



Nuclear Fuel Services, Inc.

Certified Mail
Return Receipt Requested

21G-24-0032
GOV-01-55
ACF-24-0033
February 14, 2024

Director
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Reference: Docket No. 70-143; SNM License 124

Subject: **Biannual Effluent Monitoring Report July to December 2023**

Dear Director:

In accordance with the requirements set forth in 10 CFR Part 70.59, Nuclear Fuel Services, Inc. (NFS), submits the attached reports. Attachment 1 reports the Radioactivity in Effluent Liquid for the period July to December 2023. Attachment 2 reports the Radioactivity in Effluent Air for the period July to December 2023. Attachment 3 summarizes an evaluation of the dose and air activity concentrations for the maximally exposed offsite individual due to gaseous effluents during the period July to December 2023.

If you or your staff have any questions, require additional information, or wish to discuss this, please contact me or Mr. R. Jason Faddis, Deputy Environmental Protection and Industrial Safety Section Manager, at (423) 735-5438. Please reference our unique document identification number (21G-24-0032) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

Tim Knowles
Tim Knowles
Safety & Safeguards Director

NMSS20
1E48
NMSS

CJB/las
Attachments

- 1) Report of Radioactivity in Effluent Liquid for the Period July to December 2023
- 2) Report of Radioactivity in Effluent Air for the Period July to December 2023
- 3) Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period July to December 2023

Copy:

Mr. Joel Rivera-Ortiz
Senior Fuel Facility Inspector
U. S. Nuclear Regulatory Commission
Region II
245 Peachtree Center Ave., NE
Suite 1200
Atlanta, GA 30303-1257

Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
245 Peachtree Center Ave., NE
Suite 1200
Atlanta, GA 30303-1257

Mr. James Downs
Senior Project Manager
Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Two White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Dr. Robert Williams
Chief, Projects Branch 1
U. S. Nuclear Regulatory Commission
Region II
245 Peachtree Center Ave., NE
Suite 1200
Atlanta, GA 30303-1257

Mr. Larry Harris
Senior Resident Inspector
U. S. Nuclear Regulatory Commission

**Attachment 1
To Letter Dated February 14, 2024**

**Report of Radioactivity in Effluent Liquid for the Period
July to December 2023**

(2 Pages to Follow)

