Savannah River
NUCLEAR SOLUTIONS
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September 22, 2020

SRNS-J2200-2020-00236
RSM Track #: 10818

Air Permitting Division Director,
Bureau of Air Quality
South Carolina Department of Health and
Environmental Control
2600 Bull Street
Columbia, SC 29201

Dear Director:

SAVANNAH RIVER SITE (SRS) EXPEDITED REVIEW REQUEST CONSTRUCTION PERMIT APPLICATION –SURPLUS PLUTONIUM DISPOSITION (SPD) PROJECT, EMISSION POINTS K-OE0001 (SCDHEC ID 303K), K-OP0001 (SCDHEC IDS 300K, 301K, & 302K), K-OP0002 (SCDHEC ID 299K), AND K-OT0001 (SCDHEC ID 304K)

The SPD project will be located in K-Area at the Savannah River Site (SRS). The mission of the SPD Project is to expedite removal of plutonium from the State of South Carolina by dispositioning surplus weapons-grade plutonium via the Dilute and Dispose approach. To reduce the attractiveness level and the required safeguards and security measures, the material will be mixed ("downblended") with an adulterant prior to disposition at the Waste Isolation Pilot Plant (WIPP).

This expedited review request package includes one permit application with original signatures and professional engineer embossment and a second photocopy of the original application. An electronic copy of this application with Excel emission calculations files will also be transmitted to Robert Mahoney via email distribution.

Please contact me at (803) 952-6853 if you have any questions concerning this request.

Sincerely,

Kim A. Wolfe
Environmental Compliance

Enclosures

c: R. K. Mahoney, SCDHEC – Columbia (electronic)
T. R. Fuss, SCDHEC - Aiken (electronic)
G. N. O'Quinn, SCDHEC – Aiken (electronic)
P. A. Risa, SCDHEC - Aiken (electronic)
M. M. Ewart, NNSA, 706-6F
J. G. DeMass, DOE-SR, 730-B
M. N. Ndingwan, 730-B
C. L. Bergren, SRNS, 730-4B
M. A. Flora, 706-5F
A. J. Meyer, 730-4B
C. J. Ward, 730-4B
S. J. Bell, 706-6F
R. L. Peel, 706-6F
K. A. Wolfe, 730-4B
A. R. Waller, 730-4B
J. R. Wicker, 730-4B
S. D. Yazzie, 704-28L
B. C. Blunt, 706-5F
M. C. Wright, 730-1B
Records Administration, 773-52A

Bureau of Air Quality
Construction Permit Application
Facility Information
Page 1 of 3

FACILITY IDENTIFICATION	
SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0080 - 0041	Application Date 9/22/2020
Facility Name *(This should be the name used to identify the facility at the physical address listed below)* U.S. Department of Energy - Savannah River Site managed and operated by Savannah River Nuclear Solutions, LLC	Facility Federal Tax Identification Number *(Established by the U.S. Internal Revenue Service to identify a business entity)* 530197006 (US-DOE) 26-0240191 (SRNS, LLC)

FACILITY PHYSICAL ADDRESS		
Physical Address: SRS		County: Aiken (also Barnwell and Allendale)
City: Aiken	State: SC	Zip Code: 29808-0001
Facility Coordinates *(Facility coordinates should be based at the front door or main entrance of the facility.)*		
Latitude: 431063.420519	Longitude: 3689656.543319	☐ NAD27 *(North American Datum of 1927)* Or ☒ NAD83 *(North American Datum of 1983)*

CO-LOCATION DETERMINATION
Are there other facilities in close proximity that could be considered co-located? ☐ No ☒ Yes*
List potential co-located facilities, including air permit numbers if applicable: See Attachment A, Form 2566

**If yes, please submit co-location applicability determination details in an attachment to this application.*

COMMUNITY OUTREACH
What are the potential air issues and community concerns? Please provide a brief description of potential air issues and community concerns about the entire facility and/or specific project. Include how these issues and concerns are being addressed, if the community has been informed of the proposed construction project, and if so, how they have been informed. There have been newspaper articles discussing the Surplus Plutonium Disposition (SPD) Project at the SRS. One article ran in the February 6, 2020 Aiken Standard, "Energy Department's plutonium disposal plans at SRS reach key milestone," by Colin Demarest. In general, the public has a positive view of the SPD project and is supportive of the effort.

FACILITY'S PRODUCTS / SERVICES	
Primary Products / Services *(List the primary product and/or service)* Processed Fissile Material	
Primary SIC Code *(Standard Industrial Classification Codes)* 2819 (SRS classification)	Primary NAICS Code *(North American Industry Classification System)* 325180 (SRS classification)
Other Products / Services *(List any other products and/or services)* N/A	
Other SIC Code(s): major group 97 (SPD project classification)	Other NAICS Code(s): 56 (SRS classification) 928 (SPD project classification)

Bureau of Air Quality
Construction Permit Application
Facility Information
Page 2 of 3

AIR PERMIT FACILITY CONTACT *(Person at the facility who can answer technical questions about the facility and permit application.)*			
Title/Position: Air Program Lead, Environmental Compliance - SRNS, LLC	Salutation: Ms.	First Name: Kim	Last Name: Wolfe
Mailing Address: Savannah River Site 730-4B room 3051			
City: Aiken		State: SC	Zip Code: 29808-0001
E-mail Address: kim.wolfe@srs.gov		Phone No.: 803-952-6853	Cell No.: 803-507-2066

The signed permit will be e-mailed to the designated Air Permit Contact. If additional individuals need copies of the permit, please provide their names and e-mail addresses.	
Name	**E-mail Address**
Jared Wicker	jared.wicker@srs.gov
Amy Meyer	amy.meyer@srs.gov

CONFIDENTIAL INFORMATION / DATA
Does this application contain confidential information or data? ☒ No ☐ Yes*

If yes, include a sanitized version of the application for public review and **ONLY ONE COPY OF CONFIDENTIAL INFORMATION SHOULD BE SUBMITTED*

LIST OF FORMS INCLUDED *(Identify all forms included in the application package)*	
Form Name	**Included (Y/N)**
Expedited Review Request (DHEC Form 2212)	☒ Yes ☐ No
Equipment/Processes (DHEC Form 2567)	☒ Yes
Emissions (DHEC Form 2569)	☒ Yes
Regulatory Review (DHEC Form 2570)	☒ Yes
Emissions Point Information (DHEC Form 2573)	☐ Yes ☒ No (If No, Explain The SPD project will not emit any toxic air pollutants above trace or facility-wide exemption level (lead). The SPD project will emit PM10, PM2.5, SO2, NOx, and CO at levels below Table 2.1 Exemption Emission Rates - Standard No . 2, SCDHEC modeling guide. Facility Wide emissions of lead will remain below the facility wide threshold listed in Table 2.1 of the SCDHEC modeling guide. Refer to emission calculations and facility wide emissions table contained in this construction application.)

OWNER OR OPERATOR			
Title/Position: Director - EC&ACP	Salutation: Mr.	First Name: Christopher	Last Name: Bergren
Mailing Address: 730-4B, Savannah River Site			
City: Aiken		State: SC	Zip Code: 29808-00001
E-mail Address: chris.bergren@srs.gov		Phone No.: 803-952-6530	Cell No.: 803-507-5278
OWNER OR OPERATOR SIGNATURE			
I certify, to the best of my knowledge and belief, that no applicable standards and/or regulations will be contravened or violated. I certify that any application form, report, or compliance certification submitted in this permit application is true, accurate, and complete based on information and belief formed after reasonable inquiry. I understand that any statements			

and/or descriptions, which are found to be incorrect, may result in the immediate revocation of any permit issued for this application.

Signature of Owner or Operator — Date: 9/22/20

PERSON AND/OR FIRM THAT PREPARED THIS APPLICATION *(If not the same person as the Professional Engineer who has reviewed and signed this application.)*			
Consulting Firm Name:			
Title/Position:	Salutation:	First Name:	Last Name:
Mailing Address:			
City:		State:	Zip Code:
E-mail Address:		Phone No.:	Cell No.:
SC Professional Engineer License/Registration No. (if applicable):			

PROFESSIONAL ENGINEER INFORMATION			
Consulting Firm Name:			
Title/Position: Engineer	Salutation: Mr.	First Name: John (Jeff)	Last Name: Kelly
Mailing Address: 706-6F Savannah River Site			
City: Aiken		State: SC	Zip Code: 29808-0001
E-mail Address: john02.kelly@srs.gov		Phone No.: 803-507-1056	Cell No.:
SC License/Registration No.: 36871			

PROFESSIONAL ENGINEER SIGNATURE

I have placed my signature and seal on the engineering documents submitted, signifying that I have reviewed this construction permit application as it pertains to the requirements of *South Carolina Regulation 61-62, Air Pollution Control Regulations and Standards.*

Signature of Professional Engineer — Date: 09/22/2020

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 36871 JOHN KELLY

Attachment A Form 2566 – Collocation Determination

Facility	Air Permit Numbers	Proximity	Ownership/Common Control	Additional Information
Ameresco Biomass Cogeneration Facility (including K-Area and L-Area biomass boilers)	0080-0144	Located within boundaries of SRS	Property is Owned by the Department of Energy (DOE).	Steam generated at Ameresco facilities support SRS facilities.
Salt Waste Processing Facility (SWPF)	NA-Exempted via condition 7.B.3 of SRS's original Title V Operating permit	Located within boundaries of SRS	Property is Owned by the Department of Energy (DOE).	The purpose of SWPF is to process streams from other SRS facilities, especially those facilities operated by SRR. This is a support facility
Research and Development (R&D) Activities performed at leased facilities within the Savannah River Research Campus maintained by Aiken County	NA-R&D activities are exempt from construction and operating permitting	In 2013 a determination was made that even though these facilities are not within the SRS boundary they were collocated (SRNS-J2000-2013-00248). The current guidance* states, "[The collocation guidance] is intended to be a guide and not an exhaustive list of all possible scenarios. These determinations are made on a case-by-case basis regarding the existing situation at specific facilities."	Personnel performing R&D activities at the Aiken County Facilities are SRS personnel that share common employee benefits, health plans, retirement funds and other administrative functions.	Research performed at these laboratories support the work at SRS.
Three Rivers Solid Waste Authority Regional Landfill (Landfill)	0080-0112	The Landfill is within the SRS site boundary, but a fence separates the Landfill from the remainder of SRS. Public access to the Landfill is not allowed, but access is provided to member counties and approved commercial haulers. (http://www.trswa.org/landfill.shtml)	• Landfill does not share a common workforce with SRS. • Landfill is responsible for its own equipment, property, and pollution control devices. • Landfill personnel do not share common employee benefits, health plans, retirement funds and other administrative functions. • The Landfill does accept waste from the SRS. However, SRS contributes only 1.3% of the total waste received. (http://www.trswa.org/landfill.shtml) SRS could transport their waste to another permitted facility with little or no impacts to the Landfill or SRS. • Landfill personnel are responsible for compliance with air quality control requirements at the Landfill. The DOE is not listed on the air permit for the Landfill. • Easement has been provided to the Landfill for the use of the property with DOE. The Landfill does receive waste from the SRS. These are not agreements that impact control and operation of the Landfill.	The Landfill and SRS are not within the same industrial grouping. The Landfill is not a support facility for SRS since the SRS contributes far less than 50% of the waste being disposed at the Landfill and does not have operational control over the Landfill. **Conclude not co-located based on SIC/NAICS codes or support.**

* "Guidance for Collocation/Single Source Determinations," issued by Elizabeth Basil, dated 10/28/2016, was utilized in the generation of this table.

Conclusion: Ameresco Biomass Cogeneration Facility, Salt Waste Processing Facility, and the Research and Development (R&D) Activities performed at leased facilities within the Savannah River Research Campus maintained by Aiken County are co-located facilities/activities. The Three Rivers Solid Waste Authority Regional Landfill is not co-located facilities with SRS. Simplistically speaking the Landfill is not dependent on the presence of SRS to perform their services.

Bureau of Air Quality
Expedited Review Request Instructions
Construction Permits

APPLICATION IDENTIFICATION		
Facility Name *(This should be the name used to identify the facility)* U.S. Department of Energy - Savannah River Site managed and operated by Savannah River Nuclear Solutions, LLC	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0080 - 0041	Request Date 9/22/2020

PRIMARY AIR PERMIT CONTACT			
Title/Position: Air Program Lead, Environmental Compliance - SRNS, LLC	Ms.	First Name: Kim	Last Name: Wolfe
E-mail Address: kim.wolfe@srs.gov		Phone No.: (803) 952-6853	Cell No.: (803) 507-2066

SECONDARY AIR PERMIT CONTACT *(If the Department is unable to contact the primary air permit contact please provided a secondary contact.)*			
Title/Position: Engineer, Environmental Compliance - SRNS, LLC	Mr.	First Name: Jared	Last Name: Wicker
E-mail Address: jared.wicker@srs.gov		Phone No.: (803) 952-7182	Cell No.: (803) 761-3492

Check One	Permit Type	Expedited Review Days*	Fee**
☒	Minor Source Construction Permit	30	$3,000
☐	Synthetic Minor Construction Permit	65	$4,000
☐	Prevention of Significant Deterioration (PSD) not impacting a Class I Area (no Class I modeling required)	120	$20,000
☐	Prevention of Significant Deterioration (PSD) Modification not impacting a Class I Area (no Class I modeling required) No BACT limit change but requires Public Notice	120	$5,000
☐	Prevention of Significant Deterioration (PSD) Modification not impacting a Class I Area (no Class I modeling required) Number of BACT Pollutants ☐ X $5,000 per BACT modification	120	Total Fee $ Maximum of $20,000
☐	Prevention of Significant Deterioration (PSD) impacting a Class I Area (Class I modeling required)	150	$25,000
☐	Prevention of Significant Deterioration (PSD) Modification impacting a Class I Area (Class I modeling required) No BACT limit change but requires Public Notice	150	$5,000
☐	Prevention of Significant Deterioration (PSD) Modification impacting a Class I Area (Class I modeling required) Number of BACT Pollutants ☐ X $5,000 per BACT modification	150	Total Fee $ Maximum of $25,000
☐	**Concrete** Minor Source Construction Permit Relocation Request	10	$1,500
☐	**Asphalt** Synthetic Minor Construction Permit	15	$3,500

Bureau of Air Quality
Expedited Review Request Instructions
Construction Permits

Check One	Permit Type	Expedited Review Days*	Fee**
	Relocation Request		

*All days above are calendar days, but exclude State holidays, and building closure dates due to severe weather or other emergencies. Expedited days for asphalt and concrete also exclude weekends.

