fraction is assigned to some or all the source term based on the physical state of the media. In most cases, a 10^{-3} release fraction is assigned to the source term, assuming it all to be liquids or particulate solids. For the 408A, 408B, and 408C DHX buildings, a gaseous release fraction of 1.0 is assigned to the hydrogen-3 source term.

[3] The WAC 246-247-030(15) definition for MEI is: "any member of the public (real or hypothetical) who abides or resides in an unrestricted area, and may receive the highest TEDE from the emission unit(s) under consideration, taking into account all exposure pathways affected by the radioactive air emissions." For the purposes of radiological source term, the offsite MEI is to the southeast at the Hanford Site boundary line. This excludes the land transferred to the Tri-Cities Washington Economic Development Council.

[4] A regulatory compliance tool under NESHAP (40 CFR 61), the Clean Air Act Assessment Package-1988 (CAP-88) model is a set of computer programs, databases, and associated utility programs for estimating dose and risk from radionuclide emissions to the air. CAP88-PC version 4.0 allows modeling on a personal computer and is a recent version of the code.

measurements are required as discussed in Chapter 6. For the diffuse and fugitive sources from 403, 408A, 408B, 408C, 491E, 491S and 491W, the total PTE is also less than 0.1 mrem/yr TEDE to the MEI. Table 3 provides the unabated TEDE to the onsite and offsite MEIs for each structure within the scope of this removal action.

Table 3. Total Effective Dose Equivalent to the Maximally Exposed Individual

Emission Type	Structure No.	Offsite MEI		Onsite MEI[a]	
		Unabated TEDE (mrem/yr)	MEI Location[b] (m SE)	Unabated TEDE (mrem/yr)	MEI Location[b] (m NNE)
Point source	FFTF-CB-EX Stack (405 & 4717)	1.43E-02	6,072	3.27E-02	3,028
Diffuse and fugitive	403	1.81E-03	6,058	4.91E-03	2,964
	408A	4.17E-05	5,999	1.07E-04	3,057
	408B	4.04E-05	6,132	1.04E-04	3,123
	408C	3.98E-05	6,193	1.05E-04	3,088
	491E	5.50E-05	6,034	1.43E-04	3,051
	491S	2.70E-02	6,071	6.93E-02	3,087
	491W	5.21E-05	6,105	1.35E-04	3,080
	Subtotal	2.90E-02		7.48E-02	
Total		**4.33E-02**		**1.08E-01**	

Source: ECF-HANFORD-23-0010, *Radiological and Toxic Air Emissions for the Fast Flux Test Facility Complex*, Table 7.

Note: CAP88-PC, version 4.0, allows modeling on a personal computer and is a recent version of CAP-88, a regulatory compliance tool under 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants."

a. TEDE to the onsite MEI is provided in accordance with the agreement reached between the U.S. Department of Energy, Richland Operations Office; the U.S. Environmental Protection Agency, and the Washington State Department of Health (AIR 00-1012, "New Maximally Exposed Individual Definition").

b. The offsite MEI is located to the southeast at the Hanford Site boundary and the onsite MEI is located to the north-northeast at Energy Northwest for all cases.

MEI = maximally exposed individual

NNE = north northeast

SE = southeast

TEDE = total effective dose equivalent

5 Emission Controls

As a significant activity regarding potential for airborne radionuclide emissions, this NTCRA will be subject to the substantive provisions of WAC 246-247-040, "General Standards." The 40 CFR 61.93, "Emission Monitoring and Test Procedures" requirements, adopted through WAC 246-247-035(1)(a)(i), "National Standards Adopted by Reference for Sources of Radionuclide Emissions," are also a substantive requirement within this work scope.

The activities performed in the 405 and 4717 Buildings as part of the NTCRA include hazard abatement and ongoing S&M. The FFTF-CB-EX ventilation system consists of the ducts, two sets of prefilters and high-efficiency particulate air (HEPA) filters, parallel exhaust fans, the exhaust stack, and control equipment. The FFTF-CB-EX ventilation system pulls exhaust air from the following systems and airspaces (Figure 2):

- Argon Processing and Cell Atmosphere Processing System – Building 4717
- Building 405 Process Operations – Building 405
- Access Control Area and Process Operations – Buildings 4703 and 4621E

Exhaust fans R-3 (primary) and R-4 (backup), located in the 4621E Auxiliary Equipment Building, are being used to support the FFTF-CB-EX emission unit. Only one of the two fans is operated during the period of personnel entry into the respective buildings. During the deactivation period, the original sources of power to these fans were replaced with a new power supply and the compressed air systems used to operate dampers were deactivated.