Radioactivity in Effluent Liquid July 1, 2023 to December 31, 2023

Location	Total Volume (l)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Banner Spring Down							
Pu-238	393,789,000	2.45E-13	1.02E-10	2.43E-10	9.66E-08	5.65E-09	1.23E-05
Pu-239/240	393,789,000	0.00E+00	1.31E-10	2.89E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	393,789,000	0.00E+00	3.59E-08	6.27E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	393,789,000	0.00E+00	1.54E-10	3.55E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	393,789,000	4.25E-11	1.79E-10	3.64E-10	1.67E-05	8.28E-04	4.25E-04
Th-232	393,789,000	1.64E-11	1.29E-10	2.55E-10	6.47E-06	5.94E+01	5.48E-04
U-233/234	393,789,000	4.76E-10	3.09E-10	3.43E-10	1.88E-04	3.01E-02	1.59E-03
U-235/236	393,789,000	4.68E-11	1.53E-10	2.41E-10	1.84E-05	8.53E+00	1.56E-04
U-238	393,789,000	5.56E-11	1.44E-10	2.48E-10	2.19E-05	6.54E+01	1.85E-04
						Total:	2.91E-03
Sewer							
Pu-238	22,383,314	1.29E-11	1.26E-10	2.59E-10	2.89E-07	1.69E-08	6.45E-05
Pu-239/240	22,383,314	3.46E-12	9.99E-11	2.16E-10	7.73E-08	1.24E-06	1.73E-05
Tc-99	22,383,314	7.55E-10	3.88E-08	6.72E-08	1.69E-05	1.00E-03	1.26E-06
Th-228	22,383,314	4.52E-11	1.90E-10	3.73E-10	1.01E-06	1.23E-09	2.26E-05
Th-230	22,383,314	6.08E-11	2.02E-10	3.87E-10	1.36E-06	6.74E-05	6.08E-05
Th-232	22,383,314	2.51E-12	1.18E-10	2.43E-10	5.61E-08	5.15E-01	8.35E-06
U-232	22,383,314	0.00E+00	1.47E-10	3.56E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	22,383,314	6.67E-09	8.23E-10	2.26E-10	1.49E-04	2.39E-02	2.22E-03
U-235/236	22,383,314	3.09E-10	1.91E-10	1.51E-10	6.93E-06	3.21E+00	1.03E-04
U-238	22,383,314	7.42E-10	2.75E-10	1.44E-10	1.66E-05	4.96E+01	2.47E-04
						Total:	2.75E-03
West Ditch							
Pu-238	144,342,000	3.18E-11	1.03E-10	2.16E-10	4.59E-06	2.68E-07	1.59E-03
Pu-239/240	144,342,000	0.00E+00	1.05E-10	2.58E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	144,342,000	2.07E-09	3.50E-08	6.06E-08	2.99E-04	1.77E-02	3.45E-05
Th-228	144,342,000	4.62E-12	1.44E-10	3.27E-10	6.67E-07	8.15E-10	2.31E-05
Th-230	144,342,000	5.45E-11	1.61E-10	3.05E-10	7.86E-06	3.89E-04	5.45E-04
Th-232	144,342,000	0.00E+00	9.42E-11	2.12E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	144,342,000	1.52E-08	1.56E-09	3.48E-10	2.19E-03	3.51E-01	5.06E-02
U-235/236	144,342,000	6.06E-10	3.65E-10	2.33E-10	8.75E-05	4.05E+01	2.02E-03
U-238	144,342,000	1.15E-09	4.31E-10	2.54E-10	1.66E-04	4.96E+02	3.83E-03
						Total:	5.86E-02
WWTF							
Am-241	3,395,574	2.38E-11	5.77E-11	1.12E-10	8.07E-08	2.35E-08	1.19E-03
Cs-137	3,395,574	0.00E+00	1.82E-09	1.85E-09	0.00E+00	0.00E+00	0.00E+00
Na-22	3,395,574	2.00E-11	8.75E-10	1.59E-09	6.79E-08	1.09E-11	3.33E-06
Np-237	3,395,574	5.20E-11	2.54E-10	4.81E-10	1.76E-07	2.51E-04	2.60E-03
Pb-212	3,395,574	1.93E-09	3.59E-09	2.94E-09	6.56E-06	4.74E-12	9.66E-04
Pu-238	3,395,574	1.18E-11	6.23E-11	1.20E-10	4.01E-08	2.34E-09	5.90E-04

¹ ECV Effluent Concentration Value from 10-CFR-20, Appendix B
 Note: A value of "0" was substituted for negative analytical results.

Radioactivity in Effluent Liquid July 1, 2023 to December 31, 2023

Location	Total Volume (l)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
WWTF							
Pu-239/240	3,395,574	3.14E-12	5.69E-11	1.23E-10	1.07E-08	1.72E-07	1.57E-04
Pu-241	3,395,574	0.00E+00	1.19E-08	2.07E-08	0.00E+00	0.00E+00	0.00E+00
Ra-224	3,395,574	1.46E-08	9.21E-09	1.73E-08	4.97E-05	3.13E-10	7.32E-02
Tc-99	3,395,574	2.15E-09	3.79E-08	6.56E-08	7.30E-06	4.32E-04	3.58E-05
Th-228	3,395,574	0.00E+00	1.12E-10	3.00E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	3,395,574	1.03E-10	1.89E-10	3.22E-10	3.51E-07	1.74E-05	1.03E-03
Th-231	3,395,574	8.42E-09	4.76E-08	4.93E-08	2.86E-05	5.37E-11	1.68E-04
Th-232	3,395,574	3.20E-12	9.78E-11	2.11E-10	1.09E-08	9.98E-02	1.07E-04
U-232	3,395,574	0.00E+00	1.12E-10	2.64E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	3,395,574	7.87E-09	6.95E-10	1.36E-10	2.67E-05	4.28E-03	2.62E-02
U-235/236	3,395,574	3.62E-10	1.58E-10	1.17E-10	1.23E-06	5.68E-01	1.21E-03
U-238	3,395,574	6.11E-11	7.66E-11	1.02E-10	2.07E-07	6.19E-01	2.04E-04
						Total:	1.08E-01

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B.
 Note: A value of "0" was substituted for negative analytical results.