****DO NOT SEND PAYMENT UNTIL THE APPLICATION HAS BEEN ACCEPTED INTO THE EXPEDITED PROGRAM.** If chosen for expedited review, you will be notified by phone for verbal acceptance into the program. Fees must be paid within five business days of acceptance.

PRIMARY AIR PERMIT CONTACT SIGNATURE
I have read the most recent version of the Expedited Review Program Standard Operating Procedures and accept all of the terms and conditions within. I understand that it is my responsibility to ensure an application of the highest quality is submitted in a timely manner, and to address any requests for additional information by the deadline specified. I understand that submittal of this request form is not a guarantee that expedited review will be granted.

Signature of Primary Air Permit Contact

9/22/2020
Date

Bureau of Air Quality
Construction Permit Application
Equipment / Processes

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)* U.S. Department of Energy - Savannah River Site managed and operated by Savannah River Nuclear Solutions, LLC	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0080 - 0041	Application Date 9/22/2020

PROJECT DESCRIPTION
Brief Project Description (What, why, how, etc.): The mission of the Surplus Plutonium Disposition (SPD) Project is to expedite removal of plutonium from the State of South Carolina by dispositioning surplus weapons-grade plutonium via the Dilute and Dispose approach. To reduce the attractiveness level and the required safeguards and security measures, the material will be mixed ("downblended") with an adulterant prior to disposition at the Waste Isolation Pilot Plant (WIPP).

ATTACHMENTS	
☒ Process Flow Diagram	Location in Application: Attachment 1 DHEC 2567
☒ Detailed Project Description	Location in Application: Attachment 1 DHEC 2567

EQUIPMENT / PROCESS INFORMATION

Equipment ID Process ID	Action	Equipment / Process Description	Maximum Design Capacity (Units)	Control Device ID(s)	Pollutants Controlled (Include CAS#)	Capture System Efficiency and Description	Emission Point ID(s)
	☐ Add ☐ Remove ☐ Modify ☐ Other	See attached DHEC 2567 Equipment/Process Information					
	☐ Add ☐ Remove ☐ Modify ☐ Other						
	☐ Add ☐ Remove ☐ Modify ☐ Other						
	☐ Add ☐ Remove ☐ Modify ☐ Other						
	☐ Add ☐ Remove ☐ Modify ☐ Other						

CONTROL DEVICE INFORMATION					
Control Device ID	**Action**	**Control Device Description**	**Maximum Design Capacity (Units)**	**Inherent/Required/Voluntary (Explain)**	**Destruction/Removal Efficiency Determination**
	☐ Add ☐ Remove ☐ Modify ☐ Other	See attached DHEC 2567 Control Device Information			
	☐ Add ☐ Remove ☐ Modify ☐ Other				
	☐ Add ☐ Remove ☐ Modify ☐ Other				
	☐ Add ☐ Remove ☐ Modify ☐ Other				

RAW MATERIAL AND PRODUCT INFORMATION			
Equipment ID Process ID Control Device ID	**Raw Material(s)**	**Product(s)**	**Fuels Combusted**
300K, 301K, 302K	Pu Oxides	Blended containerized material	NA
303K	ULSD (Ultra Low Sulfur Diesel)	Emergency Power	ULSD (0.0015%) 140,000 Btu/gal (AP42 Appendix A)
304K	ULSD	ULSD	NA

MONITORING AND REPORTING INFORMATION					
Equipment ID Process ID Control Device ID	**Pollutant(s)/Parameter(s) Monitored**	**Monitoring Frequency**	**Reporting Frequency**	**Monitoring/Reporting Basis**	**Averaging Period(s)**
300K, 301K, & 302K	Radionuclides	Continuous Sampling	Annual	10 mrem/year, 40 CFR 61 Subpart H	NA
300K, 301K, & 302K	Relative Accuracy (RA)	Semiannual. A semiannual RA test may be skipped whenever previous test results indicate an RA of less than or equal to 7.5%	Semiannual. A semiannual RA test may be skipped whenever previous test results indicate an RA of less than or equal to 7.5%	10 mrem/year, 40 CFR 61 Subpart H Test report submitted within 30 days of RA test	NA
303K	Fuel Oil Sulfur Content	Semiannual. Fuel supplier certification the oil complies with the specifications for No 2 fuel per condition 4.B.25 of existing facilty Title V Operating permit.	Semiannual. SRS will continue to comply with existing Title V operating permit condition 4.B.25.	SRS will continue to comply with existing Title V operating permit condition 4.B.25.	NA

DHEC 2567 Equipment/Process Information

Equipment ID Process ID	Action	Equipment/Process Description	Max. Design Capacity (units)	Control Device ID(s)	Pollutants Controlled (include CAS#)	Capture System Efficiency and Description	Emission Point ID(s)
300K	Add	Dilute Processing Glovebox 1	1.91E+06g Pu Oxides/yr total for SPD project	I-103	Radionuclides	100% (Integrated into glovebox)	K-OP0001 (PIC 1)
301K	Add	Dilute Processing Glovebox 2	1.91E+06g Pu Oxides/yr total for SPD project	I-104	Radionuclides	100% (Integrated into glovebox)	K-OP0001 (PIC 1)
302K	Add	Dilute Processing Glovebox 3	1.91E+06g Pu Oxides/yr total for SPD project	I-105	Radionuclides	100% (Integrated into glovebox)	K-OP0001 (PIC 1)
300K, 301K, and 302K	Add	Dilute Processing Gloveboxes 1, 2, and 3	1.91E+06g Pu Oxides/yr total for SPD project	H-1000	Radionuclides	100% (Integrated into exhaust plenum)	K-OP0001 (PIC 1)
299K	Add	Dilute Process Area – non-containment area	NA-Material is not processed in this area	H-1001	Radionuclides	100% (Integrated into exhaust plenum)	K-OP0002 (PIC 4)
303K	Add	200-kW emergency diesel generator	200-kW	NA	NA	NA	K-0E0001
304K	Add	2000-gallon diesel fuel tank	2000-gal	NA	NA	NA	K-OT0001

DHEC 2567 Control Device Information

Control Device ID	Action	Control Device Description	Maximum Design Capacity (Units)	Inherent/Required/Voluntary (Explain)	Destruction/Removal Efficiency Determination
I-103	Add	Fabric roughing filter integrated into dilute processing glovebox 1	NA – Using 40 CFR 61 Subpart H Appendix D	Required – Utilized in 40 CFR 61 Subpart H Appendix D calculation	99% (0.1 adjustment factor 40 CFR 61 Subpart H Appendix D
I-104	Add	Fabric roughing filter integrated into dilute processing glovebox 2	NA – Using 40 CFR 61 Subpart H Appendix D	Required – Utilized in 40 CFR 61 Subpart H Appendix D calculation	99% (0.1 adjustment factor 40 CFR 61 Subpart H Appendix D
I-105	Add	Fabric roughing filter integrated into dilute processing glovebox 3	NA – Using 40 CFR 61 Subpart H Appendix D	Required – Utilized in 40 CFR 61 Subpart H Appendix D calculation	99% (0.1 adjustment factor 40 CFR 61 Subpart H Appendix D
H-1000	Add	HEPA filter bank – receives exhaust from glovebox containment	NA – Using 40 CFR 61 Subpart H Appendix D	Required – Utilized in 40 CFR 61 Subpart H Appendix D calculation	99.9% (0.01 adjustment factor 40 CFR 61 Subpart H Appendix D
H-1001	Add	HEPA filter bank – receives exhaust from non-containment areas of dilute process area	NA – Using 40 CFR 61 Subpart H Appendix D	Required – Utilized in 40 CFR 61 Subpart H Appendix D calculation	99.9% (0.01 adjustment factor 40 CFR 61 Subpart H Appendix D

Attachment 1 DHEC 2567
Detailed Project Description and Process Flows

The mission of the Surplus Plutonium Disposition (SPD) Project is to expedite removal of plutonium from the State of South Carolina by dispositioning surplus weapons-grade plutonium via the Dilute and Dispose approach. To reduce the attractiveness level and the required safeguards and security measures, the material will be diluted ("downblended") with an adulterant prior to disposition at the Waste Isolation Pilot Plant (WIPP).

The dilution process will occur in one of three gloveboxes located in K-Area. Figure 1 is a simplified process flow. A feed can (also referred to as 3013 or SAVY can) will enter a glovebox. Once the can is in the glovebox it will be opened using an electric can cutter. The feed can is weighed and then the contents are added to the Blend Can Loading System (BCLS). The BCLS has an integrated sieve. Any material that does not pass through the sieve will be placed into a separate closed grinding equipment or mortar and pestle for size reduction.

An offsite vendor generates the preloaded blend cans. Blend cans containing preloaded adulterant are placed in the glovebox. The BCLS is used to load a prescribed amount of Plutonium Oxide (feed) into the blend cans. Blend cans are weighed prior to and after loading via the BCLS. After loading at the BCLS is complete each blend can is closed and mixed in a closed apparatus. When mixing is completed the blend can is enclosed in a shield can. The Dilute Product Can is then removed from the glovebox and stored.

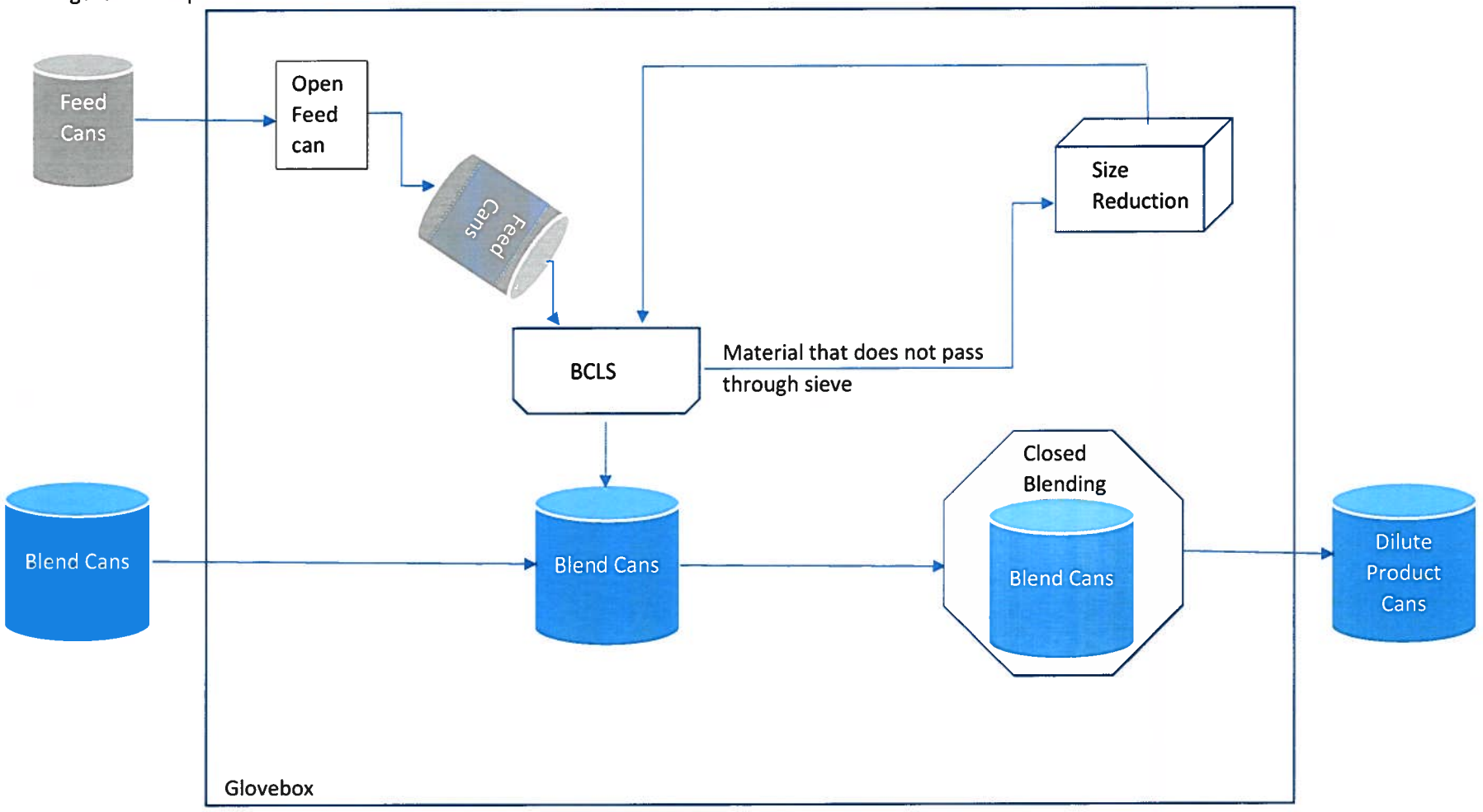
All efforts are made to reduce the generation of loose particulate matter in the gloveboxes. The non-radiological emissions from the dilution processing in the gloveboxes are documented in SRNS-RP-2020-00437. The radiological emissions from the SPD project are documented in SRNS-RP-2019-00152.