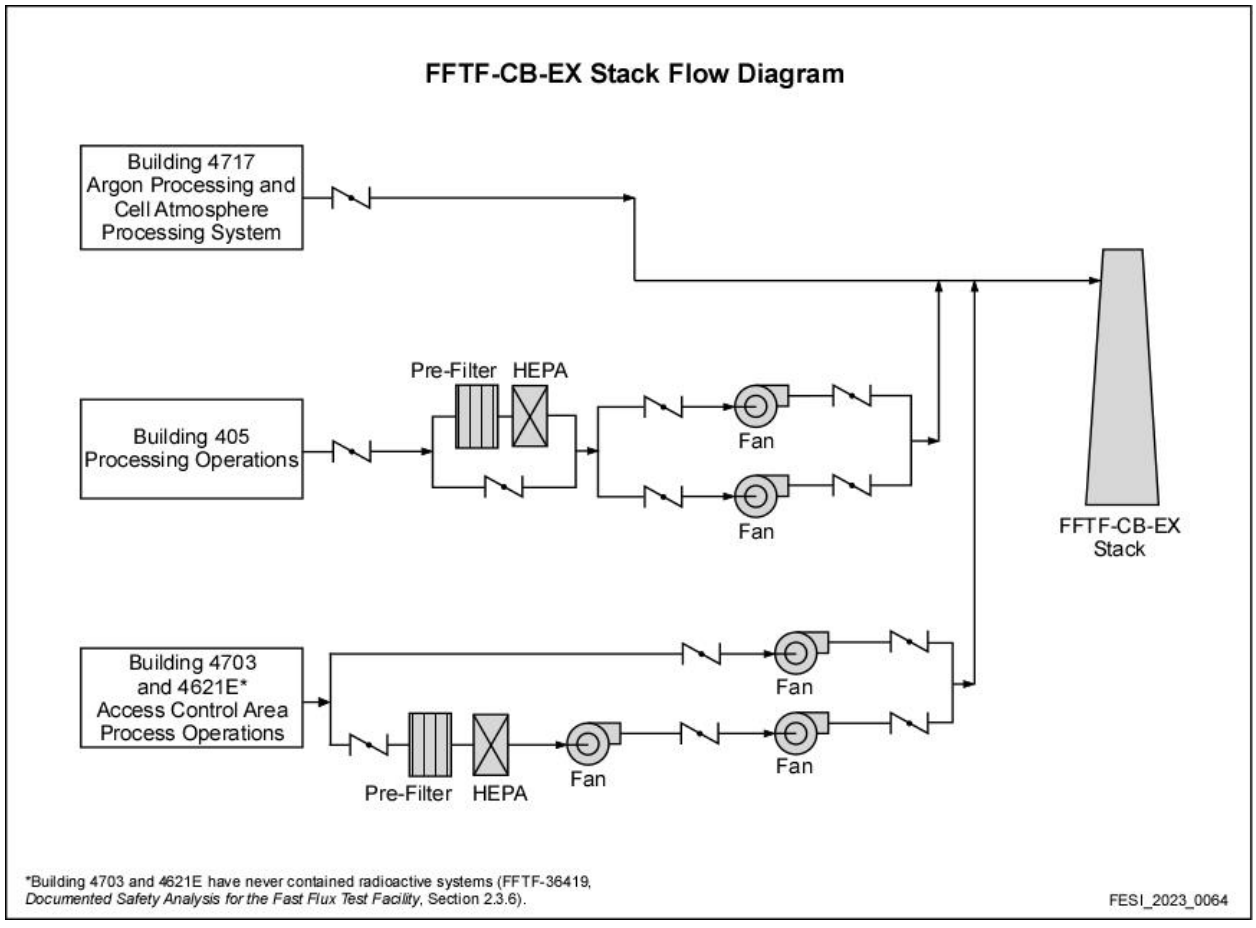

Figure 2. FFTF-CB-EX Stack Ventilation System Schematic

HEPA filters will have a manufacturer rated removal efficiency of at or above 99.97%. The filters are in-place leak tested annually to the standard of at or above 99.95%, meeting the intent of ASME N511-2017, *In-Service Testing of Nuclear Air-Treatment, Heating, Venting, and Air-Conditioning Systems*. The filters are not used if aerosol testing performance criteria are not met.
The following measures were selected to provide added worker protection controls:

- Planning for the special handling of stabilized items while minimizing risk of damage during handling.
- Vacuum cleaners and/or portable exhausters used for removal activities equipped with HEPA-type filters to provide point source or downdraft contamination control.
- Future temporary exhausters with HEPA filters will be provided as an alternate air mover as practicable.