**Attachment 2
To Letter Dated February 14, 2024**

**Report of Radioactivity in Effluent Air for the Period
July to December 2023**

(3 Pages to Follow)

**Radioactivity in Effluent Air
 July 1, 2023 to December 31, 2023**

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Main Stack 416		1013.64 m³/min		16.89 m³/sec			
Th-228	265,683,538	1.09E-15	1.84E-16	7.86E-17	2.91E-07	3.55E-10	5.47E-02
Th-230	265,683,538	1.09E-15	1.84E-16	7.86E-17	2.91E-07	1.44E-05	5.47E-02
Th-232	265,683,538	8.21E-16	1.38E-16	5.89E-17	2.18E-07	2.00E+00	2.05E-01
U-234	265,683,538	2.58E-13	4.34E-14	1.85E-14	6.86E-05	1.10E-02	5.16E+00
U-235	265,683,538	9.85E-15	1.66E-15	7.07E-16	2.62E-06	1.21E+00	1.64E-01
U-238	265,683,538	2.74E-15	4.60E-16	1.96E-16	7.27E-07	2.17E+00	4.56E-02
						Total:	5.69E+00
Stack 234 Bldg. 234		315.90 m³/min		5.27 m³/sec			
Am-241	83,246,700	4.65E-17	2.83E-17	4.25E-17	3.87E-09	1.13E-09	2.32E-03
Pu-238	83,246,700	5.68E-17	3.46E-17	5.19E-17	4.73E-09	2.77E-10	2.84E-03
Pu-239/240	83,246,700	2.01E-16	1.23E-16	1.84E-16	1.68E-08	2.70E-07	1.01E-02
Pu-241	83,246,700	9.59E-15	3.59E-15	4.62E-15	7.98E-07	7.75E-09	1.20E-02
Th-228	83,246,700	3.10E-17	1.89E-17	2.83E-17	2.58E-09	3.15E-12	1.55E-03
Th-230	83,246,700	3.87E-16	2.36E-16	3.54E-16	3.22E-08	1.60E-06	1.94E-02
Th-232	83,246,700	4.91E-16	2.98E-16	4.48E-16	4.08E-08	3.75E-01	1.23E-01
U-234	83,246,700	1.06E-15	6.44E-16	9.67E-16	8.81E-08	1.41E-05	2.12E-02
U-238	83,246,700	3.10E-16	1.89E-16	2.83E-16	2.58E-08	7.70E-02	5.16E-03
						Total:	1.97E-01
Stack 327 Bldg. 330		974.04 m³/min		16.23 m³/sec			
Pu-241	255,277,191	2.89E-15	4.17E-16	4.99E-16	7.37E-07	7.16E-09	3.61E-03
Tc-99	255,277,191	9.34E-14	1.35E-14	1.61E-14	2.38E-05	1.41E-03	1.04E-04
U-234	255,277,191	5.79E-14	9.77E-15	8.42E-15	1.48E-05	2.37E-03	1.16E+00
U-235	255,277,191	1.79E-15	3.02E-16	2.60E-16	4.57E-07	2.12E-01	2.99E-02
						Total:	1.19E+00
Stack 421 Bldg. 100		35.68 m³/min		0.59 m³/sec			
Pu-241	9,345,920	6.98E-15	1.22E-15	1.30E-15	6.52E-08	6.33E-10	8.72E-03
Tc-99	9,345,920	2.26E-13	3.96E-14	4.21E-14	2.11E-06	1.25E-04	2.51E-04
U-234	9,345,920	2.88E-14	1.66E-14	2.27E-14	2.69E-07	4.31E-05	5.76E-01
U-235	9,345,920	8.91E-16	5.14E-16	7.01E-16	8.33E-09	3.86E-03	1.49E-02
						Total:	6.00E-01
Stack 424 Bldg. 100		34.38 m³/min		0.57 m³/sec			
Pu-241	9,006,009	2.45E-15	9.11E-16	9.57E-16	2.20E-08	2.14E-10	3.06E-03
Tc-99	9,006,009	7.91E-14	2.94E-14	3.09E-14	7.12E-07	4.21E-05	8.79E-05
U-234	9,006,009	2.00E-14	1.16E-14	1.76E-14	1.80E-07	2.89E-05	4.00E-01
U-235	9,006,009	6.18E-16	3.58E-16	5.46E-16	5.57E-09	2.58E-03	1.03E-02
						Total:	4.13E-01
Stack 573 Bldg 306-W		114.37 m³/min		1.91 m³/sec			
Pu-241	29,974,550	1.27E-15	7.31E-16	1.01E-15	3.82E-08	3.71E-10	1.59E-03
Tc-99	29,974,550	4.12E-14	2.37E-14	3.25E-14	1.23E-06	7.30E-05	4.58E-05