The SPD processing area will exhaust via two stacks. Glovebox emissions will emit to the "low flow" stack (K-OP0001) that has been determined to be a potential impact category (PIC) 1 stack. The feed cans of Plutonium Oxide are only opened inside a glovebox. Figure 2 provides a simplified ventilation drawing of the glovebox portion of the SPD processing area. Each glovebox has an integrated roughing filter. The glovebox emissions are routed to a HEPA filter bank prior to exiting the K-OP0001 stack. The HEPA filter and roughing filter are only credited for radionuclide control. Neither of these control devices were credited for the non-radiological emissions from dilute processing. The remaining SPD processing area will ventilate to a separate HEPA filter bank prior to exiting the second stack referred to as the "Dilute Process Area (DPA) Stack" (K-OP0002) that has been determined to be a PIC 4 stack. No open cans/containers of radiological material will be in areas ventilated to the DPA Stack. These areas are not expected to have contamination under normal conditions. The non-radiological emissions associated with the SPD processing area consist of low quantities of particulate matter and extremely low levels of lead (9.95E-11 ton/year) (there is no construction exemption level for processes that emit lead).

A 200-kW emergency diesel generator and associated 2000-gallon fuel tank are also part of the SPD project. However, both the emergency diesel generator (K-OE0001) and associated tank (K-OT0001) are not part of the process as described in the 6/15/1999 SCDHEC guidance document for Standard 4, Section VIII - PM Emission Limitations. The emergency diesel generator and associated tank will be incorporated into the operating permit as insignificant activities. The non-radiological emissions from the SPD project documented in SRNS-RP-2020-00437 (dilute processing area) and SRNS-RP-2020-00438 (emergency diesel generator and associated fuel tank) are below the values required to be modeled as described in SCDHEC's Modelling Guidelines for Air Quality Permits dated October 2018 and revised 4/15/2019.

Attachment 1 DHEC 2567
Detailed Project Description and Process Flows

Figure 1 – Simplified Process Flow

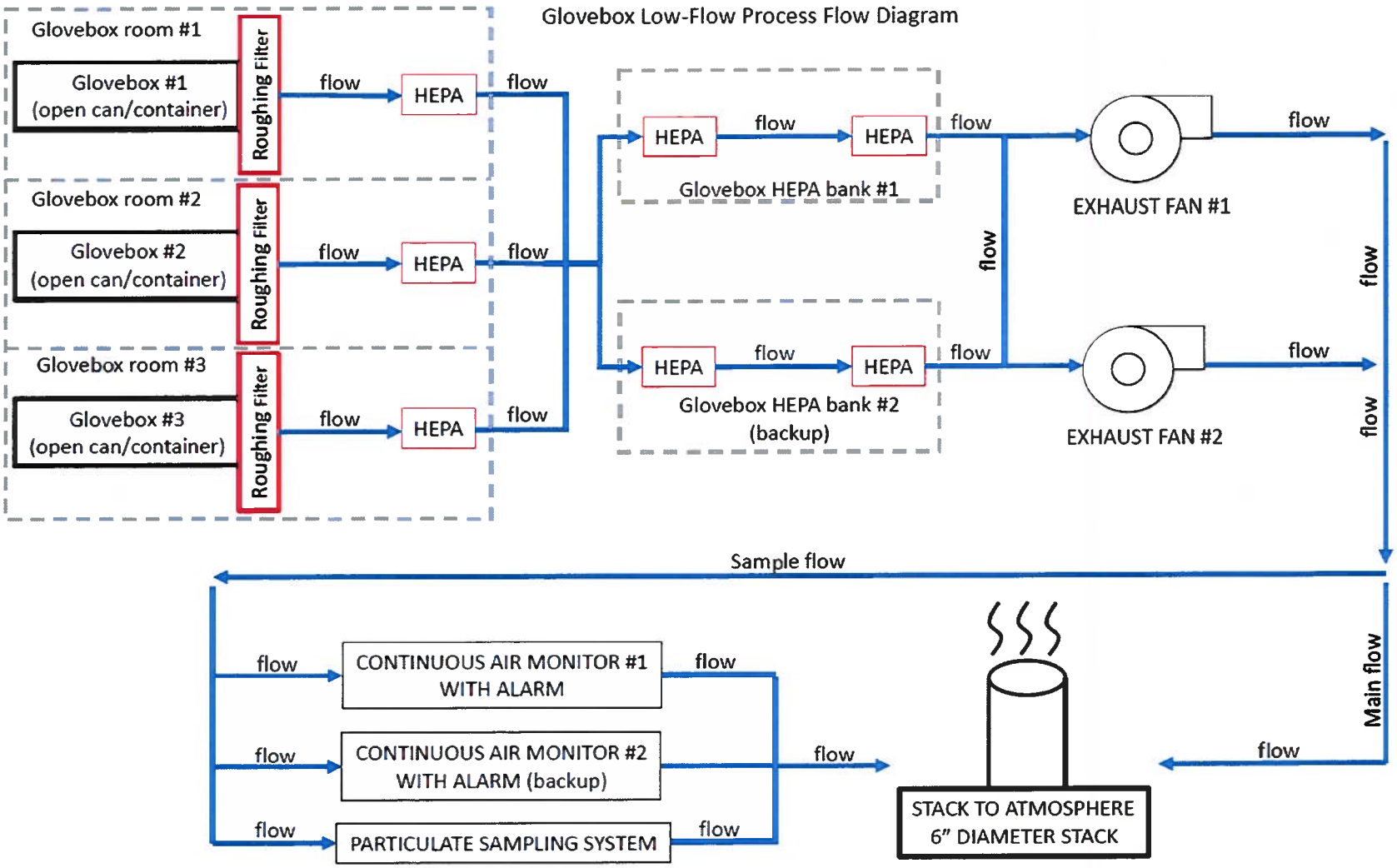


Notes:

1. Feed cans are also referred to as 3013/SAVY cans
2. Blend cans entering glovebox contain adulterant material
3. BCLS – Blend Can Loading System. BCLS contains a sieve. Material not passing sieve may be size reduced using closed grinder system or mortar and pestle.

Attachment 1 DHEC 2567
Detailed Project Description and Process Flows

Figure 2 – Simplified Ventilation Drawing for Glovebox Confinement Stack K-OP0001



Bureau of Air Quality
Construction Permit Application
Emissions

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)* U.S. Department of Energy - Savannah River Site managed and operated by Savannah River Nuclear Solutions, LLC	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0080 - 0041	Application Date 9/22/2020

ATTACHMENTS *(Check all the appropriate checkboxes if included as an attachment)*	
☒ Sample Calculations, Emission Factors Used, etc.	☒ Detailed Explanation of Assumptions, Bottlenecks, etc.
☐ Supporting Information: Manufacturer's Data, etc.	☐ Source Test Information
☐ Details on Limits Being Taken for PTE Emissions	☒ NSR Analysis

SUMMARY OF PROJECTED CHANGE IN FACILITY WIDE POTENTIAL EMISSIONS
(Calculated at maximum design capacity.)

Pollutants	Emission Rates Prior to Construction / Modification (tons/year)			Emission Rates After Construction / Modification (tons/year)		
	Uncontrolled	Controlled	PTE	Uncontrolled	Controlled	PTE
Particulate Matter (PM)	2.73E+03	2.75E+02	N/A for SRS	2.73E+03	2.75E+02	N/A for SRS
Particulate Matter <10 Microns (PM_{10})	2.04E+03	2.68E+02	N/A for SRS	2.04E+03	2.68E+02	N/A for SRS
Particulate Matter <2.5 Microns ($PM_{2.5}$)	2.01E+03	2.46E+02	N/A for SRS	2.01E+03	2.46E+02	N/A for SRS
Sulfur Dioxide (SO_2)	2.80E+03	5.61E+02	N/A for SRS	2.80E+03	5.61E+02	N/A for SRS
Nitrogen Oxides (NO_x)	9.72E+02	8.05E+02	N/A for SRS	9.72E+02	8.05E+02	N/A for SRS
Carbon Monoxide (CO)	6.59E+02	6.59E+02	N/A for SRS	6.60E+02	6.60E+02	N/A for SRS
Volatile Organic Compounds (VOC)	1.98E+02	1.98E+02	N/A for SRS	1.99E+02	1.99E+02	N/A for SRS
Lead (Pb)	3.57E-01	2.39E-01	N/A for SRS	3.57E-01	2.39E-01	N/A for SRS
Highest HAP Prior to Construction (CAS #: nitric acid 7697-37-2)	1.67E+02	1.67E+02	N/A for SRS	1.67E+02	1.67E+02	N/A for SRS
Highest HAP After Construction (CAS #: nitric acid 7697-37-2)	1.67E+02	1.67E+02	N/A for SRS	1.67E+02	1.67E+02	N/A for SRS
Total HAP Emissions*	2.95E+02	2.80E+02	N/A for SRS	2.95E+02	2.80E+02	N/A for SRS

Include emissions from exempt equipment and emission increases from process changes that were exempt from construction permits.
(*All HAP emitted from the various equipment or processes must be listed in the appropriate "Potential Emission Rates at Maximum Design Capacity" Table)

POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
Equipment ID / Process ID	Emission Point ID	Pollutants (Include CAS #)	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		PTE	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
300K, 301K, & 302K total from all 3 gloveboxes	K-EP0001	PM	SRNS-RP-2020-00437 contains non-radiological emissions evaluation. Maximum PTE is based on maximum of 1.91E+06 g Pu Oxides per year	3.46E-06	1.52E-05	3.46E-06	1.52E-05	3.46E-06	1.52E-05
300K, 301K, & 302K total from all 3 gloveboxes	K-EP0001	PM10	SRNS-RP-2020-00437 contains non-radiological emissions evaluation. Maximum PTE is based on maximum of 1.91E+06 g Pu Oxides per year	2.02E-06	8.84E-06	2.02E-06	8.84E-06	2.02E-06	8.84E-06
300K, 301K, & 302K total from all 3 gloveboxes	K-EP0001	PM2.5	SRNS-RP-2020-00437 contains non-radiological emissions evaluation. Maximum PTE is based on maximum of 1.91E+06 g Pu Oxides per year	2.02E-06	8.84E-06	2.02E-06	8.84E-06	2.02E-06	8.84E-06
300K, 301K, & 302K total from all 3 gloveboxes	K-EP0001	Lead	SRNS-RP-2020-00437 contains non-radiological emissions evaluation. Maximum PTE is based on maximum of 1.91E+06 g Pu Oxides per year	2.27E-11	9.95E-11	2.27E-11	9.95E-11	2.27E-11	9.95E-11
303K	K-OE0001	PM	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	8.82E-03	2.20E-03	8.82E-03	2.20E-03	8.82E-03	2.20E-03
303K	K-OE0001	PM10	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	8.82E-03	2.20E-03	8.82E-03	2.20E-03	8.82E-03	2.20E-03
303K	K-OE0001	PM2.5	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	8.82E-03	2.20E-03	8.82E-03	2.20E-03	8.82E-03	2.20E-03

POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
Equipment ID / Process ID	Emission Point ID	Pollutants (Include CAS #)	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		PTE	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
303K	K-OE0001	SOx (SO2)	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	5.49E-01	1.37E-01	5.49E-01	1.37E-01	5.49E-01	1.37E-01
303K	K-OE0001	NOx	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	1.76E-01	4.41E-02	1.76E-01	4.41E-02	1.76E-01	4.41E-02
303K	K-OE0001	NO2	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	3.53E-02	8.82E-03	3.53E-02	8.82E-03	3.53E-02	8.82E-03
303K	K-OE0001	CO	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	1.54E+00	3.86E-01	1.54E+00	3.86E-01	1.54E+00	3.86E-01
303K	K-OE0001	VOC	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	6.73E-01	1.68E-01	6.73E-01	1.68E-01	6.73E-01	1.68E-01
303K	K-OE0001	CO2	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	3.08E-02	7.71E+01	3.08E-02	7.71E+01	3.08E-02	7.71E+01
303K	K-OE0001	methane	SRNS-RP-2020-00438 contains non-radiological emissions evaluation for emergency diesel generator. Utilized run time of 500 hours/year.	6.05E-02	1.51E-02	6.05E-02	1.51E-02	6.05E-02	1.51E-02

POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
Equipment ID / Process ID	Emission Point ID	Pollutants (Include CAS #)	Calculation Methods / Limits Taken / Other Comments	Uncontrolled		Controlled		PTE	
				lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr
304K	K-OT0001	VOC	SRNS-RP-2020-000438 contains non-radiological emissions evaluation for fuel tank associated with diesel generator. Working Losses utilized D/G operating 500 hr/year at 15.4 gal/hr.	7.44E-05	3.26E-04	7.44E-05	3.26E-04	7.44E-05	3.26E-04
300K, 301K, 302K	K-OP0001	Radionuclides	SRNS-RP-2019-00152 contains radiological emission evaluation. Results are reported in mrem/year as required to determine Potential Impact Category. PIC 1.	NA	NA	NA	NA	NA	NA
299K	K-OP0002	Radionuclides	SRNS-RP-2019-00152 contains radiological emission evaluation. Results are reported in mrem/year as required to determine Potential Impact Category. PIC 4.	NA	NA	NA	NA	NA	NA

Applicability Procedure 61-62.5 Standard No. 7 (A)(2)(d)(iv)

The Surplus Plutonium Disposition (SPD) project is a new emission unit (K-005) at the Savannah River Site (SRS).

> (iv) **Actual-to-potential test for projects that only involve construction of a new emissions unit(s).** A significant emissions increase of a regulated NSR pollutant is projected to occur if the sum of the difference between the potential to emit (as defined in paragraph (B)(37)) from each new emissions unit following completion of the project and the baseline actual emissions (as defined in paragraph (B)(4)(c)) of these units before the project equals or exceeds the significant amount for that pollutant (as defined in paragraph (B)(49)).

