BWXT

Nuclear Fuel Services, Inc.

Certified Mail
Return Receipt Requested

21G-22-0097
GOV-01-55
ACF-22-0195

August 22, 2022

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 January to June 2022**

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 January to June 2022. Attachment 2 reports the Radioactivity in Effluent Air for the period January to June 2022. 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 January to June 2022.

If you or your staff have any questions, require additional information, or wish to discuss this, please contact me or Mr. R. Jason Faddis, Environmental Safety Unit Manager, at (423) 735-5438. Please reference our unique document identification number (21G-22-0097) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

Tim Knowles

Tim Knowles
Safety & Safeguards Director

NMSS20
NMSS01
NMSS

CJB/las
Attachments
1) Report of Radioactivity in Effluent Liquid for the Period January to June 2022
2) Report of Radioactivity in Effluent Air for the Period January to June 2022
3) Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January to June 2022

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 August 22, 2022

Report of Radioactivity in Effluent Liquid for the Period January to June 2022

(2 Pages to Follow)

Radioactivity in Effluent Liquid
January 1, 2022 to June 30, 2022

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	459,723,000	5.24E-12	1.21E-10	2.67E-10	2.41E-06	1.41E-07	2.62E-04
Pu-239/240	459,723,000	1.66E-11	1.31E-10	2.73E-10	7.65E-06	1.23E-04	8.32E-04
Tc-99	459,723,000	1.11E-08	2.53E-08	4.32E-08	5.12E-03	3.03E-01	1.86E-04
Th-228	459,723,000	1.17E-11	1.37E-10	2.88E-10	5.39E-06	6.58E-09	5.86E-05
Th-230	459,723,000	8.31E-11	1.83E-10	3.30E-10	3.82E-05	1.89E-03	8.31E-04
Th-232	459,723,000	0.00E+00	7.23E-11	1.78E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	459,723,000	2.70E-10	2.69E-10	3.84E-10	1.24E-04	1.99E-02	8.99E-04
U-235/236	459,723,000	2.41E-11	1.16E-10	2.39E-10	1.11E-05	5.12E+00	8.03E-05
U-238	459,723,000	5.44E-11	1.57E-10	2.90E-10	2.50E-05	7.47E+01	1.81E-04
						Total:	**3.33E-03**
Sewer							
Pu-238	19,708,000	2.46E-12	8.88E-11	1.88E-10	4.85E-08	2.84E-09	1.23E-05
Pu-239/240	19,708,000	1.47E-11	1.06E-10	2.16E-10	2.90E-07	4.67E-06	7.36E-05
Tc-99	19,708,000	1.01E-08	2.60E-08	4.44E-08	1.98E-04	1.17E-02	1.68E-05
Th-228	19,708,000	0.00E+00	1.73E-10	4.25E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	19,708,000	1.49E-10	2.48E-10	4.29E-10	2.93E-06	1.45E-04	1.49E-04
Th-232	19,708,000	4.11E-11	1.59E-10	2.82E-10	8.11E-07	7.44E+00	1.37E-04
U-232	19,708,000	4.76E-12	1.28E-10	2.65E-10	9.37E-08	4.38E-09	7.93E-06
U-233/234	19,708,000	1.22E-08	9.92E-10	1.68E-10	2.41E-04	3.86E-02	4.08E-03
U-235/236	19,708,000	5.10E-10	2.09E-10	1.03E-10	1.01E-05	4.65E+00	1.70E-04
U-238	19,708,000	1.36E-09	3.22E-10	1.38E-10	2.68E-05	7.99E+01	4.53E-04
						Total:	**5.10E-03**
West Ditch							
Pu-238	156,109,000	0.00E+00	1.28E-10	3.21E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	156,109,000	8.27E-12	1.27E-10	2.77E-10	1.29E-06	2.08E-05	4.14E-04
Tc-99	156,109,000	0.00E+00	3.06E-08	5.28E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	156,109,000	1.96E-11	1.59E-10	3.30E-10	3.05E-06	3.73E-09	9.78E-05
Th-230	156,109,000	1.97E-10	2.30E-10	3.48E-10	3.07E-05	1.52E-03	1.97E-03
Th-232	156,109,000	0.00E+00	9.77E-11	2.31E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	156,109,000	1.47E-08	1.48E-09	3.50E-10	2.30E-03	3.68E-01	4.90E-02
U-235/236	156,109,000	5.77E-10	3.45E-10	2.71E-10	9.00E-05	4.17E+01	1.92E-03
U-238	156,109,000	1.13E-09	4.20E-10	2.45E-10	1.77E-04	5.28E+02	3.78E-03
						Total:	**5.72E-02**
WWTF							
Am-241	3,730,543	2.17E-11	1.05E-10	1.90E-10	8.11E-08	2.36E-08	1.09E-03
Cs-137	3,730,543	4.65E-10	1.21E-09	1.39E-09	1.74E-06	1.99E-08	4.65E-04
Na-22	3,730,543	0.00E+00	7.68E-10	1.39E-09	0.00E+00	0.00E+00	0.00E+00
Np-237	3,730,543	2.80E-11	2.85E-10	6.29E-10	1.04E-07	1.48E-04	1.40E-03
Pb-212	3,730,543	9.29E-10	3.31E-09	2.84E-09	3.47E-06	2.51E-12	4.64E-04
Pu-238	3,730,543	1.18E-11	5.50E-11	1.06E-10	4.39E-08	2.57E-09	5.89E-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
January 1, 2022 to June 30, 2022