¹ ECV, Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "0" was substituted for negative analytical results.

Radioactivity in Effluent Air July 1, 2023 to December 31, 2023

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Stack 573 Bldg 306-W		114.37 m³/min		1.91 m³/sec			
U-234	29,974,550	1.35E-15	7.12E-15	1.79E-14	4.04E-08	6.47E-06	2.70E-02
U-235	29,974,550	4.17E-17	2.20E-16	5.53E-16	1.25E-09	5.78E-04	6.95E-04
						Total:	2.93E-02
Stack 600 Bldg. 110		295.54 m³/min		4.93 m³/sec			
Pu-241	77,455,900	3.39E-15	5.76E-16	6.62E-16	2.63E-07	2.55E-09	4.24E-03
Tc-99	77,455,900	1.10E-13	1.86E-14	2.14E-14	8.50E-06	5.03E-04	1.22E-04
U-234	77,455,900	1.26E-13	1.19E-14	1.18E-14	9.79E-06	1.57E-03	2.53E+00
U-235	77,455,900	3.91E-15	3.68E-16	3.66E-16	3.03E-07	1.40E-01	6.51E-02
						Total:	2.60E+00
Stack 615 Bldg. 306-W		48.03 m³/min		0.80 m³/sec			
Pu-241	12,586,491	1.29E-15	7.26E-16	9.50E-16	1.63E-08	1.58E-10	1.62E-03
Tc-99	12,586,491	4.18E-14	2.35E-14	3.07E-14	5.27E-07	3.12E-05	4.65E-05
U-234	12,586,491	1.67E-15	7.29E-15	1.75E-14	2.10E-08	3.36E-06	3.33E-02
U-235	12,586,491	5.15E-17	2.26E-16	5.42E-16	6.48E-10	3.00E-04	8.59E-04
						Total:	3.58E-02
Stack 646 Bldg. 110		33.30 m³/min		0.56 m³/sec			
Pu-241	8,727,425	1.46E-15	7.60E-16	9.60E-16	1.28E-08	1.24E-10	1.83E-03
Tc-99	8,727,425	4.73E-14	2.46E-14	3.10E-14	4.13E-07	2.44E-05	5.26E-05
U-234	8,727,425	2.25E-15	7.68E-15	1.75E-14	1.96E-08	3.14E-06	4.49E-02
U-235	8,727,425	6.94E-17	2.37E-16	5.43E-16	6.06E-10	2.81E-04	1.16E-03
						Total:	4.79E-02
Stack 701 Bldg. 307		130.71 m³/min		2.18 m³/sec			
Pu-241	34,256,629	1.52E-15	8.35E-16	1.09E-15	5.21E-08	5.06E-10	1.90E-03
Tc-99	34,256,629	4.92E-14	2.70E-14	3.53E-14	1.68E-06	9.97E-05	5.47E-05
U-234	34,256,629	3.90E-15	9.27E-15	2.00E-14	1.34E-07	2.14E-05	7.80E-02
U-235	34,256,629	1.21E-16	2.87E-16	6.19E-16	4.13E-09	1.91E-03	2.01E-03
						Total:	8.19E-02
Stack 702 Bldg. 307		153.00 m³/min		2.55 m³/sec			
Pu-241	40,097,176	1.62E-15	7.77E-16	9.51E-16	6.51E-08	6.32E-10	2.03E-03
Tc-99	40,097,176	5.25E-14	2.51E-14	3.07E-14	2.11E-06	1.25E-04	5.83E-05
U-234	40,097,176	1.46E-14	1.05E-14	1.75E-14	5.84E-07	9.36E-05	2.91E-01
U-235	40,097,176	4.50E-16	3.24E-16	5.42E-16	1.81E-08	8.36E-03	7.51E-03
						Total:	3.01E-01
Stack 703 Exhaust Room Air		476.58 m³/min		7.94 m³/sec			
Pu-241	125,899,447	4.04E-14	2.43E-14	3.25E-14	5.08E-06	4.93E-08	5.05E-02
Th-228	125,899,447	7.41E-16	9.13E-16	1.83E-15	9.33E-08	1.14E-10	3.70E-02
Th-230	125,899,447	4.27E-16	5.25E-16	1.05E-15	5.37E-08	2.66E-06	2.13E-02
Th-232	125,899,447	6.06E-16	7.47E-16	1.49E-15	7.63E-08	7.00E-01	1.52E-01
U-234	125,899,447	4.64E-15	5.72E-15	1.14E-14	5.84E-07	9.36E-05	9.28E-02