Required Values to determine if a significant emission increase of a New Source Review (NSR) pollutant is projected to occur

1. Potential to Emit 61-62.5 Standard No. 7 (B)(37)
2. Baseline Actual Emissions 61-62.5 Standard No. 7 (B)(4)(c)
3. Significant Amount for the NSR pollutant 61-62.5 Standard No. 7 (B)(49)

Potential to Emit 61-62.5 Standard No. 7 (B)(37)

> (37) **Potential to emit** means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable. Secondary emissions do not count in determining the potential to emit of a stationary source.

SRNS-RP-2020-00437 provides the potential to emit (PTE) values for the glovebox containment processing area. The processing area is limited to 1.91E+06 g Pu Oxides per year feed. SRNS-RP-2020-00438 provides the potential to emit values for the emergency diesel generator and associated fuel tank. These PTE values are based on a 500 hour/year run time for the emergency diesel generator at a 15.4 gal/hr consumption rate.

The following table summarizes the maximum PTE from the SPD project.

Pollutant	Containment Processing PTE (TPY)	Emergency D/G PTE (TPY)	Fuel Tank PTE (TPY)	Total SPD Project PTE (TPY)
CO		3.86E-01		3.86E-01
NOx		4.41E-02		4.41E-02
SO2		1.37E-01		1.37E-01
PM	1.52E-05	2.20E-03		2.22E-03
PM10	8.84E-06	2.20E-03		2.21E-03
PM2.5	8.84E-06	2.20E-03		2.21E-03
VOC		1.68E-01	3.26E-04	1.68E-01
Lead	9.95E-11			9.95E-11

Baseline Actual Emissions 61-62.5 Standard No. 7 (B)(4)(c)

(c) For a new emissions unit, the baseline actual emissions for purposes of determining the emissions increase that will result from the initial construction and operation of such unit shall equal zero; and thereafter, for all other purposes, shall equal the unit's potential to emit.

Significant Amount for the NSR pollutant 61-62.5 Standard No. 7 (B)(49)

(49)(a) Significant means, in reference to a net emissions increase or the potential of a source to emit any of the following pollutants, a rate of emissions that would equal or exceed any of the following rates:

Pollutant		Emissions Rate (tons per year)
Carbon monoxide		100
Nitrogen oxides		40
Sulfur dioxide		40
Particulate matter:	Particulate matter emissions	25
	PM_{10} emissions	15
	Direct $PM_{2.5}$	10
	Sulfur dioxide emissions	40
	Nitrogen oxide emissions unless demonstrated not to be a $PM_{2.5}$ precursor under paragraph (B)(44) of this section	40
Ozone:	Volatile organic compounds (VOCs)	40
	Nitrogen Oxides	40
Lead		0.6
Fluorides		3
Sulfuric acid mist		7
Hydrogen sulfide (H_2S)		10
Total reduced sulfur (including H_2S)		10
Reduced sulfur compounds (including H_2S)		10
Municipal waste combustor organics (measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans):		3.2×10^{-6} megagrams per year (3.5×10^{-6} tons per year)
Municipal waste combustor metals (measured as particulate matter)		14 megagrams per year (15 tons per year)
Municipal waste combustor acid gases (measured as sulfur dioxide and hydrogen chloride)		36 megagrams per year (40 tons per year)
Municipal solid waste landfills emissions (measured as nonmethane organic compounds)		45 megagrams per year (50 tons per year)

Conclusion

Since the Baseline Actual Emissions for a new emission unit is zero per 61-62.5 Standard No. 7 (B)(4)(c) the Actual-to-Potential test results in the Potential emissions being compared to the Significant Amount of NSR pollutants provided in the regulations. The following table demonstrates the emissions from the new SPD project emission unit will not exceed the significant increase amounts of NSR pollutants.

Pollutant	Containment Processing PTE (TPY)	Emergency D/G PTE (TPY)	Fuel Tank PTE (TPY)	Total SPD Project PTE (TPY)	Significant Increase PTE (TPY)
CO		3.86E-01		3.86E-01	100
NOx		4.41E-02		4.41E-02	40
SO2		1.37E-01		1.37E-01	40
PM	1.52E-05	2.20E-03		2.22E-03	25
PM10	8.84E-06	2.20E-03		2.21E-03	15
PM2.5	8.84E-06	2.20E-03		2.21E-03	10
VOC		1.68E-01	3.26E-04	1.68E-01	40
Lead	9.95E-11			9.95E-11	0.6

APPLICATION IDENTIFICATION *(Please ensure that the information list in this table is the same on all of the forms and required information submitted in this construction permit application package.)*		
Facility Name *(This should be the name used to identify the facility)* U.S. Department of Energy - Savannah River Site managed and operated by Savannah River Nuclear Solutions, LLC; Liquid Waste Operations managed by Savannah River Remediation, LLC	SC Air Permit Number (8-digits only) *(Leave blank if one has never been assigned)* 0080 - 0041	Application Date 9/22/2020

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.1, Section II(E) Synthetic Minor Construction Permits	☐	☒	SRS is not requesting federally enforceable permit conditions to result in a synthetic minor construction permit.	NA	NA
Regulation 61-62.1, Section II(G) Conditional Major Operating Permits	☐	☒	SRS is not requesting federally enforceable permit limits to constrain operation to emit less than major source thresholds.	NA	NA
Regulation 61-62.5, Standard No. 1 Emissions from Fuel Burning Operations	☐	☒	SPD project emission sources do not meet the definition of Fuel Burning Operation contained in R. 61-62.1 Section I.31. The fuel associated with the emergency diesel generator (303K) is burned to provide emergency power not indirect heating.	NA	NA

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.5, Standard No. 2 Ambient Air Quality Standards	☒	☐	This SPD project will impact emission rates of Standard No. 2 pollutants. The emissions from emission points K-OP0001 are below the exemption levels for the pollutants listed in R.61-62.1 Section II B.h. Unfortunately, there is no exemption level provided for Lead in the current regulations. The SPD project will result in an increase in lead emissions at K-OP0001. The emergency diesel generator emissions at K-OE0001 and the associated 2000 gallon fuel tank emissions at K-OT0001 are both exempt but must be included in the constuction application for the purpose to determine regulatory applicability of PSD, Title V or MACT standards.	Emissions for Standard 2 pollutants are all below the exemption levels provided in the regulation. Lead does not have an exemption level provided. The Modeling demonstration will not need to be revised since facility wide emissions of lead will remain below 0.5TPY (Table 2.1 of Modeling Guidelines for Air Quality Permits dated October 2018 and Revised 4/15/2019).	Refer to D-2567 Detailed Project Description document and D-2569 facility wide emissions documents. Both are contained within this construction application.
Regulation 61-62.5, Standard No. 3 Waste Combustion and Reduction	☐	☒	Not Applicable - Not waste combustion and reduction operation as described by the regulation.	NA	NA

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.5, Standard No. 4 Emissions from Process Industries	☒	☐	The SPD process is considered to fall under Section VIII, Other Manufacturing. The maximum process weight is 1.91E+06g Pu Oxide/year. This equates to 2.40E -04 ton/hr. The effect factor from Table B of the regulation is 1.0. These values result is an allowable rate of emission of 1.54E-02 lb/hr PM. The SPD process also fall under Section IX - Visible Emissions (Where not Specified Elsewhere). Since construction will begin after 12/31/1985 opacity at emission point K-OP0001 shall not exceed 20%.	Allowable emission rate of 1.54E-02 lb/hr PM and opacity not to exceed 20%.	SRNS-RP-2020-00437 concludes the maximum potential to emit PM from K-0P0001 is 3.46E-06 lb/hr. There is no basis to anticipate an opacity exceeding 20% at a K-OP0001. All possible actions are taken to reduce the loss of particulate matter in the glovebox containment.
Regulation 61-62.5, Standard No. 5 Volatile Organic Compounds	☐	☒	The SRS does not operate a process described in R.6 I-62.5 Standard No. 5 Section II. (R.61-62.5 Standard No. 5 Section I Part B).	NA	NA

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.5, Standard No. 5.2 Control of Oxides of Nitrogen	☐	☒	The only NOx emissions associated with the SPD project occurs at the emergency diesel generator (K-OE0001). R 61-62.5 Standard No. 5.2 Section I.B.1 exempts any source emitting NOx listed under R 61-62.1 Section II (B) exemptions. R.61-62.1 Section II (B)2.h. exempts sources emitting less than 5 TPY NOx. SRNS-RP-2020-00438 concludes the maximum potential to emit NOx from K-OE0001 is 4.41E-02 TPY.	NA	NA
Regulation 61-62.5, Standard No. 7 Prevention of Significant Deterioration*	☐	☒	This SPD project does not result in a significant emissions increase as defined in R.61-62.5 Standard No. 7 (b)(49). Refer to DHEC 2569 - New Source Review - Standard No. 7 Prevention of Significant Deterioration.	NA	NA
Regulation 61-62.5, Standard No. 7.1 Nonattainment New Source Review*	☐	☒	Not Applicable - Location of facility is in Aiken County and is not a Nonattainment Area.	NA	NA

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.5, Standard No. 8 Toxic Air Pollutants	☐	☒	Not Applicable - There are no regulated Toxic Air Pollutants released as a result of the SPD Project. Refer to SRNS-RP-2020-00437 for K-OP0001 maximum emission calculations. The emergency diesel generator emitting to K-OE0001 burns only virgin fuel.	NA	NA
Regulation 61-62.6 Control of Fugitive Particulate Matter	☐	☒	Not Applicable - None of the activities associated with the SPD project will result in the type of fugitive particulate matter addressed under this regulation.	NA	NA
Regulation 61-62.68 Chemical Accident Prevention Provisions	☐	☒	SRS does not exceed the thresholds contained in R61-62.68.	NA	NA

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
Regulation 61-62.70 Title V Operating Permit Program	☒	☐	SRS has a Title V permit 0080-0041. The emergency diesel generator (303K) and the associated 2000 gal fuel tank (304K) are part of the project but are not part of the process as described in the 6/15/1999 SCDHEC guidance document for Standard 4, Section VIII - PM Emission Limitations. Therefore, these 2 pieces of equipment will be added to the Insignificant Activty List for the SRS Title V permit prior to operating.	0080-0041 expired on 3/31/2008. Emission Unit K-005 (Emission point K-OP0001) will operate under the Construction permit issued by SCDHEC until a new Title V operating permit is issued. K-OP0002 is a source of radiological emission only and is a PIC 4 stack. K-OP0002 will not be listed anywhere on the site's Title V permit. An Operational Flexibility packet to list 303K and 304K on the list of Insignificant Activities will be submitted prior to operation of these sources.	Submit an Operational Flexibility packet to list 303K and 304K on the list of Insignificant Activities and an updated Title V renewal application Form G that includes 303K and 304K and new emission unit K-005 (emission point K-OP0001).
40 CFR Part 64 - Compliance Assurance Monitoring (CAM)	☐	☒	The HEPA and roughing filters are only credited for controlling radionuclides. PM is not considered a criteria pollutant with respect to 40 CFR 70.	NA	NA
40 CFR 60 Subpart A - General Provisions	☒	☐	303K is an emergency diesel generator and must comply with 40 CFR 60 Subpart IIII. The compliance requirements of 40 CFR 60.4218 and Table 8 to Subpart IIII specifies the General Provisions for compliance.	303K will operate under the General Provision compliance requirements of 40 CFR 60.4218 and Table 8 to Subpart IIII.	SRS will comply with the General Provisions, as well as all notification and record keeping requirments. Records will be available upon request.

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
40 CFR 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition Combustion Engines	☒	☐	303K is an emergency internal combustion engine.	Compliance with the non-emergency operational limits contained in 40 CFR 60.4211	An operational log will be maintained and available upon request.
40 CFR 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition Combustion Engines	☒	☐	303K is an emergency internal combustion engine.	40 CFR 60.4207 specifies fuel requirements. Diesel Fuel for 303K must meet 40 CFR 80.510(b) requirements.	Semiannual fuel supplier certification will be obtained from fuel supplier.
40 CFR 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition Combustion Engines	☒	☐	303K is an emergency internal combustion engine	40 CFR 60.4211(a)(1) requires 303K to be operated and maintained according to the manufacturer's emission related written instructions.	Maintenance history will be made available upon request.
	☐	☐			

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
40 CFR 61 Subpart A - General Provisions	☒	☐	K-OP0001 is a potential impact category (PIC) 1 stack (SRNS-RP-2019-00152) with an Effective Does Equivalent (EDE) of 2.03E-01 mrem/yr located at a Department of Energy facility.	40 CFR 61.07 - An application for approval of construction shall be submitted 40 CFR 61.09 - Notification of Startup 40 CFR 61.12 - K-OP0001, and control devices I-0103, I-0104, I-0105 and H-1000 shall be operated and maintained consistent with good air pollution control practices for minimizing emissions. 40 CFR 61.14 - A monitoring systems shall be maintained and operated as specified by Subpart H	40 CFR 61.07 - This construction permit application contains all of the information required by 40 CFR 61.07. EPA Region IV is included in distribution for this construction permit application (40 CFR 61.04) 40 CFR 61.09 - SCDHEC will be notified of anticipated date of initial startup and actual date of initial startup. EPA Region IV will be copied on these notifications. 40 CFR 61.12 - K-OP0001 will be a continuous monitored source 40 CFR 61.14 - K-OP0001 will be continuous monitored source in accordance with Subpart H
40 CFR 61 Subpart H -National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities	☒	☐	K-OP0001 is a potential impact category (PIC) 1 stack (SRNS-RP-2019-00152) with an Effective Does Equivalent (EDE) of 2.03E-01 mrem/yr located at a Departement of Energy facility.	10mrem/year	Compliance is demonstrated using the EPA approved CAP88 dose model as required by 40 CFR 61.93(a) and reported as required by 40 CFR 61.94.

