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Memorandum

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From: Fred Hughes

Subject: **Permit to Construct Exemption for the AMWTP Characterization Facility (WMF-634)**

The attached Category I & II Exemption documents that the AMWTP Characterization Facility (WMF-634) meets all of the requirements to exempt the facility from obtaining a permit to construct.

This memo and the attached exemption will be placed in the facility operating record and submitted to the DEQ upon request. Based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

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CATEGORY I AND CATEGORY II EXEMPTION

FOR THE

AMWTP CHARACTERIZATION FACILITY

February 2002

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1.0 Introduction

The Advanced Mixed Waste Treatment Project (AMWTP) Characterization Facility will be located in the southern-most Waste Management Facility (WMF) Type II Module, Building Number 634 (WMF-634), which is part of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering and Environmental Laboratory (INEEL). WMF-634 will be modified to house the equipment needed to adequately characterize waste drums and boxes prior to treatment in the Advanced Mixed Waste Treatment Facility (AMWTF) or shipment to the Waste Isolation Pilot Plant (WIPP). WMF-634 houses real time radiography (RTR) units, drum assay units, a box assay unit, a combined drum venting system (DVS) and headspace gas sampling unit, a unit for the treatment (via addition of absorbent to containers with liquids) and visual examination of containers, and a drum core sample retrieval system (DCSRS). Other equipment will include forklifts, a monorail hoist, and conveyors for material handling.

This document demonstrates that the AMWTP Characterization Facility meets the requirements to exempt the facility from obtaining a permit to construct. The drum venting/headspace gas analysis and drum coring/sampling system meet all of the general exemption criteria (IDAPA 58.01.01.220) and the specific requirements for a Category I Exemption (IDAPA 58.01.01.221). The propane heaters and standby generator also meet all of the general exemption criteria (IDAPA 58.01.01.220) and the specific requirements for a Category II Exemption (IDAPA 58.01.01.222). Listed under the Results Analysis section is a list of each requirement and how the requirement is met.

2.0 Process Description

Containers are received at WMF-634 for characterization and/or treatment. Waste is stored in WMF-634 while awaiting characterization, treatment (as required), and transport to the Type II Modules or the TSA Interim Status (IS) Units (located within the TSA-RE – designated as TSA Pads 1, 2, and R) for storage, pending disposition. Select drums pass through the DVS and DCSRS in WMF-634 prior to routing for further disposition. Typically, retrieved containers undergo RTR examination to determine physical waste parameters (e.g., metals, cellulosics, rubber, plastics, soil, sludge) and to detect prohibited items, liquids, and elemental mercury.

2.1 RTR Examination.

The first step in the characterization process will be the RTR examination of boxes and drums in order to determine waste parameters and to detect any potentially prohibited items and unexpected conditions. The RTR examination will also be used to validate existing characterization data, or in the case of unknown waste containers, to correlate the contents of the container with known waste types from generator sites.

2.2 Drum Venting/Headspace Gas Sampling.

If a drum requires venting and/or headspace gas analysis (including all drums identified for coring), it will be transferred to the Head Space Gas Sampling System (HSGS). This unit will perform an automated process of puncturing the drum lid and liner, sampling the internal headspace gas, and inserting a self-tapping carbon filter in the hole left by the punch. The venting device will be contained in a housing that seals against the drum lid to minimize the spread of contamination. Each drum will be sampled for potential explosive headspace gases; if not acceptable, the drum will be purged with nitrogen. Some of the drums will also be headspace sampled to determine concentrations of hydrogen, methane, and volatile organic compounds (VOCs), in accordance with WIPP criteria.

2.3 Radioassay.

Radioassay is the next stage in the process. The containers will be scanned in order to determine the amount and isotopic composition of nuclear material, transuranic isotope activity, and decay heat. These measurements will provide data to discriminate transuranic from low-level wastes. Furthermore, the data will be used to implement criticality control throughout the AMWTP.

2.4 Drum Coring.

At this point, drums identified for coring will be diverted to the Drum Coring Room staging conveyor. All other drums will be transferred to the output queue staging area of the characterization facility. The drum will be moved via monorail hoist from the Drum Coring Room staging conveyor to the DCSRS lift table. The drum lid will be marked and oriented so that when the drum lid is removed and the drum rose it will be in position for coring. The drum will be bag transferred to the DCSRS glove box. The drum lid and rigid liner lid will be removed the drum bag will be cut away and a visual examination using audio and video recording equipment will be conducted. The drum will then be cored and the core will be sampled for appropriate RCRA constituents. At this time if free liquids are present an absorbent will be added to take up the free liquids. The cored drums will then be removed from the DCSRS and placed into Type II storage. If non-conforming items are discovered the drum will be resealed and transferred back to storage.

2.5 *Sample Preparation.*

Samples for VOC analysis of hard sludge material will be collected from the core and transferred to suitable sealed containers as quickly as practicable to reduce the potential loss of VOCs. For soft sludge material, a modified syringe will be used to extract a "plug" of sample material from inside the core. This sample material will also be transferred as quickly as practicable into a sealed container. Representative samples for other analytes (e.g., metals, mercury) will be taken from various positions along the core and loaded into appropriate containers for shipment to an analytical laboratory.

3.0 Waste Description

Both debris and non-debris wastes will be characterized at WMF-634. Non-debris waste, which includes the inorganic and organic sludge-type wastes and soils, are the primary contributors to emissions at WMF-634. Virtually all of the waste containers vented in the drum vent enclosure, and subject to coring, will be of the non-debris type. Debris waste containers will not normally require venting or headspace sampling (core samples are not normally required) and they will remain lidded during RTR and storage.