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	3,730,543	3.09E-13	5.19E-11	1.16E-10	1.15E-09	1.86E-08	1.55E-05
Pu-241	3,730,543	9.24E-10	9.47E-09	1.63E-08	3.45E-06	3.35E-08	9.24E-04
Ra-224	3,730,543	1.64E-08	9.54E-09	1.71E-08	6.12E-05	3.85E-10	8.20E-02
Tc-99	3,730,543	9.31E-10	7.18E-08	1.25E-07	3.47E-06	2.06E-04	1.55E-05
Th-228	3,730,543	3.56E-12	1.53E-10	3.38E-10	1.33E-08	1.62E-11	1.78E-05
Th-230	3,730,543	1.88E-10	2.08E-10	3.15E-10	7.00E-07	3.47E-05	1.88E-03
Th-231	3,730,543	0.00E+00	4.15E-08	3.82E-08	0.00E+00	0.00E+00	0.00E+00
Th-232	3,730,543	2.76E-11	1.07E-10	1.96E-10	1.03E-07	9.45E-01	9.20E-04
U-232	3,730,543	0.00E+00	1.08E-10	2.48E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	3,730,543	9.51E-09	8.62E-10	1.86E-10	3.55E-05	5.69E-03	3.17E-02
U-235/236	3,730,543	4.41E-10	1.90E-10	1.16E-10	1.65E-06	7.62E-01	1.47E-03
U-238	3,730,543	7.04E-11	9.50E-11	1.37E-10	2.63E-07	7.84E-01	2.35E-04
						Total:	**1.23E-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 August 22, 2022

Report of Radioactivity in Effluent Air for the Period
January to June 2022

(3 Pages to Follow)