STATE AND FEDERAL AIR POLLUTION CONTROL REGULATIONS AND STANDARDS *(If not listed below add any additional regulations that are triggered.)*					
Regulation	**Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	**Explain Applicability Determination**	**List the specific limitations and/or requirements that apply.**	**How will compliance be demonstrated?**
40 CFR 63 Subpart A - General Provisions	☐	☒	303K is a 200kW emergency diesel generator. Since this generator is less than 500Hp (373Kw) and located at a major source of HAP emission the General Provisions do not apply (40 CFR 63.6665).	NA	NA.
40 CFR 63 Subpart ZZZZ	☒	☐	303K is an emergency diesel generator that meets 40 CFR 63.6590(c)(6) criteria.	Meet the requirements of 40 CFR 60 Subpart IIII	Refer to the 40 CFR 61 Subpart IIII section of this DHEC form
	☐	☐			
	☐	☐			
	☐	☐			

* Green House Gas emissions must be quantified if these regulations are triggered.

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Evaluation of Non-Radionuclide Emissions from the Surplus Plutonium Disposition Project Dilute Process Area

SRNS-RP-2020-00437

Revision 1

September 17, 2020

Stephanie D. Yazzie

Environmental Compliance Authority

DOES NOT CONTAIN UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION
Reviewing/Denying Official: Steven Williamson, SRNS
(Name and organization)
Date: 9/17/2020

SAVANNAH RIVER SITE • AIKEN, SOUTH CAROLINA

Prepared by: STEPHANIE YAZZIE (Affiliate)

Digitally signed by STEPHANIE YAZZIE (Affiliate)
Date: 2020.09.17 14:59:49 -04'00'

Stephanie D. Yazzie **Date**

Environmental Compliance Authority

Concurrence: KIM WOLFE (Affiliate)

Digitally signed by KIM WOLFE (Affiliate)
Date: 2020.09.17 14:33:48 -04'00'

Kim Wolfe **Date**

Environmental Compliance & Area Completion Projects

INTRODUCTION

The mission of the Surplus Plutonium Disposition (SPD) Project is to expedite removal of plutonium from the State of South Carolina by expanding the SRS capability to disposition surplus weapons-grade plutonium via the Dilute and Dispose approach. To reduce the attractiveness level and the required safeguards and security measures, the material will be mixed ("downblended") with an adulterant prior to disposition at the Waste Isolation Pilot Plant (WIPP). This project is documented in the NEPA Environmental Checklist # OBU-K-2017-0089.

The project will cover four (4) primary activities:

- Unpackage Plutonium Oxide
- Dry blend with an adulterant
- Perform Non-Destructive Analysis (NDA) and Packaging
- Staging Diluted Plutonium

The proposed SPD Area is in the existing K-Area Complex footprint and will include a Dilute Process Area (DPA), West and East Staging Areas, System Support Areas, new HEPA Filter and Fan Building, a Diesel Generator Enclosure and two exhaust stacks.

The Dilute Process Area exhausts through 2 stacks. The primary active confinement ventilation area exhausts HEPA-filtered air from within the gloveboxes through the glovebox "low flow" stack (34m/124ft). The rest of the Dilute Process Area (secondary and tertiary confinement) will exhaust through the DPA "Main" stack (31m/102ft). The source of the potential pollutants is from material being downblended in the gloveboxes. Contamination in the secondary and tertiary confinement areas is not expected under normal conditions. The entire throughput for the glovebox operations is considered for this evaluation.

PROCESS

Downblend activities will be conducted in the DPA within three (3) gloveboxes. Feed cans containing Plutonium oxide ("feed material") are unpackaged from shipping containers. They enter the gloveboxes through an airlock. The feed cans are opened. Some preparation may be required to size reduce the feed material to fit a #10 sieve prior to blending. A prescribed amount of feed material is added to a blend can that is preloaded with a prescribed amount of adulterant. The preferred mechanism for loading the blend can from the feed can is a shielded hopper system. The blend can is weighed, closed, mixed, and then weighed again. The blend can is then placed in a shield can for worker dose protection. The final blend/shield can (Dilute Product Can) is bagged from the glovebox into a sealed plastic bag via an airlock.

INPUTS/ASSUMPTIONS

1. The annual process throughput is 1.91 metric tons/yr (Reference 1) of Pu oxides with some radiological and non-radiological impurities (Reference 2) in particulate form. The total weight of material to be processed is equal to the 1.91 metric tons/year of Pu oxides. With a nominal 4400 g of Pu oxide per feed can, this equates to approximately, 434 feed cans per year. However, because some feed cans contain less than 4400 g, the feed can rate could be higher at times to meet the 1.91 MT/yr feed rate. Therefore, 1.91 MT/yr is the basis for the throughput.
2. There is no heating of the material in the process.
3. Non-radiological impurities average concentrations are expressed in relation to the Pu content of the material; therefore, the total Pu content is determined (Reference 2).
4. Although the impurities are presented in metal form, the material is an oxide. Pb and Ni are further evaluated in their oxide forms. All other metals are well below the Nickel concentration so they will also be trace even in oxide/compound form. Trace is defined in South Carolina Modeling Guidelines for Air Quality Permits dated October 2018 and revised 4/15/2019 as less than 0.1% of air emissions by weight for OSHA carcinogens and less than 1% for non-OSHA carcinogens.
5. This evaluation is for uncontrolled releases. No control factors are considered.
6. AP-42, Chapter 11.12 Emission Factors for uncontrolled PM_{TOTAL} and PM_{10} releases for weigh hopper loading (Table 11.12-2) were selected based on the physical state of material and how it is handled in the process (Reference 3). $PM_{2.5}$ are assumed equivalent to PM_{10} as a conservative measure. The use of these emissions factors is grossly conservative since these activities will all be occurring in a glovebox with glovebox scale equipment.
7. Fugitive releases could occur in the three places during the process: 1. When oversize feed material is transferred for resizing, 2. When resized material is added back to the blend can loading system, and 3. Where the material exits the Blend Can Loading System (BCLS) to the blend can. Because the amount of potential release at each of these locations cannot be accurately quantified, the throughput is used at each location and the PM emission factors are applied at each location and then totaled. This is a very conservative measure because the downblend process is optimized for dust control in order to minimize worker dose as required by federal law and DOE Orders, and for nuclear material control/accountability measures.
8. Blending is conducted in closed containers.
9. Blend cans are preloaded with adulterant by the vendor. No emissions from preloading blend cans are anticipated.

10. The opening of the feed cans will not result in emissions. Opening activity will be similar to the use of a standard can opener.
11. NDA, packaging, and storage of diluted plutonium will not result in any emissions since the interior can containing the diluted plutonium process will be closed at all times during these parts of the process.
12. Unit Conversions:

1 metric ton (MT)	=	1.10231 US tons
1 g	=	1,000,000 µg
453.6 g	=	1 lb
2000 lb	=	1 ton
12 months	=	1 year
365 days	=	1 year
8760 hours	=	1 year

CALCULATIONS

I. Total PU Oxides, total Pu, and ratio of Pu/Pu Oxides Determination:

Proposed, maximum, minimum and average Pu isotopic distributions were reviewed (Reference 2). For conservatism, maximum values for each were selected. The isotopic distributions for the Pu oxides are applied to 1.91E+06 grams to generate the maximum amount of each Pu oxide processed annually in grams. The sum of these are >1 which demonstrates conservatism.

The maximum amount of each Pu oxide per year is calculated as follows:
= (Oxide %÷100) * 1.91E+06 grams

EXAMPLE:
Maximum amount of $^{238}PuO_2$ per yr
= (1.00E-02 ÷ 100) * 1.91E+06 g = 1.91E+02 g/yr

Because the Pu is presented in the oxide form, a mass fraction is calculated for each Pu isotope.

The mass fraction (dimensionless) is calculated as follows:

= atomic weight of the radionuclide (g/mol) ÷ molecular weight of the oxide (g/mol)

EXAMPLE:
Mass Fraction of $^{238}PuO_2$
= 238 g/mol ÷ (238 g/mol+(2*15.9994g/mol)) = 8.81E-01 dimensionless

---

The mass fraction is applied to the maximum oxide per year to determine the maximum amount of each Pu radionuclide per year.

The maximum amount of each Pu radionuclide per year is calculated as follows:
= mass fraction of the radionuclide (dimensionless) * maximum oxide per year (g)

EXAMPLE:
Maximum amount of ^{238}Pu per year
= 8.81E-01 * 1.91E+02 g/yr = 1.68E+02 g/yr

The amount of Pu radionuclides (g) per year is summed. Total Pu and the total material are converted to US tons and a ratio is calculated.

Oxide[Ref 2]	Source Term @ 1.91 MT/yr[Ref 1]						Max UNCONTROLLED	Unit Conversion	Max UNCONTROLLED
	Bounding Composition[Ref 2] (%/100)	Total Oxide Throughput[Ref 1] (g)	Max Oxide per year (g)	Atomic Weight of Radionuclide	Compound Molecular Weight in Oxide Form	Mass Fraction	g/yr		
$^{238}PuO_2$	1.0000E-04	1.9100E+06	1.91E+02	238	269.9988	8.81E-01	1.68E+02		
$^{239}PuO_2$	9.4465E-01	1.9100E+06	1.80E+06	239	270.9988	8.82E-01	1.59E+06		
$^{240}PuO_2$	5.9910E-02	1.9100E+06	1.14E+05	240	271.9988	8.82E-01	1.01E+05		
$^{241}PuO_2$	8.2000E-04	1.9100E+06	1.57E+03	241	272.9988	8.83E-01	1.38E+03		
$^{242}PuO_2$	3.1000E-04	1.9100E+06	5.92E+02	242	273.9988	8.83E-01	5.23E+02	g to ton	TPY
TOTAL Pu Oxides	1.0058E+00				TOTAL Pu		1.69E+06	1.10E-06	1.87E+00
					TOTAL MATERIAL		1.91E+06	1.10E-06	2.11E+00
								ratio Pu to Total	8.87E-01

II. Criteria, HAPs/TAPs Release Determination

Because the material is in particulate form, the criteria pollutant of concern is PM. PM_{TOTAL} and PM_{10} are calculated against the total throughput (2.11 TPY) using uncontrolled emissions factors. $PM_{2.5}$ is considered equivalent to PM_{10}. A factor of 3 is applied to account for 3 potential release sites. The same emissions factors are applicable to all 3 sites. PM_{TOTAL} is calculated in g/yr because it is needed for HAPs/TAPs calculations.

EXAMPLE:
(2.11 ton/yr Total Material) * (4.80E-03 lb PM_{TOTAL}/ton of Total Material) * 3 * (453.6 g/lb)
= 1.38E+01 g/yr PM_{TOTAL}

(2.11 ton/yr Total Material) * (4.80E-03 lb PM_{TOTAL}/ton of Total Material) * 3 * (1 ton/2000 lb) = 1.52E-05 TPY PM_{TOTAL}

Release rates are displayed in varying units for ease of comparison to standards.

EXAMPLES:

(1.52E-05 ton PM_{TOTAL} /yr) * (2000 lb/1 ton) = 3.03E-02 lb/yr PM_{TOTAL}
(3.03E-02 lb/yr PM_{TOTAL}) * (1 yr/12 months) = 2.53E-03 lb/month PM_{TOTAL}
(3.03E-02 lb/yr PM_{TOTAL}) *(1 yr/365 days) = 8.31E-05 lb/day PM_{TOTAL}
(3.03E-02 lb/yr PM_{TOTAL}) * (1 yr/8760 hours) = 3.46E-06 lb/hr PM_{TOTAL}

Pollutant	TOTAL Material	Emission Factor	# of Emission Sites	Unit Conversion	Release
	TPY	lb/TON Material	dimensionless	g/lb	g/yr
PM_{TOTAL}	2.11E+00	4.80E-03	3.00E+00	453.6	1.38E+01
PM_{10}	2.11E+00	2.80E-03	3.00E+00		
$PM_{2.5}$	2.11E+00	2.80E-03	3.00E+00		

Pollutant	Release	Unit Conversion	Release				
	g/yr	Ton/lb	TPY	lb/yr	lb/month	lb/day	lb/hr
PM_{TOTAL}	1.38E+01	5.00E-04	1.52E-05	3.03E-02	2.53E-03	8.31E-05	3.46E-06
PM_{10}		5.00E-04	8.84E-06	1.77E-02	1.47E-03	4.85E-05	2.02E-06
$PM_{2.5}$		5.00E-04	8.84E-06	1.77E-02	1.47E-03	4.85E-05	2.02E-06

A list of non-radiological impurities was reviewed for HAPs and TAPs and are listed in metal form. The concentrations are expressed in relation to the Pu content as µg of impurity/g of Pu. To account for emissions factors, PM_{TOTAL} (g/yr) is used and then adjusted using the Pu/Total Material ratio.

EXAMPLE:
(7.4 µg Pb/g Pu) * (1.38E+01 g/yr PM_{TOTAL}) * (8.87E-01 g Pu/g TOTAL) * (1.00E-06 g/µg) = 9.03E-05 g/yr Pb

Pollutant[Ref 2]	Average Concentration[Ref 2]	Release Rate Total=PM_{TOTAL}	Ratio of Pu/Total	Release	Unit Conversion	Release
	µg/g of Pu	g/yr	dimensionless	µg/yr	g/µg	g/yr
Pb*	7.4	1.38E+01	8.87E-01	9.03E+01	1.00E-06	9.03E-05
Ni*	861	1.38E+01	8.87E-01	1.05E+04	1.00E-06	1.05E-02
Cr*	150	1.38E+01	8.87E-01	1.83E+03	1.00E-06	1.83E-03
Cl	65	1.38E+01	8.87E-01	7.93E+02	1.00E-06	7.93E-04
P	40	1.38E+01	8.87E-01	4.88E+02	1.00E-06	4.88E-04
Mn	17	1.38E+01	8.87E-01	2.07E+02	1.00E-06	2.07E-04
Be*	6.9	1.38E+01	8.87E-01	8.42E+01	1.00E-06	8.42E-05
Co*	2.6	1.38E+01	8.87E-01	3.17E+01	1.00E-06	3.17E-05
Cd*	0.29	1.38E+01	8.87E-01	3.54E+00	1.00E-06	3.54E-06

*carcinogen per TRI Basis of OSHA Carcinogens August 2018

Release rates are displayed in varying units for ease of comparison to standards.