The estimated concentrations (bounding estimates based on existing documentation plus assumptions) of pollutants in each waste stream are based on the findings detailed in "*Waste Description Information for Transuranic-Contaminated Wastes Stored at the INEL*", B.D. Raivo, et al., INEL-95/0412, December 1995 (Raivo). The highest value for the estimated concentration of a particular pollutant in any of the non-debris waste streams is assigned to that pollutant. For example, of the waste streams in the non-debris waste type, waste stream RFETS-003 has the highest estimated concentration (5% by weight) of carbon tetrachloride. Therefore, for the non-debris waste type, the conservative concentration of 5 wt% is assigned to carbon tetrachloride. Where no concentration is given in Raivo's "estimated concentration" column for a pollutant, the analysis uses either the concentration given in Raivo's "maximum expected" column or maximum values from recent core sample data, where applicable. The pollutants assigned concentrations from the recent analytical data include arsenic, barium, cadmium, chromium, lead, and silver. Each waste stream has been cross-referenced with EDF-RWMC-803, "*Chemical Constituents in Transuranic Storage Area Waste*", INEL-95/022, Rev 5, April 1998 (EDF-803), which lists pollutants expected to be found in Transuranic Storage Area (TSA) waste, but does not give concentrations. Pollutants listed (for an individual waste stream) in EDF-803, but not in Raivo, and were not assigned a value from the core sample data, are given conservative concentrations of 1% each. Radionuclide concentrations in the waste to be characterized are discussed in Attachment 1.

4.0 Calculation of Emissions

The sources of emissions from WMF-634 include the characterization activities, drum venting and drum coring/sample preparation, propane heaters, and the diesel generator.

4.1 Characterization Emissions.

To calculate emissions from characterization activities, total volatile organic (VOC) and total particulate matter (PM) emissions are estimated for each activity. Total PM estimates are summarized in Table 1 for drum venting and drum coring/sample preparation (it was assumed that there would be no release of particulate during the visual examination process). Table 2 summarizes the assumptions and factors used to calculate total VOCs from drum venting, drum coring/sample preparation and visual examination. Emission factors from the Environmental Protection Agency (EPA) publication *AP-42, "Supplement F of the Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources,"* (AP-42) are multiplied by the throughput for each activity to calculate an emission rate. From total VOC and PM values, individual toxic air pollutants (TAP) (and lead) emissions are determined by multiplying the worst-case concentration percentage of each constituent by the total VOCs or PM emitted for that process/area. (The TAPs are separated into those that are likely to be emitted as VOCs and those likely to be emitted as PM.) These rates are presented in Table 3. Emissions from these processes are composed of PM, VOCs, TAPs, and radionuclides (see section 4.4) All emissions rates are calculated as uncontrolled releases.

4.2 Propane Heater Emissions.

Emissions from the building unit heaters and make-up air duct furnaces are estimated, as detailed in Table 4, using AP-42 emission factors. The maximum hourly rate is calculated assuming the heaters operate at the rated input capacities for 1.0 hour. The yearly rate is based on the maximum possible annual propane usage. Emissions are composed of criteria pollutants.

4.3 Diesel Generator Emissions.

Emissions from the back-up diesel generator located at the NW corner of WMF-634 are estimated as detailed in Table 5 using vendor-supplied data. The maximum hourly rate is calculated assuming generator operation at the rated standby input capacities for 1.0 hour. The potential to emit is based on 500 hours of operation (ref. EPA Memorandum dated January 25, 1995) for emergency generators. Emissions are composed of criteria pollutants.

4.4 *Radionuclide Emissions.*

WMF-634 is divided into three ventilation confinement zones to minimize the potential for waste to be released to the environment via the air pathway. Air within WMF-634 generally flows from the outside through the clean areas into Zone 1, then into Zone 2, and finally into Zone 3. Exhaust from the Zone 2 ventilation confinement zones is drawn, via exhaust fans, through two stages of high-efficiency particulate air (HEPA) filters, then discharged via the exhaust duct and stack. Likewise, the Zone 3 air supply is drawn from the Zone 2 areas and is exhausted through three stages of HEPA filters and two stages of carbon filters prior to being discharged to the main exhaust duct and stack. Under normal operating conditions, uncontained waste is located only in Zone 3 areas (i.e. drum coring glove box), while Zone 1 and 2 areas remain clean (i.e., radiologically uncontaminated) and accessible to workers. Emissions are calculated from those radionuclides estimated to be in the non-debris waste streams slated for drum venting and drum coring/sample preparation (characterization emissions). The analysis is presented in Attachment 1.

5.0 Results Analysis

Below is a list of each of the requirements and how the requirements are met for the Category I Exempt sources and Category II Exempt sources. The drum coring/sample preparation and drum venting sources meet Category I requirements, while the six propane heaters and the standby generator meet Category II requirements.

	220. GENERAL EXEMPTION CRITERIA FOR PERMIT TO CONSTRUCT EXEMPTIONS **01. General Exemption Criteria**. Sections 220 through 223 may be used by owners or operators to exempt certain sources from the requirement to obtain a permit to construct. No permit to construct is required for a source that satisfies all of the following criteria, in addition to the criteria set forth at Sections 221, 222, or 223: **a.** The maximum capacity of a source to emit an air pollutant under its physical and operational design without consideration of limitations on emission such as air pollution control equipment, restrictions on hours of operation and restrictions on the type and amount of material combusted, stored or processed would not: **i.** Equal or exceed one hundred (100) tons per year of any regulated air pollutant.
Response	**This source will not exceed one hundred tons per year of any regulated air pollutant (see Table 6).**
	ii. Cause an increase in the emissions of a major facility that equals or exceeds the significant emissions rates set out in the definition of significant at Section 006.
Response	**The results of the significant emission analysis are shown in Table 6. The pollutants listed in the table include those compounds from the significant emissions list specified in IDAPA 58.01.01.006.92 that are expected to be present in the wastes characterized in drum venting and drum coring/sample preparation, or emitted from the propane heaters and the diesel generator at WMF-634. As shown in Table 6, all WMF-634 emissions are estimated to be below the significant thresholds, as required by the rules for a Category I exemption.**
	iii. Cause or significantly contribute to a violation of an ambient air quality standard, based upon the applicable air quality models, data bases, and other requirements of 40 CFR Part 51, Appendix W (Guideline on Air Quality Models). No demonstration under this subsection is required for those sources listed at Subsection 222.02.