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "*" was substituted for negative analytical results

Radioactivity in Effluent Air July 1, 2023 to December 31, 2023

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Stack 703 Exhaust Room Air		476.58 m³/min		7.94 m³/sec			
U-235	125,899,447	4.79E-16	5.90E-16	1.18E-15	6.03E-08	2.79E-02	7.98E-03
U-238	125,899,447	5.84E-16	7.19E-16	1.44E-15	7.35E-08	2.19E-01	9.73E-03
						Total:	3.71E-01
Stack 773 Bldg. 440		174.69 m³/min		2.91 m³/sec			
Pu-241	45,781,877	5.07E-14	3.04E-14	3.93E-14	2.32E-06	2.26E-08	6.34E-02
Th-228	45,781,877	1.89E-16	1.30E-15	3.16E-15	8.67E-09	1.06E-11	9.47E-03
Th-230	45,781,877	2.44E-16	1.67E-15	4.06E-15	1.12E-08	5.52E-07	1.22E-02
Th-232	45,781,877	1.62E-16	1.11E-15	2.71E-15	7.43E-09	6.82E-02	4.06E-02
U-234	45,781,877	5.01E-16	3.43E-15	8.35E-15	2.29E-08	3.67E-06	1.00E-02
U-235	45,781,877	8.79E-17	6.02E-16	1.47E-15	4.03E-09	1.86E-03	1.47E-03
U-238	45,781,877	1.76E-16	1.20E-15	2.93E-15	8.05E-09	2.40E-02	2.93E-03
						Total:	1.40E-01
Stack 774 Bldg. 301		214.25 m³/min		3.57 m³/sec			
Tc-99	29,000,242	3.49E-13	2.56E-14	2.31E-14	1.01E-05	5.98E-04	3.87E-04
Th-228	29,000,242	1.62E-16	2.81E-16	6.01E-16	4.68E-09	5.72E-12	8.08E-03
Th-230	29,000,242	5.51E-16	9.56E-16	2.05E-15	1.60E-08	7.90E-07	2.75E-02
Th-232	29,000,242	3.26E-16	5.67E-16	1.21E-15	9.47E-09	8.68E-02	8.16E-02
U-234	29,000,242	1.47E-15	2.55E-15	5.47E-15	4.26E-08	6.83E-06	2.94E-02
U-235	29,000,242	9.56E-17	1.66E-16	3.56E-16	2.77E-09	1.28E-03	1.59E-03
U-238	29,000,242	6.92E-16	1.20E-15	2.58E-15	2.01E-08	5.99E-02	1.15E-02
						Total:	1.60E-01
Stack 796 Bldg. 100		16.35 m³/min		0.27 m³/sec			
Pu-241	4,287,257	1.88E-15	8.24E-16	9.52E-16	8.04E-09	7.81E-11	2.34E-03
Tc-99	4,287,257	6.07E-14	2.67E-14	3.08E-14	2.60E-07	1.54E-05	6.74E-05
U-234	4,287,257	3.00E-15	8.16E-15	1.76E-14	1.29E-08	2.06E-06	6.00E-02
U-235	4,287,257	9.28E-17	2.52E-16	5.44E-16	3.98E-10	1.84E-04	1.55E-03
						Total:	6.40E-02