EXAMPLES:

(9.03E-05 g Pb/yr) * (1 lb/453.6 g) * (1 ton/2000 lb) = 9.95E-11 TPY Pb
(9.95E-11 ton Pb/yr) * (2000 lb/1 ton) = 1.99E-07 lb/yr Pb
(1.99E-07 lb Pb/yr) * (1 yr/12 months) = 1.66E-08 lb/mon Pb
(1.99E-07 lb Pb/yr) *(1 yr/365 days) = 5.45E-10 lb/day Pb
(1.99E-07 lb Pb/yr) * (1 yr/8760 hours) = 2.27E-11 lb/hr Pb

Pollutant[Ref 2]	Release	Unit Conversion	Unit Conversion	Release				
	g/yr	lb/g	ton/lb	TPY	lb/yr	lb/month	lb/day	lb/hr
Pb*	9.03E-05	2.20E-03	5.00E-04	9.95E-11	1.99E-07	1.66E-08	5.45E-10	2.27E-11
Ni*	1.05E-02	2.20E-03	5.00E-04	1.16E-08	2.32E-05	1.93E-06	6.34E-08	2.64E-09
Cr*	1.83E-03	2.20E-03	5.00E-04	2.02E-09	4.03E-06	3.36E-07	1.11E-08	4.61E-10
Cl	7.93E-04	2.20E-03	5.00E-04	8.74E-10	1.75E-06	1.46E-07	4.79E-09	2.00E-10
P	4.88E-04	2.20E-03	5.00E-04	5.38E-10	1.08E-06	8.96E-08	2.95E-09	1.23E-10
Mn	2.07E-04	2.20E-03	5.00E-04	2.29E-10	4.57E-07	3.81E-08	1.25E-09	5.22E-11
Be*	8.42E-05	2.20E-03	5.00E-04	9.28E-11	1.86E-07	1.55E-08	5.08E-10	2.12E-11
Co*	3.17E-05	2.20E-03	5.00E-04	3.50E-11	6.99E-08	5.83E-09	1.92E-10	7.98E-12
Cd*	3.54E-06	2.20E-03	5.00E-04	3.90E-12	7.80E-09	6.50E-10	2.14E-11	8.90E-13

*carcinogen per TRI Basis of OSHA Carcinogens August 2018

Pb and Ni are further evaluated as PbO and NiO for trace determination purposes.

The % of the air emission by weight for Ni and Pb compounds are calculated as follows:

Weight % = $RELEASE_{COMPOUND} \div PM_{TOTAL} * 100\%$

Where:

$RELEASE_{compound} = RELEASE_{metal} * (g/g\text{-}mol_{compound})/(g/g\text{-}mol_{metal})$

Pb = 207.2 g/g-mol
Ni = 58.693 g/g-mol
O = 15.999 g/g-mol
PbO = 223.199 g/g-mol

NiO = 74.692 g/g-mol

EXAMPLE:

$RELEASE_{PbO}$

=(9.95E-11 TPY Pb)*(2.23E+02 g/g-mol PbO)/(2.07E+02 g/g-mol Pb)

=1.07E-10 TPY PbO

% of air emission by weight for PbO:

$=(1.07E\text{-}10 \text{ TPY PbO})/(1.52E\text{-}05 \text{ TPY } PM_{TOTAL}) * 100\ \%$

=0.0007 %

Pollutant[Ref 2]	Release Metal	Compound	Metal	Release Compound		percent air emission by weight
	TPY	g/g-mol	g/g-mol	TPY	lb/yr	%
Lead Compounds (PbO)	9.95E-11	2.23E+02	2.07E+02	1.07E-10	2.14E-07	0.0007%
Nickel Compounds (NiO)	1.16E-08	7.47E+01	5.87E+01	1.47E-08	2.95E-05	0.0972%

REFERENCES

1. M-SYD-K-00039 *Surplus Plutonium Disposition System Design Description for Balance of Plant, Rev. 3,* July 2020.
2. SRNS-TR-2016-00315 *Plutonium Oxide Characterization for Use in Radiation Dose Assessments: Surplus Plutonium Disposition Program Dilute and Dispose Approach, Rev. 0,* November 18, 2016.
3. AP-42, *Compilation of Air Pollutant Emissions Factors Volume 1 Stationary Point and Area Sources, 5th Edition,* January 1995.

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Evaluation of Non-Radionuclide Emissions from the Surplus Plutonium Disposition Project Diesel Generator Enclosure

SRNS-RP-2020-00438

Revision 1

September 17, 2020

Stephanie D. Yazzie

Environmental Compliance Authority

SAVANNAH RIVER SITE • AIKEN, SOUTH CAROLINA

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Environmental Compliance & Area Completion Projects

INTRODUCTION

The mission of the Surplus Plutonium Disposition (SPD) Project is to expedite removal of plutonium from the State of South Carolina by expanding the SRS capability to disposition surplus weapons-grade plutonium via the Dilute and Dispose approach. To reduce the attractiveness level and the required safeguards and security measures, the material will be mixed ("downblended") with an adulterant prior to disposition at the Waste Isolation Pilot Plant (WIPP). This project is documented in the NEPA Environmental Checklist # OBU-K-2017-0089.

The project will cover four (4) primary activities:

- Unpackage Plutonium Oxide
- Dry blend with an adulterant
- Perform Non-Destructive Analysis (NDA) and Packaging
- Staging Diluted Plutonium

The proposed SPD Area is in the existing K-Area Complex footprint and will include a Dilute Process Area (DPA), West and East Staging Areas, System Support Areas, new HEPA Filter and Fan Building, a Diesel Generator Enclosure and two exhaust stacks.

The proposed Diesel Generator enclosure will house a 200 kW Tier 4 diesel generator with a 2000-gallon, double-walled sub-base fuel tank for emergency use (Reference 1).

Both the generator and the fuel tank will be evaluated for potential emissions.

DIESEL GENERATOR EVALUATION

INPUTs/ASSUMPTIONS

1. The diesel generator (DG) is a 200 kW unit (Reference 1)
2. The DG is emergency use and is being evaluated for 500 hrs/yr (Attachment 1)
3. The DG will burn Ultra Low Sulfur Diesel (No. 2 Fuel Oil)
4. The DG will meet the EPA Tier 4 emissions standards (Reference 1)
5. This evaluation is for uncontrolled releases. No control factors are considered.
6. Emissions Factors for SO_x/SO_2, VOCs, and CO_2 are AP-42, Table 3.3-1 (Reference 2)
7. Emissions Factors for PM_{TOTAL}. PM_{10}, $PM_{2.5}$, NO_x, and CO are Tier 4 Emissions Standards (Reference 3)

8. An in-stack ratio of 0.2NO_2/NO_x is applied (Reference 4)
9. Methane is 9% of the VOC (Reference 4)
10. Unit Conversions:

1 kW	=	1.34 hp
12 months	=	1 year
2000 lb	=	1 ton
453.6 g	=	1 lb

CALCULATIONS

Emissions using AP-42 factors (lb/hp-hr) are calculated as follows:

(lb/hp-hr) * (kW) * (1.34 hp/kW) = lb/hr
(lb/hr) * (500 hr/yr)* (1 yr/12 months) = lb/month
(lb/month) * (12 month/yr) * (1 ton/2000 lb) = TPY

EXAMPLE (SO_xSO_2)

(2.05E-03 lb/hp-hr) * (200 kW) * (1.34 hp/Kw) = 5.49E-01 lb/hr
(5.49E-01 lb/hr) * (500 hr/yr) * (1 yr/12 months) = 2.29E+01 lb/month
(2.29E+01 lb/month) * (12 month/yr) * (1 ton/2000 lb) = 1.37E-01 TPY

Emissions using Tier 4 emissions standards are calculated as follows:

(g/kW-hr) * (kW) * (lb/ 453.6 g) = lb/hr
(lb/hr) * (500 hr/yr)* (1 yr/12 months) = lb/month
(lb/month) * (12 month/yr) * (1 ton/2000 lb) = TPY

EXAMPLE (PM_{TOTAL})

(2.00E-02 g/kW-hr) * (200 kW) * (1 lb/453.6 g) = 8.82E-03 lb/hr

(8.82E-03 lb/hr) * (500 hr/yr) * (1 yr/12 months) = 3.67E-01 lb/month

(3.67E-01 lb/month) * (12 month/yr) * (1 ton/2000 lb) = 2.20E-03 TPY

KW[Ref 1]	HP*	Run Time (hrs/yr)[Att 1]
200	268	500

*1kW= 1.34 hp

Pollutant	AP-42[Ref 2] (except methane[Ref 4])				Tier 4 Emission Standards[Ref 3] (except NO_2[Ref 4])			
	Emission Factors	PTE			Emission Factors	PTE		
	lb/hp-hr	lb/hr	lbs/month	TPY	g/kw-hr	lb/hr	lbs/month	TPY
PM_{TOTAL}					2.00E-02	8.82E-03	3.67E-01	2.20E-03
PM_{10}					2.00E-02	8.82E-03	3.67E-01	2.20E-03
$PM_{2.5}$					2.00E-02	8.82E-03	3.67E-01	2.20E-03
SOx (SO2)	2.05E-03	5.49E-01	2.29E+01	1.37E-01				
NOx					4.00E-01	1.76E-01	7.35E+00	4.41E-02
CO					3.50E+00	1.54E+00	6.43E+01	3.86E-01
VOC	2.51E-03	6.73E-01	2.80E+01	1.68E-01				
NO_2[Ref 4]						3.53E-02	1.47E+00	8.82E-03
CO_2	1.15E+00	3.08E+02	1.28E+04	7.71E+01				

FUEL TANK EVALUATION

INPUTS/ASSUMPTIONS

1. The tank is a 2000-gallon double-walled sub-base tank. (Reference 1)
2. Dimensions for a standard 2000 gallon horizontal above ground fuel tank are assumed. (Attachment 2)
3. The tank is housed inside a climate-controlled (60-80˚F) enclosure to prevent derating of equipment and instrumentation. (Reference 5, 6). Since the evaluation does not take credit for this in the standing loss, the calculation is considered conservative.
4. Because the tank is stored indoors, the paint solar absorptance is set to zero.
5. Meteorological data specific to SRS is used rather than data provided in AP-42 Ch 7 for Augusta, Ga. (Reference 7)
6. The evaluation assumes 500 hr/yr operating at 15.4 gal/hr (7700 gallons) (Attachment 1, Reference 8)
7. Emissions are VOCs. (TOCs are assumed VOCs)
8. Because EPA software TANKs is no longer supported by the EPA, this evaluation utilizes the AP-42, Ch. 7: Liquid Storage Tanks equations prescribed in Sections 7.1.3.1 and 7.1.3.2 for fixed roof tanks in a horizontal configuration. (Reference 9)
9. Total loss from the tank is a sum of the standing loss and working loss. (Reference 9)

METEOROLOGICAL DATA

2018	Daily Max Temp (°F)	Daily Min Temp (°F)	Ave Wind Speed (mph)	Solar Radiation (Langley/day)	Solar Insolation Factor (btu/ft^2/day)
Jan	73.7	16.2	3.8	256	944
Feb	81.7	30.7	3.8	244	900
Mar	81.5	27.4	4.7	409	1508
Apr	84.7	35.6	4.5	489	1803
May	94.8	44.6	3.4	580	2138
Jun	96.7	63.5	3.1	587	2164
Jul	97.6	65.4	2.9	509	1877
Aug	93.2	64.4	2.9	507	1869
Sept	94.2	65.4	3.4	412	1519
Oct	90.8	37.5	3.4	343	1265
Nov	80.8	26.7	3.6	206	759
Dec	72.1	27.3	3.4	170	627
Average	86.8	42.1	3.6		1448

Ave Daily Ambient Temp (°F)		64.6		
Atomsphereic Press (psia)		14.6	1007	mb

Unit Conversion

1 Langley/day =	0.153613	BTU/ft^2-hr
BTU/ft^2-hr =	3.686712	BTU/ft^2-day

CALCULATIONS

Parameter	Symbol	Value	Unit	Equation	Source/Assumption/Input
Tank Color		indoor	dimensionless		Reference 1
Tank Dia	D	5.33	ft		Attachment 2
Tank Shell Length	H_s	12	ft		Attachment 2
Cone Roof Slope	S_R	0.0625	ft/ft		Reference 9 (Section 7.1.3.1)
Shell Radius	R_S	2.665	ft	radius=0.5*diameter	Standard equation
Daily Max Amb Temp		86.817	°F		Reference 7
Daily Max Amb Temp	T_{AX}	546.517	°R	°R= °F+459.7	Standard Conversion
Daily Min Amb Temp		42.058	°F		Reference 7
Daily Min Amb Temp	T_{AN}	501.758	°R	°R= °F+459.7	Standard Conversion
Paint Solar Absorptance	α	0	dimensionless		indoor=0
Paint Solar Absorptance Avg	α_{AVG}	0	dimensionless		indoor=0
Solar Insolation Factor	I	1448	btu/ft^2/day		Reference 7
breather vent pressure	P_{BP}	0.03	psig	default value	Reference 9 (Section 7.1.3.1)
breather vent vacuum	P_{BV}	-0.03	psig	default value	Reference 9 (Section 7.1.3.1)
Annual Throughput		7700	gal/yr		Reference 8
Annual Throughput	Q	183.337	bbl/yr	bbl=gal*2.381/100	Standard Conversion
Tank Volume		2000	gal		Reference 1
Effective Diameter	D_E	9.024	ft	eq 1-14	Reference 9 (Section 7.1.3.1)