Response	**WMF-634 emission estimates for CO, lead (Pb), nitrogen dioxide (NO_2), ozone (VOCs), PM-10, and SO_2 were used to determine maximum ambient contributions from WMF-634 emissions, regardless of whether these worst-case concentrations were located at points accessible to the public. This was accomplished by determining the maximum hourly dispersion coefficients for the WMF-634 stack. Modeling was not performed; instead the worst-case dispersion coefficients for the WMF-676 were substituted. These maximum dispersion coefficients were then used to determine worst-case ambient concentrations for those pollutants with hourly- or quarterly-averaged concentrations. For ambient concentrations based on yearly averages, worst-case dispersion coefficients at discrete off-Site receptor locations were used. The maximum WMF-634 ambient contributions were then added to the background ambient concentrations for these pollutants and the totals compared with the Section 577 NAAQS. The results are shown in Table 7. The estimated WMF-634 ambient contributions are all at least one order of magnitude lower than the Idaho background ambient concentrations obtained from Idaho Department of Environmental Quality (DEQ). The combined ambient concentrations are still significantly below the NAAQS limits. A discussion of the air dispersion model and methodology used to determine the dispersion coefficients used in Table 7 can be found in BNFL document BNFL-5232-PTC-01 "Application to Construct an Air Pollution Emitting Facility: the Advanced Mixed Waste Treatment Facility", Rev. 02, August 2001, Appendix E.**
	iv. Combination. The source is not part of a proposed new major facility or part of a proposed major modification.
Response	**This source is not part of a proposed new major facility nor is it part of a major modification.**

02. Record Retention. Unless the source is subject to and the owner or operator complies with Section 385, the owner or operator of the source, except for those sources listed in Subsections 222.02.a. through 222.02.g., shall maintain documentation on site, which shall identify the exemption determined to apply to the source and verify that the source qualifies for the identified exemption. The records and documentation shall be kept for a period of time not less than five (5) years from the date the exemption determination has been made or for the life of the source for which the exemption has been determined to apply, which ever is greater, or until such time as a permit to construct or an operating permit is issued which covers the operation of the source.

The owner or operator shall submit the documentation to the Department upon request.	
Response	**A copy of this exemption will be kept in the Facility Operating Record.**

221. CATEGORY I EXEMPTION.
No permit to construct is required for a source that satisfies the criteria set forth in Section 220 and the following:

01. Below Regulatory Concern. The maximum capacity of a source to emit an air pollutant under its physical and operational design considering limitations on emissions such as air pollution control equipment, restrictions on hours of operation and restrictions on the type and amount of material combusted, stored or processed shall be less than ten percent (10%) of the significant emission rates set out in the definition of significant at Section 006.

Response	**This requirement only applies to the drum coring and drum venting sources; this requirement does not apply to the propane heaters or the diesel generator. The drum coring and drum venting sources are less than 10% of the emission rate limits (see Table 6).**

02. Radionuclides. The source shall have potential emissions that are less than one percent (1%) of the applicable radionuclides standard in 40 CFR Part 61, Subpart H.

Response	**This source has potential emissions that are less than 1% on the standard (please see Attachment 1 for analysis).**

03. Toxic Air Pollutants. The source shall comply with Section 223.

Response	**This source qualifies as a Level 1 source (see Table 3).**

222. CATEGORY II EXEMPTION.
No permit to construct is required for the following sources.

01. Exempt Source. A source that satisfies the criteria set forth in Section 220 and that is specified below:

d. Stationary internal combustion engines used exclusively for emergency purposes which are operated less than two hundred hours per year and are fueled by natural gas, propane gas, liquefied petroleum gas, distillate fuel oils, residual fuel oils, and diesel fuel; waste oil, gasoline, or refined gasoline shall not be used.

Response	**The standby generator is powered by diesel and is used to provide back-up power when electric power from the local utility is interrupted.**

02. Other Exempt Sources. A source that satisfies the criteria set forth in Section 220 and that is specified below: **c.** Fuel burning equipment for indirect heating and for heating and reheating furnaces using natural gas, propane gas, liquefied petroleum gas exclusively with a capacity of less than fifty (50) million btu's per hour input.	
Response	**The four 340,000 Btu/hr and two 800,000 Btu/hr propane heaters fit under 220.20 as described above.**
223. EXEMPTION CRITERIA AND REPORTING REQUIREMENTS FOR TOXIC AIR POLLUTANT EMISSIONS. No permit to construct for toxic air pollutants is required for a source that satisfies any of the exemption criteria below, the record keeping requirements at Subsection 220.02, and reporting requirements as follows: **02. Level I Exemption.** To obtain a Level I exemption, the source shall satisfy the following criteria: **a.** The uncontrolled emission rate (refer to Section 210) for all toxic air pollutants shall be less than or equal to all applicable screening emission levels listed in Sections 585 and 586.	
Response	**Table 3 compares uncontrolled (i.e., no credit is taken for filtration or other means of abatement) TAP emissions from characterization activities to their respective emission limits (EL). The estimated non-carcinogenic and carcinogenic TAP emissions are below their ELs.**
05. Annual Report For Toxic Air Pollutant Exemption. Commencing on May 1, 1996, and annually thereafter, the owner or operator of a source claiming a Level I, II, or III exemption shall submit a certified report for the previous calendar year to the Department for each Level I, II, or III exemption determination. The report shall be labeled "Toxic Air Pollutant Exemption Report" and shall state the date construction has or will commence and shall include copies of all exemption determinations completed by the owner or operator for each Level I, II, and III exemption.	
Response	**This Category Exemption will be sent to the DEQ in May of next year for the calendar year 2002.**