Radioactivity in Effluent Air
January 1, 2022 to June 30, 2022

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		**1066.64 m^3/min**	**17.78 m^3/sec**				
Th-228	278,008,817	6.94E-16	1.58E-16	9.46E-17	1.93E-07	2.35E-10	3.47E-02
Th-230	278,008,817	6.94E-16	1.58E-16	9.46E-17	1.93E-07	9.55E-06	3.47E-02
Th-232	278,008,817	5.20E-16	1.18E-16	7.10E-17	1.45E-07	1.33E+00	1.30E-01
U-234	278,008,817	1.64E-13	3.72E-14	2.23E-14	4.55E-05	7.29E-03	3.27E+00
U-235	278,008,817	6.24E-15	1.42E-15	8.51E-16	1.74E-06	8.03E-01	1.04E-01
U-238	278,008,817	1.73E-15	3.95E-16	2.37E-16	4.82E-07	1.44E+00	2.89E-02
						Total:	**3.60E+00**
Stack 185 Bldg. 131		**109.81 m^3/min**	**1.83 m^3/sec**				
Pu-241	28,621,594	1.71E-16	8.78E-16	1.65E-15	4.89E-09	4.75E-11	2.14E-04
Tc-99	28,621,594	5.53E-15	2.84E-14	5.34E-14	1.58E-07	9.36E-06	6.14E-06
U-234	28,621,594	0.00E+00	7.79E-15	2.11E-14	0.00E+00	0.00E+00	0.00E+00
U-235	28,621,594	0.00E+00	2.41E-16	6.52E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**2.20E-04**
Stack 234 Bldg. 234		**313.07 m^3/min**	**5.22 m^3/sec**				
Am-241	83,217,178	9.95E-18	2.26E-17	4.79E-17	8.28E-10	2.41E-10	4.97E-04
Pu-238	83,217,178	1.22E-17	2.76E-17	5.86E-17	1.01E-09	5.92E-11	6.08E-04
Pu-239/240	83,217,178	4.31E-17	9.78E-17	2.08E-16	3.59E-09	5.77E-08	2.15E-03
Pu-241	83,217,178	0.00E+00	3.93E-15	7.28E-15	0.00E+00	0.00E+00	0.00E+00
Th-228	83,217,178	6.63E-18	1.50E-17	3.19E-17	5.52E-10	6.74E-13	3.32E-04
Th-230	83,217,178	8.29E-17	1.88E-16	3.99E-16	6.90E-09	3.41E-07	4.14E-03
Th-232	83,217,178	1.05E-16	2.38E-16	5.06E-16	8.74E-09	8.01E-02	2.62E-02
U-234	83,217,178	2.27E-16	5.14E-16	1.09E-15	1.89E-08	3.02E-06	4.53E-03
U-238	83,217,178	6.63E-17	1.50E-16	3.19E-16	5.52E-09	1.65E-02	1.11E-03
						Total:	**3.96E-02**
Stack 327 Bldg. 330		**988.79 m^3/min**	**16.48 m^3/sec**				
Pu-241	257,710,188	1.83E-15	5.17E-16	7.87E-16	4.73E-07	4.59E-09	2.29E-03
Tc-99	257,710,188	5.93E-14	1.67E-14	2.55E-14	1.53E-05	9.04E-04	6.59E-05
U-234	257,710,188	9.33E-14	1.16E-14	9.11E-15	2.40E-05	3.85E-03	1.87E+00
U-235	257,710,188	2.88E-15	3.59E-16	2.82E-16	7.43E-07	3.44E-01	4.81E-02
						Total:	**1.92E+00**
Stack 421 Bldg. 100		**31.77 m^3/min**	**0.53 m^3/sec**				
Pu-241	8,280,925	2.48E-15	1.42E-15	2.28E-15	2.05E-08	1.99E-10	3.09E-03
Tc-99	8,280,925	8.00E-14	4.61E-14	7.39E-14	6.63E-07	3.92E-05	8.89E-05
U-234	8,280,925	9.04E-15	1.61E-14	2.76E-14	7.49E-08	1.20E-05	1.81E-01
U-235	8,280,925	2.80E-16	4.97E-16	8.54E-16	2.32E-09	1.07E-03	4.66E-03
						Total:	**1.89E-01**
Stack 424 Bldg. 100		**33.05 m^3/min**	**0.55 m^3/sec**				
Pu-241	8,613,048	8.55E-16	9.94E-16	1.66E-15	7.36E-09	7.15E-11	1.07E-03
Tc-99	8,613,048	2.76E-14	3.21E-14	5.36E-14	2.38E-07	1.41E-05	3.07E-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
January 1, 2022 to June 30, 2022