Hazard abatement and ongoing S&M activities in the 403, 408A, 408B, 408C, 491E, 491S, and 491W Buildings are the contributors to the diffuse and fugitive emissions. It has been demonstrated through Hanford Site experience and ongoing operations that the listed available methods, systems, and techniques for the control of radionuclide particulate emissions in the bulleted list below represent the most effective control technology from among all known feasible alternatives and the required level of best available radionuclide control technology for the subject NTCRA.

Based on analysis of the potential emissions and evaluation of available control technologies, the following active controls of diffuse and fugitive emissions have been selected for use when practicable during this removal action. The radiological control and environmental organizations are responsible for selecting and ensuring that appropriate controls are implemented to maintain both worker exposure and environmental releases as low as reasonably achievable. These include, but are not limited to, the following:

- Items inside of the ventilated space may be internally and externally stabilized and handled to minimize any potential release prior to being removed from ventilated space or securing ventilation.
- Radiological surveys (e.g., swipes/smears) will be taken from equipment leaving areas where there is the potential for removable contamination above 2,000 dpm/100 cm^2 alpha or 100,000 dpm/100 cm^2 beta/gamma following any removal activities.
- Operational limits for removable or transferable radioactive contamination levels will be established in work packages and associated radiation work procedures. Fixatives or other physical controls will be employed if removable or transferable contamination levels above 100,000 dpm/100 cm^2 beta/gamma or exceeding 2,000 dpm/100 cm^2 alpha are measured or expected.
- Fixatives will be applied to contaminated equipment per manufacturer instructions as needed to minimize airborne contamination during the NTCRA activities. Fixative application techniques may include spraying, brushing, pouring, or another method, as necessary.
- Measures such as decontamination solutions, expandable foam, or encasement in grout, fixatives, or glovebags will also be used in a graded approach to help minimize the spread of contamination.
- Waste containers will remain closed, except during packaging and waste inspection activities.
- Any vacuum cleaners and portable exhausters used for removal activities will be equipped with appropriately tested HEPA filters. Filters will be aerosol tested annually. Units will undergo

additional aerosol testing in the event that the units are thought to have been compromised (e.g., dropped or roughly handled).

- Portable exhausters or wet methods will be utilized to control emissions from stripping operations, which tend to generate respirable particulate matter (e.g., grinding, cutting, or welding) whenever it is reasonably possible to do so.

If unanticipated new sources of airborne pollutants are encountered, the potential for emissions will be reviewed and appropriate controls implemented, as required.

Best available radionuclide control technology and as low as reasonably achievable control technology controls will be applied based on the PTE using a graded approach.

6 Monitoring

There are two components associated with airborne emissions monitoring at the FFTF Complex as part of the NTCRA: point source monitoring (e.g., sampling of HEPA-filtered vacuums, portable HEPA-filtered exhausters, or temporary exhausters) and diffuse and fugitive monitoring (e.g., temporary ambient air monitors used by the radiological control program, radiological surveys), coupled with monitoring effectiveness validation using the near-facility monitoring (NFM) (air monitoring stations N589, N911, N912, N939, and N951). Figure 3 provides the air monitoring station locations.