Table 1 Total Uncontrolled PM Emissions from Characterization Activities

Characterization Activity		Process Rate	Waste Type	Waste Density	Waste Throughput	Emission Factor	Total PM Emitted
	Notes		*a*		*b*		*c*
	d	dm/dy		lb/dm	ton/hr	lb/ton	lb/hr
Drum Venting	*e,f*	80	ND	469	0.78	0	0.0E+00
Drum Coring/Sample Preparation	*e,g*	30	ND	469	0.0024	0.1	2.4E-04

a. Waste type: ND=Non-debris (primarily organic and inorganic homogeneous solids).
b. For Drum Venting, Waste Throughput (ton/hr) = Process Rate (dm/dy) x Waste Density (lb/dm) / (2000 lb/ton x 24 hr/dy). For Drum Coring/Sample Preparation, Waste Throughput (ton/hr) = Process Rate (dm/dy) x 0.06 ft3 (volume of 2 in. dia. x 33 in. core) x 7.48 gal/ft3 x 1 dm/55 gal x Waste Density (lb/dm) / (2000 lb/ton x 24 hr/dy).
c. Total Particulate Matter (PM) Emitted (lb/hr) = Waste Throughput (ton/hr) x Emission Factor (lb/ton).
d. Unit appreviations: dm=drum; dy=day; lb=pound; hr=hour.
e. The waste density is the maximum average organic homogeneous solids density.
f. Waste handled in the Drum Venting area is primarily bound in sludge and, because it is not significantly mechanically disturbed, no PM is assumed emitted.
g. Worst-case PM emissions are assumed to be generated by drum coring/sample preparation at a conservative rate of 0.1 lb emitted per ton processed from AP-42, Table 11.12-2, Emission Factors for Concrete Batching; concrete batching is a much dustier operation than core drilling/sample preparation. Process Rate (dm/dy) = 5 dm/shift (1 core/dm) x 3 shifts/dy x 2 activities (cores handled twice each - once during drilling and again during sample preparation).

Table 2 Total Uncontrolled VOC Emissions from Characterization Activities

Characterization Activity		Process Rate	Waste Type	Waste Density	Waste Throughput	Liquid Throughput	Emission Factor	"VOC" Emissions
	Notes		*a*		*b*	*c*	*d*	
	e	dm/dy		lb/dm	ton/hr	ton/hr	lb/ton	lb/hr
Drum Venting	*f*	80	ND	469	0.7811	0.0020	0.02	4.1E-05
Drum Sludge Visual Examination	*f*	10	ND	469	0.0976	0.0003	0.72	1.8E-04
Drum Coring/Sample Preparation	*f,g*	15	ND	469	0.0024	0.0000	0.72	4.5E-06

a. Waste type: ND=Non-debris (primarily organic and inorganic homogeneous solids).
b. For Drum Venting, Waste Throughput (ton/hr) = Process Rate (dm/dy) x Waste Density (lb/dm) / (2000 lb/ton x 24 hr/dy). For Drum Coring/Sample Preparation, Waste Throughput (ton/hr) = Process Rate (dm/dy) x 0.06 ft3 (volume of 2 in. dia. x 33 in. core) x 7.48 gal/ft3 x 1 dm/55 gal x Waste Density (lb/dm) / (2000 lb/ton x 24 hr/dy).
c. The quantity of liquid in the waste stream (except for SCW - see footnote i) is assumed to be up to 1% in up to 26% of the containers; therefore, Liquid Throughput = 0.01 x 0.26 x Waste Throughput.
d. Emission factors are from AP-42, Table 4.7-1, Emission Factors for Solvent Reclaiming. Processes handling (disturbing) waste use 0.72 lb volatile organic compounds (VOCs) emitted per ton processed (factor for solvent loading). Areas where waste is not disturbed use 0.02 lb/ton (factor for a solvent storage tank vent). Also, liquid is not all VOCs (mostly oils).
e. Unit appreviations: dm=drum; dy=day; lb=pound; hr=hour.
f. The waste density is the maximum average organic homogeneous solids density.
g. The worst-case VOC emissions in this area are from the drilling and sample preparation of cores from non-debris sludges. The cores are approximately 2 in. in diameter by 33 in. long (height of a 55-gal drum). Process Rate (dm/dy) = 5 dm/shift (1 core/dm) x 3 shifts/dy x 2 activities (cores handled twice each - once during drilling and again during sample preparation).