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 424 Bldg. 100		**33.05 m^3/min**	**0.55 m^3/sec**				
U-234	8,613,048	1.29E-15	9.23E-15	2.12E-14	1.11E-08	1.78E-06	2.58E-02
U-235	8,613,048	3.99E-17	2.85E-16	6.54E-16	3.43E-10	1.59E-04	6.64E-04
						Total:	**2.75E-02**
Stack 573 Bldg 306-W		**112.22 m^3/min**	**1.87 m^3/sec**				
Pu-241	29,230,139	6.99E-17	7.91E-16	1.53E-15	2.04E-09	1.98E-11	8.74E-05
Tc-99	29,230,139	2.26E-15	2.56E-14	4.96E-14	6.61E-08	3.91E-06	2.51E-06
U-234	29,230,139	0.00E+00	6.42E-15	1.98E-14	0.00E+00	0.00E+00	0.00E+00
U-235	29,230,139	0.00E+00	1.99E-16	6.13E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**8.99E-05**
Stack 600 Bldg. 110		**312.08 m^3/min**	**5.20 m^3/sec**				
Pu-241	81,340,532	7.43E-16	5.61E-16	9.92E-16	6.05E-08	5.87E-10	9.29E-04
Tc-99	81,340,532	2.40E-14	1.81E-14	3.21E-14	1.96E-06	1.16E-04	2.67E-05
U-234	81,340,532	1.79E-14	7.89E-15	1.33E-14	1.45E-06	2.33E-04	3.58E-01
U-235	81,340,532	5.53E-16	2.44E-16	4.11E-16	4.50E-08	2.08E-02	9.22E-03
						Total:	**3.68E-01**
Stack 615 Bldg. 306-W		**48.95 m^3/min**	**0.82 m^3/sec**				
Pu-241	12,757,629	0.00E+00	8.54E-16	1.67E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	12,757,629	0.00E+00	2.76E-14	5.39E-14	0.00E+00	0.00E+00	0.00E+00
U-234	12,757,629	0.00E+00	6.98E-15	2.13E-14	0.00E+00	0.00E+00	0.00E+00
U-235	12,757,629	0.00E+00	2.16E-16	6.58E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**0.00E+00**
Stack 646 Bldg. 110		**36.50 m^3/min**	**0.61 m^3/sec**				
Pu-241	9,513,469	1.14E-16	8.68E-16	1.65E-15	1.09E-09	1.05E-11	1.43E-04
Tc-99	9,513,469	3.69E-15	2.81E-14	5.34E-14	3.51E-08	2.08E-06	4.10E-06
U-234	9,513,469	0.00E+00	6.68E-15	2.11E-14	0.00E+00	0.00E+00	0.00E+00
U-235	9,513,469	0.00E+00	2.07E-16	6.52E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**1.47E-04**
Stack 701 Bldg. 307		**123.71 m^3/min**	**2.06 m^3/sec**				
Pu-241	32,244,850	0.00E+00	9.48E-16	1.89E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	32,244,850	0.00E+00	3.07E-14	6.11E-14	0.00E+00	0.00E+00	0.00E+00
U-234	32,244,850	2.74E-15	9.46E-15	2.41E-14	8.85E-08	1.42E-05	5.49E-02
U-235	32,244,850	8.49E-17	2.92E-16	7.45E-16	2.74E-09	1.27E-03	1.41E-03
						Total:	**5.63E-02**
Stack 702 Bldg. 307		**155.83 m^3/min**	**2.60 m^3/sec**				
Pu-241	40,615,524	4.72E-18	8.56E-16	1.67E-15	1.92E-10	1.86E-12	5.90E-06
Tc-99	40,615,524	1.53E-16	2.77E-14	5.39E-14	6.20E-09	3.67E-07	1.70E-07
U-234	40,615,524	3.21E-16	8.58E-15	2.12E-14	1.30E-08	2.09E-06	6.42E-03

[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
January 1, 2022 to June 30, 2022