Tank Vapor Space Volume V_V

Effective Height	H_E	4.186	ft	eq 1-15	Reference 9 (Section 7.1.3.1)
Vapor Space Outage	H_{VO}	2.093	ft	H_E/2 for horizontal tanks	Reference 9 (Section 7.1.3.1)
Tank Vapor Space Volume	V_v	133.874	ft^3	eq 1-3	Reference 9 (Section 7.1.3.1)

Vapor Density W_V

Ideal Gas Constant	R	10.731	psia ft^3/lb-mole °R		Standard Value
avg daily ambient temp	T_{AA}	524.138	°R	eq 1-30	Reference 9 (Section 7.1.3.1)
liquid bulk temp	T_B	524.138	°R	eq 1-31	Reference 9 (Section 7.1.3.1)
Avg daily liquid surface temp	T_{LA}	524.138	°R	eq 1-28	Reference 9 (Section 7.1.3.1)
avg vapor temp	T_V	524.138	°R	eq 1-33	Reference 9 (Section 7.1.3.1)
Antoine's Constant in the vapor equation	A	12.101	dimensionless		Reference 9 (Table 7.1-2 for No. 2 Fuel Oil)
Antoine's Constant in the vapor equation	B	8907	°R		Reference 9 (Table 7.1-2 for No. 2 Fuel Oil)
true vapor pressure	P_{VA}	7.50E-03	psia	eq 1-25	Reference 9 (Section 7.1.3.1)
vapor molecular weight	M_v	130	lb/lb mol		Reference 9 (Table 7.1-2 for No. 2 Fuel Oil)
Vapor Density	W_V	1.73E-04	lb/ft^3	eq 1-22	Reference 9 (Section 7.1.3.1)

Vapor Space Expansion Factor K_E					
avg daily ambient temp range	ΔT_A	44.758	°R	eq 1-11	Reference 9 (Section 7.1.3.1)
avg daily vapor temp range	ΔT_V	31.331	°R	eq 1-7	Reference 9 (Section 7.1.3.1)
avg daily vapor pressure range	ΔP_V	3.84E-03	psia	eq 1-9	Reference 9 (Section 7.1.3.1)
breather vent pressure setting range	ΔP_B	0.06	psig	eq 1-10	Reference 9 (Section 7.1.3.1)
avg daily max liquid surface temp	T_{LX}	531.970	°R		Reference 9 (Figure 7.1-17)
avg daily min liquid surface temp	T_{LN}	516.305	°R		Reference 9 (Figure 7.1-17)
vapor pressure at the averge daily max liq surface temp	P_{VX}	9.63E-03	psia	eq 1-25	Reference 9 (Section 7.1.3.1)
vapor pressure at the averge daily min liq surface temp	P_{VN}	5.80E-03	psia	eq 1-25	Reference 9 (Section 7.1.3.1)
atmospheric pressure	P_A	14.605	psia		Reference 7
Expansion Factor	K_E	5.59E-02	per day	eq 1-5	Reference 9 (Section 7.1.3.1)

Vapor space Saturation Factor K_S					
Vented Vapor Saturation Factor	K_S	9.99E-01	dimensionless	eq 1-21	Reference 9 (Section 7.1.3.1)

Standing Loss	L_S				
Standing Loss=$365*V_V*W_V*K_E*K_S$	L_S	4.73E-01	lb/yr	eq 1-2	Reference 9 (Section 7.1.3.1)

Working Loss=	L_W				
working loss product factor	K_P	1	dimensionless	K_P = 0.75 for crude oil, otherwise = 1	Reference 9 (Section 7.1.3.1.2)
working loss turnover (saturation) factor	K_N	1	dimensionless	for turnovers ≤36, K_N =1. If >, K_N=(180+N)/6N	Reference 9 (Section 7.1.3.1.2)
max liquid height	H_{LX}	4.186	ft	eq 1-37	Reference 9 (Section 7.1.3.1.2)
min liquid height	H_{LN}	0	ft	eq 1-37	Reference 9 (Section 7.1.3.1.2)
annual sum of the increases in liquid level	ΣH_{OI}	16.092	ft/yr	eq 1-37	Reference 9 (Section 7.1.3.1.2)
number of turnovers per year	N	3.844	dimensionless	eq 1-36	Reference 9 (Section 7.1.3.1.2)
net working loss throughput	V_Q	1029.254	ft^3/yr	eq 1-39	Reference 9 (Section 7.1.3.1.2)
vent setting correction factor	K_B	1	dimensionless	for vent setting +/- .03 psia, K_B=1	Reference 9 (Section 7.1.3.1.2)
Working Loss=$V_Q*K_N*K_P*W_V*K_B$	L_W	1.78E-01	lb/yr	eq 1-35	Reference 9 (Section 7.1.3.1.2)

Total Loss	L_T				
Total Loss (VOCs)= $L_S + L_W$	L_T	6.52E-01	lb/yr	eq 1-1	Reference 9 (Section 7.1.3.1)
Total Loss (VOCs)	L_T	5.43E-02	lb/month	yr= 12 months	Standard Conversion
Total Loss (VOCs)	L_T	7.44E-05	lb/hr	1 yr=8760 hrs (NOTE: 500 hrs used for working loss calculation)	Standard Conversion
Total Loss (VOCs)	L_T	3.26E-04	tons/yr	1 ton=2000 lb	Standard Conversion

REFERENCES

1. E-SYD-K-00004 *Surplus Plutonium Disposition System Design Description for Electrical Power and Distribution System, Rev. 0,* March 10, 2020.
2. AP-42, *Compilation of Air Pollutant Emissions Factors Volume 1 Stationary Point and Area Sources, 5th Edition, Ch 3: Stationary Internal Combustion Sources*
3. 40 CFR 1039 Subpart B *Control of Emissions from New and In-use Nonroad Compressions-Ignition Engines,* Table 1 of 1039.101.
4. SRNS-J2210-2013-00008, *Supporting Documentation for Emission Factors and Trace Determination for Stationary, Non-Emergency, Internal Combustion Engines Less Than or Equal to 600HP That Utilize Ultra Low Sulfur Diesel Fuel,* November 5, 2013.
5. E-SPP-K-00052, *Diesel Generator for the SPD Project (U), Rev. C.*
6. E-DSRS-K-00001, *Surplus Plutonium Disposition Y744 Design Safety Requirement Specification for Diesel Generator, Rev. A,* June 8, 2020.
7. SRNL-RP-2019-00371, *Savannah River Site Annual Meteorology Report for 2018,* June 5, 2019.
8. G-SOW-K-00039, *Surplus Plutonium Disposition Project Statement of Work K-Area, Rev. 1,* October 3, 2019.
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ATTACHMENTS

1. Wolfe, K. "FW: Question on construction permit application for Surplus Plutonium Disposition Project at Savannah River Site" Received by S. Yazzie, et al, July 23, 2020.
2. "UL 142 Double Walled Horizontal Tanks," *Stanwade Metal Products Inc,* https://www.weather.gov/epz/wxcalc_vaporpressure . Accessed 07/23/2020.

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Evaluation of Radionuclide Emissions from the Surplus Plutonium Disposition Project using 40 CFR 61 Appendix D Methodology

SRNS-RP-2019-00152

Revision 0

July 21, 2020

Stephanie D. Yazzie

Environmental Compliance Authority

SAVANNAH RIVER SITE • AIKEN, SOUTH CAROLINA

Prepared by: STEPHANIE YAZZIE (Affiliate) Digitally signed by STEPHANIE YAZZIE (Affiliate) Date: 2020.07.21 16:53:45 -04'00'

Stephanie D. Yazzie **Date**

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Reviewed by:

7/22/2020

Brent Blunt **Date**

Advisory Engineer

Concurrence:

Jared R Wicker 7-28-2020

Jared Wicker **Date**

Environmental Compliance & Area Completion Projects

RadNESHAP Coordinator

INTRODUCTION

The mission of the Surplus Plutonium Disposition (SPD) Project is to expedite removal of plutonium from the State of South Carolina by expanding the SRS capability to disposition surplus weapons-grade plutonium via the Dilute and Dispose approach. To reduce the attractiveness level and the required safeguards and security measures, the material will be mixed ("downblended") with an adulterant prior to disposition at the Waste Isolation Pilot Plant (WIPP). This project is documented in the NEPA Environmental Checklist # OBU-K-2017-0089.

The project will cover four (4) primary activities:

- Unpackage Plutonium Oxide
- Dry blend with an adulterant
- Perform Non-Destructive Analysis (NDA) and Packaging
- Staging Diluted Plutonium

The proposed SPD Area is in the existing K-Area Complex footprint and will include a Dilute Process Area (DPA), West and East Staging Areas, System Support Areas, new HEPA Filter and Fan Building, a Diesel Generator Enclosure and two exhaust stacks.

This evaluation considers the radionuclide emissions and its effective dose equivalent to members of the public in accordance with 40 CFR 61 Subpart H *National Emissions Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities* ("radNESHAPs") using Appendix D methodology.

THE PROCESS

Downblend activities will be conducted in the DPA within three (3) gloveboxes. Feed cans containing Plutonium oxide ("feed material") are unpackaged from shipping containers. They enter the gloveboxes through an airlock. The feed cans are opened. Some preparation may be required to size reduce the feed material to fit a #10 sieve prior to blending. A prescribed amount of feed material is added to a blend can that is preloaded with a prescribed amount of adulterant. The preferred mechanism for loading the blend can from the feed can is a shielded hopper system. The blend can is weighed, closed, mixed, and then weighed again. The blend can is then placed in a shield can for worker dose protection. The final blend/shield can is bagged from the glovebox into a sealed plastic bag via an airlock.

EXHAUST DESCRIPTION

Two stacks will be constructed for the SPD project. Glovebox emissions will route through a roughing filter integrated into each glovebox, then a HEPA filter bank and will exhaust through a dedicated stack ("low flow stack") that extends 37m (124 ft) above grade. The remaining DPA exhaust will route through separate HEPA filter banks and exits through another stack that extends 31m (102ft) above grade. These stack height determinations were made using EPA's *Guideline for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations)* EPA-450/4-80-023R, June 1985.

40 CFR 61 SUBPART H, APPENDIX D EVALUATION

Both stacks will be evaluated to determine the Potential Impact Category (PIC) levels which set forth the sampling and monitoring requirements for each.

I. Glovebox "low flow" Stack Evaluation

A. Source Term

The project will operate three (3) gloveboxes to process a total 1.91 MT (1.91E+06 g) per year of Pu Oxides (Reference 1).

Proposed, maximum, minimum and average Pu isotopic distributions were reviewed (Reference 2). For conservatism, maximum values for each were selected. The isotopic distributions for the Pu oxides are applied to 1.91E+06 grams to generate the maximum amount of oxide processed annually in grams.

The maximum amount of Pu oxide per year is calculated as follows:
= (Oxide %÷100) * 1.91E+06 grams

EXAMPLE:
Maximum amount of $^{238}PuO_2$ per yr
= (1.00E-02 ÷ 100) * 1.91E+06 g = 1.91E+02 g/yr

The distributions for the remaining oxides (U, Am, Np) are relative to the mass of the total Pu Oxide (Reference 2). Because the maximum potential concentrations of Pu isotopes are used, the total Pu oxides in this calculation is >1.91E+06 g, which further demonstrates conservativism.

The maximum amount of other oxides is calculated as follows:
= (Oxide %÷100) * sum of maximum Pu oxides per year (g)

EXAMPLE:
Maximum amount of $^{235}UO_2$
= (1.69E-01 ÷ 100) * (1.92E+06 g of Pu Oxides) = 3.25E+03 g

Because the Pu is presented in the oxide form, a mass fraction is calculated for each Pu isotope.

The mass fraction (dimensionless) is calculated as follows:

= atomic weight of the radionuclide ÷ molecular weight of the oxide

EXAMPLE:
Mass Fraction of $^{238}PuO_2$
= 238 ÷ (238+(2*15.9994)) = 8.81E-01

The mass fraction is applied to the maximum oxide per year to determine the maximum amount of radionuclide per year.

The maximum amount of radionuclide per year is calculated as follows:
= mass fraction of the radionuclide (dimensionless) * maximum oxide per year (g)

EXAMPLE:
Maximum amount of ^{238}Pu per year
= 8.81E-01 * 1.91E+02 g/yr = 1.68E+02 g/yr

The activity is calculated as follows:

Activity of radionuclide (Curies) per year
= Max radionuclide (g) per year * Specific Activity (Ci/g)

EXAMPLE:
Curies of ^{238}Pu per year
= (1.68E+02 g/yr) * (1.7109E+01 Ci/g) = 2.88E+03 Ci/yr

Oxide[Ref 2]	Source Term @ 1.91MT/yr[Ref 1]								
	Bounding Composition[Ref 2] (%/100)	Total Oxide Throughput[Ref 1] (g)	Max Oxide per year (g)	Atomic Weight of Radionuclide	Compound Molecular Weight in Oxide Form	Mass Fraction	Max Radionuclide per Year (g)	Specific Activity[Ref 3] (Ci/g)	Source Term (Ci/yr)
$^{238}PuO_2$	1.0000E-04	1.9100E+06	1.91E+02	238	269.9988	8.81E-01	1.68E+02	1.7109E+01	2.88E+03
$^{239}PuO_2$	9.4465E-01	1.9100E+06	1.80E+06	239	270.9988	8.82E-01	1.59E+06	6.2015E-02	9.87E+04
$^{240}PuO_2$	5.9910E-02	1.9100E+06	1.14E+05	240	271.9988	8.82E-01	1.01E+05	2.2704E-01	2.29E+04
$^{241}PuO_2$	8.2000E-04	1.9100E+06	1.57E+03	241	272.9988	8.83E-01	1.38E+03	1.0354E+02	1.43E+05
$^{242}PuO_2$	3.1000E-04	1.9100E+06	5.92E+02	242	273.9988	8.83E-01	5.23E+02	3.9498E-03	2.07E+00
SUBTOTAL Pu Oxides	**1.0058E+00**		**1.92E+06**				**1.69E+06**		
^{235}U	1.6900E-03						3.25E+03	2.1621E-06	7.02E-03
^{241}Am	5.6400E-03						1.08E+04	3.4161E+00	3.70E+04
^{237}Np	1.3500E-03						2.59E+03	7.0299E-04	1.82E+00
SUBTOTAL Rad Impurities	**8.6800E-03**						**1.67E+04**		
TOTAL	**1.0145E+00**						**1.71E+06**		

B. Adjusted Source Term

The source term is adjusted using a physical state factor applicable to liquids/particulate solids. The gloveboxes exhaust through a roughing filter integral to the glovebox and then to a series of HEPA filters. Therefore, control factors for fabric (1.00E-01) and HEPA (1.00E-02) filters are applied (Reference 4).