Table 3 Toxic Air Pollutant Emissions from Characterization Activities

Pollutant		Worst-Case Non-Debris	Drum Venting	Drum Sludge VE	Drum Coring/ Sample Preparation	Total Characterization Emissions	Type	Screening Level
	Notes	*a* wt%	*b* lb/hr	*b* lb/hr	*b* lb/hr	lb/hr	*c*	lb/hr
Total VOCs	*e*	NA	4.1E-05	1.8E-04	4.5E-06	2.3 E-04	S	NA
Acetone		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	119
Benzene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	C	8.0E-04
Butyl alcohol		0.001	4.1E-10	1.83E-09	4.5E-11	2.28E-09	N	10
Carbon tetrachloride		5	2.0E-06	9.14E-06	2.2E-07	1.14E-05	C	4.4E-04
Chlorobenzene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	23.3
Chloroform		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	C	2.8E-04
Cyclohexane		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	70
1,2-Dichoroethane		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	C	2.5E-04
1,1-Dichoroethylene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	C	1.3E-04
2-Ethoxyethanol		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	1.27
Ethyl benzene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	29
Methanol		0.003	1.2E-09	5.48E-09	1.3E-10	6.84E-09	N	17.3
Methyl ethyl ketone		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	39.3
Methylene chloride		0.07	2.8E-08	1.28E-07	3.1E-09	1.6E-07	C	1.6E-03
Nitrobenzene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	0.333
Tetrachlorothylene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	C	1.3E-02
Toluene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	N	25
1,1,1-Trichloroethane		15	6.1E-06	2.74E-05	6.7E-07	3.42E-05	N	127
1,1,2-Trichloroethane		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	C	4.2E-04
Trichlorethylene		1	4.1E-07	1.83E-06	4.5E-08	2.28E-06	C	5.1E-04
1,1,2-Trichloro-1,2,2-trifluoroethane		5	2.0E-06	9.14E-06	2.2E-07	1.14E-05	NA	NA
Xylene		0.005	2.0E-09	9.14E-09	2.2E-10	1.14E-08	N	29
Total PM	*f*	NA	0	0	2.4E-04	2.4E-04	S	NA
Arsenic	*g*	0.0015	0	0	3.6E-09	3.6E-09	C	1.5E-06
Barium	*g*	0.044	0	0	1.1E-07	1.1E-07	N	0.033
Beryllium		1	0	0	2.4E-06	2.4E-06	C	2.8E-05
Cadmium	*g*	0.10	0	0	2.4E-07	2.4E-07	C	3.7E-06
Chromium	*g*	0.12	0	0	2.9E-07	2.9E-07	C	5.6E-07
Lead	*g*	0.38	0	0	9.1E-07	9.1E-07	S	NA
Mercury		2.5	0	0	6.0E-06	6.0E-06	N	0.001
Nickel		1	0	0	2.4E-06	2.4E-06	C	2.7E-05
Selenium		1	0	0	2.4E-06	2.4E-06	N	0.013
Silver	*g*	0.052	0	0	1.2E-07	1.2E-07	N	0.001
Cyanide		1	0	0	2.4E-06	2.4E-06	N	0.333
Polychlorinated biphenyls (PCBs)		15	0	0	3.6E-05	3.6E-05	C	6.6E-05

a. Virtually all of the waste subject to drum venting and coring/sample preparation will be of the non-debris type (primarily inorganic and organic sludge-type wastes). See Waste Description section for the method used to assign worst-case pollutant concentrations.
b. Emission Rate (lb/hr) = Worst-Case Non-Debris Concentration (wt%/100) x Total Volatile Organic Compounds (VOCs) (lb/hr) or Total Particulate Matter (PM).
c. N = Non-carcinogenic Toxic Air Pollutant (TAP) per IDAPA 58.01.01, Section 585. C = Carcinogenic TAP per Section 586. S = Significant pollutant per Section 006.
d. See Table 2 for calculations of Total VOCs.
e. See Table 1 for calculations of Total PM.
f. Worst-case pollutant concentration based on recent core sample data.

Table 4 Emissions from Propane Heaters

Pollutant	Emission Factor		Unit Heaters	Make-up Air Duct Furnaces	Total Maximum Hourly Emissions	Unit Heaters	Make-up Air Duct Furnaces	Total Annual Emissions
Rated Input Capacity (Total)			1,360,000	1,600,000		1,360,000	1,600,000	
	lb/1,000 gal		lb/hr	lb/hr	lb/hr	ton/yr	ton/yr	ton/yr
	a	*Notes*	*b*	*c*		*b*	*c*	
Maximum Usage (gal/hr for emissions in lb/hr, gal/yr for emissions in ton/yr)		*d*	14.9	17.5	32.3	130,203.3	153,180.3	283,383.6
Carbon monoxide	1.9		2.8E-02	3.3E-02	6.1E-02	1.2E-01	1.5E-01	2.7E-01
Nitrogen oxides	14		2.1E-01	2.4E-01	4.5E-01	9.1E-01	1.1E+00	2.0E+00
Sulfur dioxide	1.5	*e*	2.2E-02	2.6E-02	4.9E-02	9.8E-02	1.1E-01	2.1E-01
PM/PM-10	0.4		5.9E-03	7.0E-03	1.3E-02	2.6E-02	3.1E-02	5.7E-02
Ozone (VOCs)	0.5		7.4E-03	8.7E-03	1.6E-02	3.3E-02	3.8E-02	7.1E-02

a. Emission factors are from AP-42, Table 1.5-1, Emission Factors for LPG Combustion for commercial boilers (heat input capacities generally between 0.3 and 10 million Btu/hr).
b. Four unit heaters each have a rated input capacity of 340,000 Btu/hr.
c. Two make-up air duct furnaces each have a rated input capacity of 800,000 Btu/hr.
d. The maximum hourly usage is calculated by dividing the rated input capacity by 91,500 Btu/gal (heating value of propane). The annual propane usage is calculated by dividing the rated input capacity by 20,000 Btu/lb for 7 months per year at 50% operating time (equivalent to 105 days per year).
e. The emission factor for sulfur dioxide is 0.10S (S=15 gr/100 ft3).
f.

Table 5 Emissions from Diesel Generator

Pollutant	Generator: Standby	
Number of units	1	
	HP	hrs/yr
	380	500
	lb/hr	ton/yr
Carbon monoxide	8.4E-01	2.1E-01
Nitrogen oxides	7.8E+00	1.9E+00
Sulfur dioxide	4.7E-01	1.2E-01
PM/PM-10	4.2E-01	1.0E-01
Ozone (VOCs)	4.0E-01	1.0E-01

The generator information is as follows:
a. Model: Onan 250DFAC, 60 Hz Diesel Generator Set
b. Engine: Cummins LTA10-G1, Turbocharged and Aftercooled
c. Performance Data: Standby – 380 HP, 17.1 gal/hr
d. Exhaust Emission Data (HC, NOx, CO, PM, SO2) in units of grams per HP-hour (g/HP-hr): Standby (0.48, 9.30, 1.00, 0.50, 0.56).