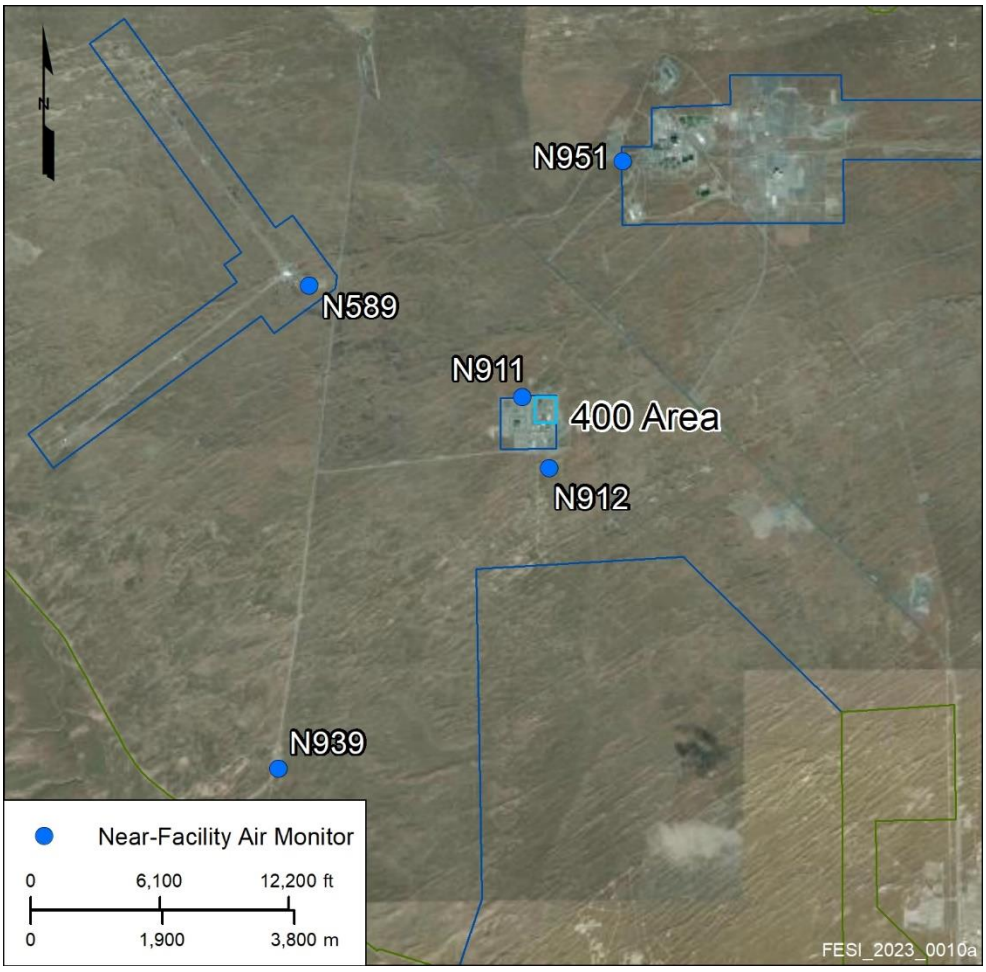

Figure 3. Near-Facility Air Monitoring Locations for the FFTF Complex Structures

The calculated unabated annual dose combined for all in-scope related point source (1.43E-02 mrem/yr) and diffuse and fugitive source (2.90E-02 mrem/yr) activities during the NTCRA is 4.33E-02 mrem/yr TEDE to the offsite MEI (Table 3). For the onsite MEI, the calculated unabated annual dose combined for all in-scope related point source (3.27E-02 mrem/yr) and diffuse and fugitive source (7.48E-02 mrem/yr) activities during the NTCRA is 1.08E-01 mrem/yr TEDE (Table 3). Therefore, this activity is subject to emissions monitoring of the point source in accordance with the substantive requirements of WAC 246-247-075(3). Fugitive and diffuse emissions monitoring with applicable quality assurance will be provided, reflecting the substantive requirements of WAC 246-247-075(8).

The activities performed in the FFTF Complex structures as part of the NTCRA include hazard abatement and equipment decontamination, in addition to ongoing S&M. All activities are performed within the confinement boundary of the buildings/structures. For the 405 and 4717 structures, resultant emissions will exhaust through the FFTF-CB-EX Stack and are controlled and monitored as point source emissions. FFTF-CB-EX emissions are currently estimated using WAC 246-247-030(21)(a) and reported in the annual Hanford Site radioactive air emissions report (e.g., DOE/RL-2023-07, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2022*). For the 403, 408A, 408B, 408C, 491E, 491S, and 491W Buildings, the resultant emissions are controlled and monitored as diffusion and fugitive sources.

As the point source TEDE to both the onsite and offsite MEIs are below the 0.1 mrem/yr threshold for the NTCRA, the FFTF-CB-EX Stack would remain:

- A “minor” point source of emissions meeting the substantive requirements of 40 CFR 61.93(b)(4). All radionuclides that could cause an effective dose equivalent greater than 1% of the standard or contribute greater than 10% of the potential effective dose equivalent may be determined through alternative procedures under 40 CFR 61.93(b)(4)(i).
- A potential impact category 3 point source requiring periodic confirmatory sampling with offline analysis, according to Table 2 of ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*.

The removal action scope is similar to the scope of activities identified and conducted under the current AOP for the FFTF-CB-EX emission unit. The FFTF-CB-EX Stack sampling system is non-operational and non-compliant with ANSI/HPS N13.1-1999. Periodic confirmatory measurements to verify low emissions will consist of sampling four weeks per year using a portable sampler inside the 405 RCB at ground level and analyzing for total alpha and total beta. For conservatism, all alpha is assumed to be plutonium-239 and all beta is assumed to be cesium-137. Samples will be handled following the applicable sections of 40 CFR 61, Appendix B, “Test Methods,” Method 114. Concurrence for the periodic confirmatory sampling methodology will be obtained from EPA, in consultation with WDOH, prior to implementation.