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 702 Bldg. 307		**155.83 m^3/min**	**2.60 m^3/sec**				
U-235	40,615,524	9.93E-18	2.65E-16	6.57E-16	4.03E-10	1.87E-04	1.66E-04
						Total:	**6.59E-03**
Stack 703 Exhaust Room Air		**768.55 m^3/min**	**12.81 m^3/sec**				
Pu-241	200,314,824	0.00E+00	2.50E-14	4.90E-14	0.00E+00	0.00E+00	0.00E+00
Th-228	200,314,824	0.00E+00	7.00E-16	1.91E-15	0.00E+00	0.00E+00	0.00E+00
Th-230	200,314,824	0.00E+00	4.03E-16	1.10E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	200,314,824	0.00E+00	5.73E-16	1.56E-15	0.00E+00	0.00E+00	0.00E+00
U-234	200,314,824	0.00E+00	4.39E-15	1.20E-14	0.00E+00	0.00E+00	0.00E+00
U-235	200,314,824	0.00E+00	4.53E-16	1.24E-15	0.00E+00	0.00E+00	0.00E+00
U-238	200,314,824	0.00E+00	5.52E-16	1.51E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	**0.00E+00**
Stack 773 Bldg. 440		**158.46 m^3/min**	**2.64 m^3/sec**				
Pu-241	41,393,821	6.36E-15	3.44E-14	6.53E-14	2.63E-07	2.55E-09	7.94E-03
Th-228	41,393,821	0.00E+00	1.21E-15	3.63E-15	0.00E+00	0.00E+00	0.00E+00
Th-230	41,393,821	0.00E+00	1.56E-15	4.67E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	41,393,821	0.00E+00	1.04E-15	3.12E-15	0.00E+00	0.00E+00	0.00E+00
U-234	41,393,821	0.00E+00	3.20E-15	9.61E-15	0.00E+00	0.00E+00	0.00E+00
U-235	41,393,821	0.00E+00	5.62E-16	1.69E-15	0.00E+00	0.00E+00	0.00E+00
U-238	41,393,821	0.00E+00	1.12E-15	3.38E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	**7.94E-03**
Stack 774 Bldg. 301		**306.08 m^3/min**	**5.10 m^3/sec**				
Th-228	79,775,865	0.00E+00	1.81E-16	4.63E-16	0.00E+00	0.00E+00	0.00E+00
Th-230	79,775,865	0.00E+00	6.18E-16	1.58E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	79,775,865	0.00E+00	3.66E-16	9.35E-16	0.00E+00	0.00E+00	0.00E+00
U-234	79,775,865	0.00E+00	1.65E-15	4.21E-15	0.00E+00	0.00E+00	0.00E+00
U-235	79,775,865	0.00E+00	1.07E-16	2.74E-16	0.00E+00	0.00E+00	0.00E+00
U-238	79,775,865	0.00E+00	7.77E-16	1.98E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	**0.00E+00**
Stack 796 Bldg. 100		**18.21 m^3/min**	**0.30 m^3/sec**				
Pu-241	4,745,664	4.68E-16	9.28E-16	1.65E-15	2.22E-09	2.16E-11	5.85E-04
Tc-99	4,745,664	1.51E-14	3.00E-14	5.34E-14	7.18E-08	4.25E-06	1.68E-05
U-234	4,745,664	0.00E+00	7.07E-15	2.11E-14	0.00E+00	0.00E+00	0.00E+00
U-235	4,745,664	0.00E+00	2.19E-16	6.52E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**6.02E-04**

[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 August 22, 2022

Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January to June 2022

(3 Pages to Follow)

Report of Potential Gaseous Effluent Dose to the Maximally Exposed Offsite Individual and on the Maximum Radionuclide Concentrations for the Period: January to June 2022

Introduction

During this biannual period, NRC License SNM-124, Section 9.1.1.3, required 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 sixteen (16) radiological stacks during the first half of 2022. 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 550 meters North-Northeast from the center of the plant site. The TEDE to the MEI was estimated to be 2.3E-03 mrem for gaseous effluents released during the first half of 2022. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 1.3E-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 first half of 2022)**
Adrenals	1.6E-04
Urinary Bladder Wall	1.8E-04
Bone Surface	6.5E-03
Brain	1.6E-04
Breasts	1.7E-04
Stomach Wall	2.4E-03
Small Intestine	1.8E-04
Upper Large Intestine Wall	7.6E-04
Lower Large Intestine Wall	1.9E-03
Kidneys	2.2E-03
Liver	5.4E-04
Muscle	1.6E-04
Ovaries	1.6E-04
Pancreas	1.6E-04
Red Bone Marrow	8.3E-04
Skin	3.3E-04
Spleen	1.6E-04
Testes	1.7E-04
Thymus	1.6E-04
Thyroid	1.2E-03
Gall Bladder Wall	1.6E-04
Heart Wall	1.6E-04
Uterus	1.6E-04
Extra-thoracic	1.1E-02
Lungs	1.3E-02
Total Effective Dose Equivalent	**2.3E-03 mrem**
Location of MEI:	550 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 4.3E-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	1.0E-17	NNE	400	9.E-10	1.1E-08
^{228}Th	3.7E-20	NNE	750	2.E-14	1.8E-06
^{230}Th	4.0E-20	NNE	700	2.E-14	2.0E-06
^{232}Th	3.2E-20	NNE	700	4.E-15	8.0E-06
^{234}U	2.0E-17	NNE	550	5.E-14	4.0E-04
^{235}U	6.7E-19	NNE	600	6.E-14	1.1E-05
^{238}U	9.4E-20	NNE	750	6.E-14	1.6E-06
^{238}Pu	1.6E-21	NNE	250	2.E-14	8.1E-08
^{239}Pu	5.7E-21	NNE	250	2.E-14	2.9E-07
^{241}Pu	5.4E-19	NNE	400	8.E-13	6.8E-07
^{241}Am	1.3E-21	NNE	250	2.E-14	6.6E-08
				Sum of Fractions:	**4.3E-04**