Table 6 Significant Emissions Comparison

Pollutant		Emissions from Characterization Activities	Emissions from Generators	Emissions from Propane Heaters	Total WMF-634 Emissions	*Significant Emission Limit*	*% of Significant Limit*
		ton/yr	ton/yr	ton/yr	ton/yr	ton/yr	
	Notes	*a*	*Standby*	*b*	*c*	*d*	*e*
Carbon monoxide		0	.21	2.7E-01	.48	100	.48%
Nitrogen oxides		0	1.9	2.0E+00	3.9	40	9.75%
Sulfur dioxide		0	.12	2.1E-01	.33	40	.825%
Particulate matter (PM)		9.5E-04	.1	5.7E-02	.157	25	.628%
PM-10	*f*	9.5E-04	.1	5.7E-02	.157	15	1.04%
Ozone (as VOCs)	*g*	1.8E-04	.1	7.1E-02	.171	40	.427%
Lead		3.6E-06	0	0	3.6E-06	0.6	0.00060%
Beryllium		9.5E-06	0	0	9.5E-06	0.0004	2.4%
Mercury		2.4E-05	0	0	2.4E-05	0.1	0.024%
Radionuclides (EDE)	*h*	4.3E-03 mrem		0	4.3E-03 mrem	0.1	4.3%

a. Nonradioactive characterization activity emissions are from Table 3.
b. Heater emissions are from Table 4.
c. Listed emissions are unabated (calculated without considering air pollution control equipment removal efficiencies).
d. "Significant" emission limits are defined in IDAPA 58.01.01, Section 006.
e. % of Significant Limit = (Total WMF-634 Emissions / Significant Emission Limit) x 100. For nonradioactive emissions, a Category I exemption requires abated (controlled) emissions to be less than 10% of their significant limits; the comparison presented uses unabated emissions. For radionuclides, the EDE must be < 0.1 mrem/yr to meet Category I requirements.
f. All PM is assumed to be PM-10 (PM with a diameter < 10 micrometers) for conservatism.
g. Volatile organic compounds (VOCs) are used as a measure of ozone.
h. See Attachment 1 for the calculation of Effective Dose Equivalent (EDE) estimated for WMF-634 activities.

Table 7 National Ambient Air Quality Standards Analysis

Pollutant	CO	CO	Lead [a]	NO2	Ozone	PM-10	PM-10	SO2	SO2	SO2
(Units vary, see below)	(8-hr)	(1-hr)	(quarter)	(annual)	(1-hr)	(annual)	(24-hr)	(annual)	(24-hr)	(3-hr)
Main Stack Emissions [b]	NA	NA	9.1E-07	NA	2.3 E-04	2.4E-04	2.4E-04	NA	NA	NA
Main Stack Disp. Coeff.	NA	NA	7.6E-01	NA	2.6E+02	3.2E-02	4.7E+01	NA	NA	NA
Main Stack Ambient Conc'n.[c]	NA	NA	6.9E-07	NA	.059	7.6E-06	1.1E-02	NA	NA	NA
Propane Heater Emissions[d]	6.1E-02	6.1E-02	NA	4.5E-01	1.6E-02	1.3E-02	1.3E-02	4.9E-02	4.9E-02	4.9E-02
Propane Heater Disp. Coeff.	9.3E+01	2.6E+02	NA	3.2E-02	2.6E+02	3.2E-02	4.7E+01	3.2E-02	4.7E+01	1.5E+02
Propane Heater Amb. Conc'n.[c]	5.7E+00	1.6E+01	NA	1.4E-02	4.2E+00	4.1E-04	6.1E-01	1.6E-03	2.3E+00	7.3E+00
Diesel Generator Emissions[d]	8.4E-01	8.4E-01	NA	7.8E+00	4.0E-01	4.2E-01	4.2E-01	4.7E-01	4.7E-01	4.7E-01
Diesel Generator Disp. Coeff.	9.3E+01	2.6E+02	NA	3.2E-02	2.6E+02	3.2E-02	4.7E+01	3.2E-02	4.7E+01	1.5E+02
Diesel Generator Ambient Conc'n. [c]	7.8E+01	2.2E+02	NA	7.8	1.0E+02	1.3E-02	2.0E+01	1.5E-02	2.2E+01	7.1E+01
Max. AMWTF Ambient Conc'n.[e]	8.3E+01	2.3E+02	6.9E-07	7.8	1.1E+02	1.4E-02	2.0E+01	1.7E-02	2.4E+01	7.8E+01
ID Background Ambient Conc'n. [f]	5.1E+03	1.1E+04	1.7E-01	4.0E+01	7.8E+01	3.3E+01	8.6E+01	2.4E+01	1.4E+02	5.4E+02
Combined Ambient Conc'n.[f]	5.2E+03	1.1E+04	1.7E-01	47.8	1.9E+02	3.3E+01	1.1E+02	2.4E+01	1.6E+02	6.2E+02
Sect. 577 NAAQS (ug/m3)	1.0E+04	4.0E+04	1.5E+00	1.0E+02	2.4E+02	5.0E+01	1.5E+02	8.0E+01	3.7E+02	1.3E+03
Max. AMWTF % of NAAQS limit	0.8%	0.6%	0.0%	7.8%	45.0%	0.0%	13.5%	0.0%	6.5%	6.0%
ID Background % of NAAQS limit	51.0%	27.5%	11.3%	40.0%	32.5%	66.0%	57.3%	30.0%	37.8%	41.5%
Combined % of NAAQS limit	51.8%	28.1%	11.3%	47.8%	77.5%	66.0%	70.8%	30.0%	44.4%	47.6%

UNITS ***Emissions***: lb/hr ***Dispersion coefficients:*** ($\mu g/m^3$)/(lb/hr) ***Concentrations:*** $\mu g/m^3$

a. A conservative 24-hr dispersion coefficient was used for lead since quarterly averages are not provided by the model.
b. Main stack emissions consist of the process emissions from Table 1 and 2.
c. Ambient concentrations reported are maximums except for annual averages, which are reported for discrete offsite receptors.
d. Heater and Engine stack emissions obtained from Table 4 and Table 5. Maximum hourly emissions were used for all heater and engine pollutants.
e. Statewide background ambient concentrations for criteria pollutants were obtained from the Idaho Department of Environmental Quality.
f. Combined ambient concentrations were obtained by adding the WMF-634 ambient concentrations to the statewide background ambient concentrations.