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "0" was substituted for negative analytical results

**Attachment 3
To Letter Dated February 14, 2024**

**Report of Gaseous Effluent Dose and Activity Concentrations
for the Maximally Exposed
Off-Site Individual for the Release Period
July to December 2023**

(4 Pages to Follow)

Report of Potential Gaseous Effluent Dose to the Maximally Exposed Offsite Individual and on the Maximum Radionuclide Concentrations for the Period: July to December 2023

Introduction

During this biannual period, NRC License SNM-124, Section 9.1.1.3, requires NFS to assess the total effective dose equivalent (TEDE) to the maximally exposed offsite receptor and the maximum radioactive air concentrations at the site boundary attributable to NFS' air effluents. The required biannual assessment has been completed and the details of the assessment are provided in the subsequent sections.

Summary of Methods

In accordance with SNM-124, Section 9.1.1.4, and internal procedure NFS-HS-A-27, the U.S. Department of Energy's CAP88-PC computer program was used to estimate off-site doses and activity concentrations for gaseous effluents. NFS operated fifteen (15) radiological stacks during the second half of 2023. Based on effluent types and stack physical characteristics, releases from these stacks were grouped into effective stacks for modeling purposes. To accommodate the co-location limitation of the model, the effective stacks were taken to be at the approximate center of the plant site. The distance to the site boundary (nearest model receptor distance) was conservatively taken to be 150 meters for all sectors.

Meteorological data was based on the average wind speed and direction frequencies from the onsite meteorological tower covering the time period for this report. Atmospheric stability class D (neutral atmosphere) was used for all releases (default value recommended by the U.S. Environmental Protection Agency in "User's Guide for COMPLY"). The most conservative inhalation class was assumed for each radionuclide released. A particle size (activity median aerodynamic diameter or AMAD) of 1.0 micron was assumed for modeling purposes since no information on actual particle sizes exists.

Because CAP88-PC models releases over an entire year, the six-month source term (i.e., total curies of each radionuclide released over the period, given in Attachment 2) was annualized (i.e., transformed into a 12-month release) so that airborne activity concentrations would not be under-estimated during the release period.

Summary of Results

Doses are reported in Table 1 below and are derived from the CAP88-PC "Synopsis Report." These doses are at the location of the maximally exposed (off-site) individual (MEI). The results include an adjustment (using the normalization factor mentioned above) to convert the "annualized" doses back to those doses that were actually received in the six-month release period. Activity concentrations reported in Table 2 come directly from the CAP88-PC "Concentration Tables" report; no adjustments are needed for these concentrations. The CAP88-PC output reports are available for review at NFS.

Table 1 summarizes the six-month dose to a hypothetical individual at the MEI location, which was determined to be approximately 600 meters North-Northeast from the center of the plant site. The TEDE to the MEI was estimated to be 5.2E-03 mrem for gaseous effluents released during the second half of 2023. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 2.3E-02 mrem to the lungs. These MEI doses are well below the Environmental Radiological Monitoring Program action levels and applicable regulatory limits/ALARA constraints.