The adjusted source term is calculated as follows:

Adjusted source term (Curies per year) per radionuclide
= Source term (Ci/year) * Physical State Factor (1.00E-03) * Control Factor (1.00E-01) * Control Factor (1.00E-02)

EXAMPLE:
Adjusted source term for ^{238}Pu in Curies per year
= (2.88E+03 Ci/yr) * (1.00E-03) * (1.00E-01) * (1.00E-02) = 2.88E-03 Ci/yr

Radionuclide	Source Term (Ci/yr)	Adjusted Source Term			
		Physical State Factor (1E-03)[Ref 4]	Control Factor[Ref 4] Fabric Roughing Filter	Control Factor[Ref 4] HEPA	Adjusted Source Term (Ci/yr)
^{238}Pu	2.88E+03	1.00E-03	1.00E-01	1.00E-02	2.88E-03
^{239}Pu	9.87E+04	1.00E-03	1.00E-01	1.00E-02	9.87E-02
^{240}Pu	2.29E+04	1.00E-03	1.00E-01	1.00E-02	2.29E-02
^{241}Pu	1.43E+05	1.00E-03	1.00E-01	1.00E-02	1.43E-01
^{242}Pu	2.07E+00	1.00E-03	1.00E-01	1.00E-02	2.07E-06
^{235}U	7.02E-03	1.00E-03	1.00E-01	1.00E-02	7.02E-09
^{241}Am	3.70E+04	1.00E-03	1.00E-01	1.00E-02	3.70E-02
^{237}Np	1.82E+00	1.00E-03	1.00E-01	1.00E-02	1.82E-06

C. Dose Estimates

1. The Effective Dose Equivalent (EDE) is calculated by applying area-specific dose release factors (Reference 5) to each radionuclide at the proposed stack height. The total EDE is found by summation.

EDE is calculated as follows:

EDE (mrem per year)
= Adjusted Source Term (Ci/yr) * Dose Release Factor (mrem/Ci)

EXAMPLE:
EDE for ^{238}Pu in mrem per year
= (2.88E-03 Ci/yr) * (1.18E+00 mrem/Ci) = 3.40E-03 mrem/yr

Radionuclide	Adjusted Source Term (Ci/yr)	Dose Estimate	
		Dose Release Factors[Ref 5] (mrem/Ci)	EDE (mrem/yr)
^{238}Pu	2.88E-03	1.18E+00	3.40E-03
^{239}Pu	9.87E-02	1.29E+00	1.27E-01
^{240}Pu	2.29E-02	1.29E+00	2.96E-02
^{241}Pu	1.43E-01	2.36E-02	3.38E-03
^{242}Pu	2.07E-06	1.22E+00	2.52E-06
^{235}U	7.02E-09	1.39E-01	9.76E-10
^{241}Am	3.70E-02	1.07E+00	3.96E-02
^{237}Np	1.82E-06	6.89E-01	1.26E-06
		TOTAL	2.03E-01

2. The Potential Effective Dose Equivalent (PEDE) is calculated by applying area-specific dose release factors to each radionuclide at the proposed stack height but assumes an uncontrolled release (i.e. no control devices/no control factor). The total PEDE is found by summation.

PEDE is calculated as follows:

PEDE (mrem per year)
= Adjusted Source Term without Control Factors (Ci/yr) * Dose Release Factor (mrem/Ci)

EXAMPLE:
PEDE for ^{238}Pu in mrem per year
= (2.88E+00 Ci/yr) * (1.18E+00 mrem/Ci) = 3.40E+00 mrem/yr

Radionuclide	Source Term (Ci/yr)	Adjusted Source Term		Dose Estimate	
		Physical State Factor (1E-03)[Ref 4]	Adjusted Source Term (Ci/yr)	Dose Release Factors[Ref 5] (mrem/Ci)	PEDE (mrem/yr)
^{238}Pu	2.88E+03	1.00E-03	2.88E+00	1.18E+00	3.40E+00
^{239}Pu	9.87E+04	1.00E-03	9.87E+01	1.29E+00	1.27E+02
^{240}Pu	2.29E+04	1.00E-03	2.29E+01	1.29E+00	2.96E+01
^{241}Pu	1.43E+05	1.00E-03	1.43E+02	2.36E-02	3.38E+00
^{242}Pu	2.07E+00	1.00E-03	2.07E-03	1.22E+00	2.52E-03
^{235}U	7.02E-03	1.00E-03	7.02E-06	1.39E-01	9.76E-07
^{241}Am	3.70E+04	1.00E-03	3.70E+01	1.07E+00	3.96E+01
^{237}Np	1.82E+00	1.00E-03	1.82E-03	6.89E-01	1.26E-03
				TOTAL	2.03E+02

D. Glovebox ("low flow") stack PIC Determination

Sources of radionuclide emissions with a PEDE > 1.00E-1 mrem/yr and an EDE >1.00E-02 mrem/yr are considered PIC 1 and require "continuous sampling to include real-time monitoring and alarm" (Reference 6). **Therefore, the glovebox stack (PEDE 2.03+02 mrem/yr and EDE 2.03E-01 mrem/yr) will operate as a PIC 1.**

II. Dilute Process Area (DPA) Stack

A. Source Term

The DPA Stack exhausts HEPA-filtered air from the secondary and tertiary confinement zones of the Dilute Process Area. Primary confinement is within the glovebox box which exhaust via the low-flow stack. Feed cans of Pu oxide are not open in either the secondary or tertiary confinement zones. The feed cans of Pu oxides are only opened once inside a glovebox. The 2˚ and 3˚ zones are not expected to have contamination under normal conditions but will be managed as radiological areas. The highest radiological contamination limit posting expected in the DPA 2/3˚zones is in the glovebox rooms which will be maintained as Contamination Area/Airborne Radioactivity Areas (CA/RA) at 2000 dpm/100 cm^2 alpha and 100000 dpm/100 cm^2 beta-gamma (Attachment 1). For the purpose of the evaluation, alpha is designated at Pu-239 and beta-gamma is Sr-90 (Reference 4).

The DPA stack has a designed flow rate of 9300 cfm (Reference 7). It is converted to an annual stack flow.

Stack Flow[Ref 7]	unit conversion	stack flow	unit conversion	unit conversion	Annual Stack Flow
ft^3/min	ft^3 to m^3	m^3/min	min to hour	hour to year	m^3/yr
9.30E+03	2.83E-02	2.63E+02	6.00E+01	8.76E+03	1.38E+08

Smear data is converted to surface contamination (SC) with the following calculation:
SC
= Smear data (dpm/100 cm^2) * (Ci/2.22E+12) * (100^2 cm^2/m^2)

Radionuclide[Ref 4]	Expected Radiological Postings for 2˚ Confinement Areas[Att 1]		Unit Conversion	Unit Conversion	Surface Contamination
	dpm	1/100 cm^2	Ci/dpm	cm^2/m^2	Ci/m^2
α (Pu-239)	2000	0.01	4.50E-13	1.00E+04	9.01E-08
βγ(Sr-90)	100000	0.01	4.50E-13	1.00E+04	4.50E-06

To generate the source term, a resuspension factor (RF) of 1.00E-06 m^{-1} is applied to account for the ratio of radionuclide concentration in the facility air to the radionuclide concentration on the facility surface (Reference 8).

Radionuclide[Ref 4]	Surface Contamination	Resuspension Factor[Ref 8]	Annual Air Flow	Source Term
	Ci/m^2	m^{-1}	m^3/yr	Ci/yr
α (Pu-239)	9.01E-08	1.00E-06	1.38E+08	1.25E-05
βγ(Sr-90)	4.50E-06	1.00E-06	1.38E+08	6.23E-04

B. Adjusted Source Term

The source term is adjusted to credit for control by HEPA (1.00E-02) filtration; a factor of 1.00E-02 is applied (Reference 4).

The adjusted source term is calculated as follows:

Adjusted source term (Curies per year)
= Source term (Ci/year) * Control Factor (1.00E-02)

Radionuclide[Ref 4]	Source Term	Control Factor HEPA[Ref 4]	Adjusted Source Term
	Ci/yr		Ci/yr
α (Pu-239)	1.25E-05	1.00E-02	1.25E-07
βγ(Sr-90)	6.23E-04	1.00E-02	6.23E-06

C. Dose Estimates

1. The Effective Dose Equivalent (EDE) is calculated by applying area-specific dose release factors (Reference 5) to each radionuclide at the proposed stack height. The total EDE is found by summation.

EDE is calculated as follows:

EDE (mrem per year)
= Adjusted Source Term (Ci/yr) * Dose Release Factor (mrem/Ci)

Radionuclide[Ref 4]	Adjusted Source Term	Dose Release Factors[Ref 5]	EDE
	Ci/yr	mrem/Ci	mrem/yr
α (Pu-239)	1.25E-07	1.42E+00	1.77E-07
βγ(Sr-90)	6.23E-06	3.03E-01	1.89E-06
		Subtotal	**2.07E-06**

2. The Potential Effective Dose Equivalent (PEDE) is calculated by applying area-specific dose release factors to each radionuclide at the proposed stack height but assumes an uncontrolled release (i.e. no control devices/no control factor). The total PEDE is found by summation.

Radionuclide[Ref 4]	Source Term	Dose Release Factors[Ref 5]	PEDE
	Ci/yr	mrem/Ci	mrem/yr
α (Pu-239)	1.25E-05	1.42E+00	1.77E-05
βγ(Sr-90)	6.23E-04	3.03E-01	1.89E-04
		Subtotal	**2.07E-04**

D. DPA stack PIC Determination

Sources of radionuclide emissions with a PEDE ≤ 1.00E-1 mrem/yr and an EDE ≤1.00E-05 mrem/yr are considered PIC 4 sources and require "an annual administrative review of facility to confirm the absence of radioactive materials in forms and quantities not conforming to prescribed specifications and/or limits" (Reference 6). **Therefore, the DPA stack (PEDE 2.07E-04 mrem/yr and EDE 2.07E-06 mrem/yr) will operate as a PIC 4.**

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1. M-SYD-K-00039 *Surplus Plutonium Disposition System Design Description for Balance of Plant, Rev. 3,* July 2020.
2. SRNS-TR-2016-00315 *Plutonium Oxide Characterization for Use in Radiation Dose Assessments: Surplus Plutonium Disposition Program Dilute and Dispose Approach, Rev. 0,* November 18, 2016.
3. SRR-CWDA-2018-00018 *Database Compilation of Radionuclides Standardized with Half-life in Seconds and Specific Activity, Ci/g, Rev. 0,* April 17, 2018.
4. SRNS-IM-2016-00020 *Radiological NESHAP Evaluation Implementation Manual for Unmonitored Emissions,* April 2016.
5. SRNL-L3200-2020-00069 *NESHAP Area Specific Dose-release Factors for Revised K-Area Stack Heights, Rev. 0,* June 26, 2020.
6. WSRC-IM-2002-00014 *SRS Air Emissions Monitoring Graded Approach, Rev. 18,* May 4, 2020.
7. M-CLC-K-00826, *Surplus Plutonium Disposition Project Dilute Process Area Exhaust Stack, Rev. 0,* June, 2020.
8. WSRC-TR-95-0378, *Determining Radionuclide Emissions from Unmonitored Sources, Rev. 1,* July 14, 1999.

ATTACHMENT

1. Entzminger, R. "RE: DPA room exhaust question" Received by R. Peele & S. Yazzie, May 9, 2019.

From: Robert Entzminger
To: Rusty Peel
Cc: Stephanie Yazzie
Subject: RE: DPA room exhaust question
Date: Thursday, May 9, 2019 7:51:52 AM

Rusty,
No problem, I just don't have all the terminology down yet.

Stephanie,
We anticipate that all areas, except the glovebox rooms and airlocks, will be RBAs only. From a contamination standpoint, these RBAs are maintained at <20 dpm alpha/100cm2, <200 dpm beta-gamma/100cm2.

The glovebox room airlocks will be maintained as CAs. The airlocks will be kept <200 dpm alpha/100cm2, <1000 dpm beta-gamma/100cm2.

The glovebox rooms will be maintained as CA/ARAs. These rooms are anticipated to be <200 dpm alpha/100cm2, <1000 dpm beta-gamma/100cm2. Based on any events and general processing changes over time, we should anticipate that these rooms could have levels up to the CA limits of 2000 dpm alpha/100cm2, 100,000 dpm beta-gamma/100cm2. If the postings and associated contamination levels in the room increase, this will have to be re-evaluated at that time.

Let me know if I have not made this clear, or if we need to discuss this further.

Thanks,
Robert