Attachment 1

Type II Storage Module WMF-634

Analysis of Potential Radionuclide Release Due to Planned Characterization Activities

1.0 Introduction and Summary

This attachment documents an exemption from air quality permit to construct (PTC) requirements for activities to be performed in building WMF-634 of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering and Environmental Laboratory (INEEL). The building will be modified to provide characterization services for containers of Transuranic Storage Area (TSA) waste, as part of the Advanced Mixed Waste Treatment Project (AMWTP). Activities included in this analysis include real time radiography (RTR) units, drum assay units, a box assay unit, a combined drum venting system (DVS) and headspace gas sampling unit, a unit for the treatment (via addition of absorbent to containers with liquids) and visual examination of containers, and a drum core sample retrieval system (DCSRS).

The analysis presented herein demonstrates that emissions associated with the planned activities will meet the general exemption requirements for radionuclides per IDAPA 16.01.01.220, as well as, the conditions required for an exemption under IDAPA 16.01.01.221 (Category I). That is, the potential of the building to emit radionuclides is demonstrated to be less than 1% of the standard in 40 CFR 61, Subpart H (i.e., unabated emissions result in an effective dose equivalent [EDE] of less than 0.1 millirem [mrem] per year).

1.1 Calculated Maximum Individual Dose.

The most conservative location at which the public can be exposed to radioactive emissions from WMF-634 is at the southern INEEL boundary (Staley, 1998). The calculated maximum individual dose (EDE) from unabated airborne emissions for this location is 4.3E-03 mrem/year (SSW direction). Modeling was done using the Clean Air Act Assessment Package (CAP-88) computer code.

2.0 Identification of Radionuclide Source Term

The source term for WMF-634 was derived by summing the contribution from each individual activity (it was assumed that the coring, sample preparation, and venting would generate the majority of radionuclide emissions, the emissions from other minor activities would be encompassed in the analysis of these three processes). Table 1 (all tables found at the end of the document) lists process assumptions for estimating atmospheric radionuclide releases from WMF-634. The reader is directed to the main document associated with this attachment, *AMWTP Characterization Facility Emissions Analysis*, for details on the coring/sample preparation and venting processes and a brief description of the waste to be characterized in WMF-634.

2.1 Release Fraction.

The values in Appendix D of 40 CFR 61 were used for the release fraction (i.e., the amount of each radionuclide released from each process). Although the distribution of hazardous and radioactive contaminants in the waste generally is not well characterized, we do have relatively good information about the physical characteristics and volumes/masses of the waste. The solid release factor is used for most components of the source term because the wastes to be cored/vented are primarily solid non-debris wastes—specifically, inorganic and organic homogenous solids (estimated over 99% for venting and 95-to-97% for coring) with the remaining 1 to 3% soil. A small amount of particulate (about 0.43 kg/year) that will be produced by the coring process was included in the source term for coring. For sample preparation, the core mass was again considered, using the solid release fraction.

Any radionuclides that would be released in venting (i.e., entrained in the headspace gas) would be in particulate form. We know from process knowledge that little or no radioactive material is likely to be released.[1] However, a conservative source term for venting was estimated for this analysis to ensure that potential emissions are not underestimated. Particulate is not expected to be present in the waste, and industry factors for this type of process are zero, so it was necessary to manufacture a source term. It was assumed a fraction (10%) of the solid waste near the top of the drum has the potential to be disturbed during processing, and that 1.0E-06 of that would be rendered particulate (in actuality, no waste is disturbed during venting). The Appendix D factor for particulate was then applied to this calculated particulate fraction to determine the amount that was assumed released during venting. Note that there is little evidence that this conservative assumption would be reflected in practice, and actual radioactive releases to vent gas are expected to be at or near zero.

2.2 Filtration Factor.

Exhaust from WMF-634 will pass through three HEPA filters, each with a conservative 99% efficiency, per 40 CFR 61, Appendix D. Therefore, the fraction of the radionuclides released during processing will pass through the control system and will be reduced by a filtration factor of 0.01 x 0.01 x 0.01 = 1.0E-06. However, no credit was taken for air pollution control equipment for the unabated EDE determination.

Table 2 presents the source term used for the CAP-88 analysis, which is described below. The estimates presented in the table are based on the throughput for a process, multiplied by the activity concentration for a radionuclide and the appropriate factor to account for release into the offgas. Values are listed for the primary radionuclides identified as present in TSA waste (Table 4.1 in Raivo et al.).

3.0 CAP-88 Analysis

Dose assessment modeling was done using the CAP-88 computer code, the program approved by the U.S. Environmental Protection Agency (EPA) for assessment of dose and risk from radionuclide emissions to air in compliance with National Emission Standards for Hazardous Air Pollutants (NESHAP) for radionuclides other than radon at DOE facilities (40 CFR 61, Subpart H).

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[1] At the Savannah River Site, using waste handling methods and a venting/HGS system similar to that to be used at WMF-634, only two drums out of 11,264 were contaminated. The contamination occurred only in the area where the filter was inserted through the drum lid within the seal area, indicating that radionuclides are only rarely present in the headspace gas area of the drum. It is reported that venting equipment used at SRS was not contaminated by its use in venting this large number of drums.