Table 1. Organ Doses and Total Effective Dose Equivalent at the MEI Location

Organ	Committed Dose Equivalent (mrem per second half of 2023)
Adrenals	3.9E-04
Urinary Bladder Wall	4.8E-04
Bone Surface	1.4E-02
Brain	3.9E-04
Breasts	4.0E-04
Stomach Wall	9.0E-03
Small Intestine	4.4E-04
Upper Large Intestine Wall	2.4E-03
Lower Large Intestine Wall	6.3E-03
Kidneys	4.1E-03
Liver	1.3E-03
Muscle	4.0E-04
Ovaries	4.3E-04
Pancreas	3.8E-04
Red Bone Marrow	1.9E-03
Skin	8.7E-04
Spleen	3.9E-04
Testes	4.5E-04
Thymus	3.9E-04
Thyroid	4.6E-03
Gall Bladder Wall	3.8E-04
Heart Wall	3.9E-04
Uterus	3.9E-04
Extra-thoracic	2.0E-02
Lungs	2.3E-02
Total Effective Dose Equivalent	5.2E-03 mrem
Location of MEI:	600 meters North-Northeast

Table 2 summarizes the maximum radioactive air concentrations at or beyond the site boundary, as determined by CAP88-PC, for the radionuclides released. The total sum of fractions was estimated to be 7.8E-04 and indicates that exposures to the offsite public from gaseous effluents were much less than 1% of the 10 CFR 20, Appendix B, Table 2, Col. 1 values for all offsite receptors including the site boundary. It is noted that the location of the maximum airborne concentration for a given radionuclide does not necessarily correspond to the MEI location. This is due primarily to the fact that the maximum concentrations for individual nuclides can vary due to differences in values input into the dispersion model for each of the effective stacks - such inputs include stack height, stack diameter, flow rate, and total radionuclide activities released per stack. Another reason for the disparity is the fact that the MEI dose includes both inhalation and ingestion pathways.

Table 2. Maximum Predicted Airborne Concentrations at or Beyond the Site Boundary

Maximum Predicted Airborne Concentrations at or Beyond the Site Boundary					
Nuclide	Maximum Concentration (µCi/mL)	Concentration Location		10 CFR 20, App. B, Table 2, Col. 1 Value (µCi/mL)	Ratio of Maximum Concentration to 10 CFR 20 Value
		Sector	Dist. (m)		
⁹⁹ Tc	3.9E-17	NNE	450	9.E-10	4.4E-08
²²⁸ Th	1.5E-19	NNE	600	2.E-14	7.4E-06
²³⁰ Th	1.6E-19	NNE	550	2.E-14	7.9E-06
²³² Th	1.7E-19	NNE	450	4.E-15	4.2E-05
²³⁴ U	3.4E-17	NNE	650	5.E-14	6.9E-04
²³⁵ U	1.2E-18	NNE	650	6.E-14	2.0E-05
²³⁸ U	2.7E-19	NNE	700	6.E-14	4.5E-06
²³⁸ Pu	8.9E-21	NNE	250	2.E-14	4.5E-07
²³⁹ Pu	3.2E-20	NNE	250	2.E-14	1.6E-06
²⁴¹ Pu	9.7E-18	NNE	400	8.E-13	1.2E-05
²⁴¹ Am	7.3E-21	NNE	250	2.E-14	3.7E-07
Sum of Fractions:					7.8E-04

The TEDE to the MEI for gaseous effluents released during 2023 is provided in Table 3. The results for the 1st half of 2023 were previously reported in *Biannual Effluent Monitoring Report January to June 2023* (21G-23-0116). The annual dose is well below the Environmental Radiological Monitoring Program action levels and applicable regulatory limits/ALARA constraints.

Table 3. Annual Dose to the MEI for Gaseous Effluents Released During 2023

Period Covered	Direction	Distance (m)	TEDE (mrem)
2 nd Half	NNE	600	5.2E-03
1 st Half	NE	450	4.2E-03
Annual Total			9.4E-03