Where the FFTF-CB-EX Stack ventilation is not sufficient to provide for worker safety, various types of engineering controls and containments will be used for exhausting through portable HEPA-filtered exhausters, with portable HEPA-filtered vacuums used as needed. The portable exhausters are small emission units that are easily set up for use and readily portable, being either hand-carried or wheel mounted.

HEPA-filtered vacuums intended for use will vary in size with both large and small, portable units of the type similar to those in use on the Hanford Site (e.g., portable temporary radioactive air emissions units). To verify low emissions periodically, a contamination survey of the outlet of the vacuum will be performed at the completion of use. Vacuuming using one of these devices has no specific contamination limit but will be controlled based on the specifics of the situation. If contamination levels over

2,000 dpm/100 cm^2 alpha or 100,000 dpm/100 cm^2 beta/gamma (i.e., high surface contamination area) are inadvertently exceeded, a separate evaluation regarding emissions measurement will be conducted.

During the removal activities at the FFTF Complex, worker protection (worksite) monitoring activities will be considered and may include the following:

- Real-time and periodic radiological monitoring using temporary ambient air monitors as prescribed by the Radiological Control organization and reviewed by the Environmental organization (primary method for evaluating compliance with the action levels and void limits)
- Radiological smear surveys (indicator – effluent air emission estimated rates are based on gross residual contamination levels)

These worksite monitoring activities verify the effectiveness of abatement and as low as reasonably achievable control methods during removal activities. Worksite monitoring includes using temporary ambient air monitors (real-time continuous air monitors with alarms, personnel samplers, and ambient air samplers) and surveys. The worksite monitoring network will be established as directed by the contractor Radiological Control organization, with review by the Environmental organization, and will be focused around and in the established radioactive control zones. This monitoring network provides the primary emissions data used to ensure the limits set in the Radiological Work Permit are not exceeded.

Using a graded approach, additional monitoring for diffuse and fugitive emissions may be conducted in place of using handheld instruments during removal activities at radiologically contaminated sites. The additional monitoring may be a combination of radiological contamination surveys for removable alpha and beta-gamma activity and workplace air monitoring. Work progress contamination surveys may be performed adjacent to contamination area boundaries during active remediation to monitor for contamination spread, as needed. Periodic contamination surveys may be performed when needed while working within the posted contamination areas to ensure that removable contamination levels are below the limiting conditions of the applicable Radiological Work Permit. Lapel air samplers may be worn by personnel entering areas that are monitored for occupational exposure to airborne radioactivity when workplace air samplers are determined to be nonrepresentative of active work areas (i.e., not close enough to the workers or in the wrong position to be representative of the breathing zone air activity).

In addition to worksite monitoring, the 400 Area Near Facility Ambient Air Program stations nearest the FFTF Complex provide validation of the effectiveness of the contamination control measures utilizing the near-field monitoring network. The five air monitoring stations (N589, N911, N912, N939, and N951) do not provide real-time data, so the biweekly analysis of continuous (not real-time) sampling data will be used as indicators along with the worksite monitoring data for overall trending of the effectiveness of the contamination control measures. As part of the sitewide evaluation of NFM data, the sample management and analytical results tracking database compares NFM 6-month composite air sample results to 10% of the 40 CFR 61, Appendix E, “Compliance Procedures Methods for Determining Compliance With Subpart I,” Table 2 values. The NFM database identifies results that exceed these values. Results from the air monitoring stations identified in this document that are above these values will be reviewed, the adequacy of the controls evaluated as appropriate, and DOE, Richland Operations Office, and EPA will be notified.

The well-established Hanford Site protocol for emission monitoring will be followed, including Hanford Site perimeter ambient air data collection, sampling frequencies, sample analysis, and data reporting (DOE/RL-91-50, *Hanford Site Environmental Monitoring Plan*). This method will address the substantive requirements of WAC 246-247-075. Perimeter monitoring is used to measure the diffuse

and fugitive emissions from the Hanford Site. Demonstration of compliance with the 40 CFR 61.92, "Standard," effective dose equivalent of 10 mrem/yr limit is provided by the radioactive air emissions report for the Hanford Site (e.g., DOE/RL-2023-07).

7 References

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