3.1 Meteorological Data.

A recent Central Facilities Area (CFA) 10-year averages wind file (1987 to 1996) was used in the modeling analysis. The National Oceanic and Atmospheric Administration (NOAA) provided 10-year meteorological frequency data in the form of joint frequency distributions and stability array (STAR) files. Wind files were collected from the CFA meteorological station. The default parameter values for the CAP-88 code were used for most of the model input, with the exception of stack-specific release elevation and flow parameters. The receptor was assumed to reside 5.7 km SSW of the facility (see attached page from CAP-88 printout).

3.2 Receptor Location.

The maximally exposed individual (MEI) was determined to be in the SSW sector at a distance of 5,700 meters (Staley, 1998). Because of prevailing INEEL winds, the point of maximum dose rate is actually in the ENE sector. However, the southern boundary of the INEEL represents the location with maximum dose rate where an individual could reside. This receptor location represents the hypothetical, worst case MEI for the facility and bounds any dose that would be received by an actual receptor (Staley, 1998).

4.0 Results and Conclusions

The calculated maximum individual dose (EDE) due to unabated airborne emissions from WMF-634 for the MEI receptor location is 4.3E-03 mrem/year (see SSW direction in Figure 1 from CAP-88 printout at the end of the document after the tables). Thus, potential emissions (i.e., unfiltered) from the characterization facility are below the 0.1 mrem/year value for a Category 1 exclusion per IDAPA 16.01.01.221.

Table 1. Throughput assumptions used for coring/sample preparation and venting at WMF-634

Parameter	Coring	Venting	Parameter	Coring	Venting
Throughput/day	15 cores	96 drums	Days/yr	365	365
Waste Density (kg/m^3)	1,017	1,017	Solid waste throughput (kg/yr)	9461 [a]	-
Core Volume (m^3)	0.0017	-	Particulate throughput (kg/yr)	0.48	0.74

a. Used for both coring and sample preparation activities.

Table 2. Radionuclide source term (unabated) for WMF-634 (Ci/y) [a,b]

Nuclide	*Coring*	*Venting*	*Total*		*Coring*	*Venting*	*Total*
Am-241	6.78E-05	2.60E-06	7.04E-05	Ce-144	1.51E-08	5.78E-10	1.56E-14
Pu-238	6.45E-05	2.48E-06	6.70E-05	Fe-55	6.28E-10	2.41E-11	6.52E-16
Pu-239	3.82E-05	1.47E-06	3.97E-05	Kr-85	3.81E-09	1.46E-10	3.96E-15
Pu-240	8.84E-06	3.39E-07	9.18E-06	Ni-63	1.99E-09	7.62E-11	2.06E-15
Pu-242	5.78E-10	2.22E-11	6.00E-10	Pb-212	1.48E-08	5.68E-10	1.54E-14
Pu-241	8.95E-05	3.44E-06	9.30E-05	Pm-147	1.52E-08	5.83E-10	1.58E-14
Ba-137m	1.25E-06	4.80E-08	1.30E-06	Po-212	9.45E-09	3.63E-10	9.82E-15
Cs-137	1.26E-06	4.82E-08	1.30E-06	Po-216	1.48E-08	5.68E-10	1.54E-14
Sr-90	1.12E-06	4.31E-08	1.17E-06	Pr-144	1.51E-08	5.80E-10	1.57E-14
Y-90	1.12E-06	4.31E-08	1.17E-06	Ra-224	1.48E-08	5.68E-10	1.54E-14
U-233	5.67E-07	2.18E-08	5.89E-07	Sb-125	9.17E-10	3.52E-11	9.53E-16
Cm-244	3.00E-07	1.15E-08	3.11E-07	Th-228	1.48E-08	5.68E-10	1.54E-14
Cs-134	6.17E-08	2.37E-09	6.41E-08	Th-232	4.06E-09	1.56E-10	4.22E-15
Co-60	5.56E-08	2.13E-09	5.77E-08	Tl-208	5.30E-09	2.04E-10	5.51E-15
Bi-212	1.48E-08	5.68E-10	1.54E-08	U-232	1.45E-08	5.55E-10	1.50E-14
C-14	1.32E-09	5.08E-11	1.37E-09	U-234	3.21E-09	1.23E-10	3.34E-15

a. Source term derived using release fraction of E-06 for solids and E-03 for particulate, per 40 CFR Part 61, App. D

b. Source term does not include a filtration factor.

c. The inventory of tritium in TSA waste is concentrated in 11 drums (Smith 1995), only one of which is identified as non-debris sludge. Waste suspected to contain tritium is to be handled in the AMWTF special case waste glovebox (i.e., will not be processed in WMF-634), and tritium is therefore not included in this analysis.

Figure 1. CAP-88 Printout of Modeling Results

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SUMMARY
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INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

	Distance (m)
Direction	5700
N	1.9E-03
NNW	1.5E-03
NW	9.6E-04
WNW	9.6E-04
W	1.1E-03
WSW	1.8E-03
SW	3.6E-03
SSW	4.3E-03
S	3.1E-03
SSE	2.9E-03
SE	2.9E-03
ESE	3.0E-03
E	3.5E-03
ENE	4.6E-03
NE	3.8E-03
NNE	2.6E-03

5.0 References

Raivo, B.D. et al., *Waste Description Information for Transuranic-Contaminated Wastes Stored at the Idaho National Engineering Laboratory*, INEL-95/0412, December 1995.

Smith, T.H. and B.D. Raivo. *INEL stored waste (TSA) non-database derived, non-actinide estimated activity*, ED PSPI-015546-08, Oct. 12, 1995.

Staley C. S. & Abbott M. L., *INEEL Air Modeling Protocol*, LMITCO Integrated Earth Sciences February, 1998 Draft.