BWXT
Nuclear Fuel Services, Inc.

21G-21-0103
GOV-01-55
ACF-21-0182
August 16, 2021

Certified Mail
Return Receipt Requested

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 2021**

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 2021. Attachment 2 reports the Radioactivity in Effluent Air for the period January to June 2021. 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 2021.

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-21-0103) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

IE48
NMSS20
NMSS

Tim Knowles
Tim Knowles
Safety & Safeguards Director

CJB/pj/smd
Attachments
1) Report of Radioactivity in Effluent Liquid for the Period January to June 2021
2) Report of Radioactivity in Effluent Air for the Period January to June 2021
3) Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January to June 2021

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

Attachment 1
To Letter Dated August 16, 2021

Report of Radioactivity in Effluent Liquid for the Period January to June 2021

(2 Pages to Follow)

Radioactivity in Effluent Liquid
January 1, 2021 to June 30, 2021

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	472,037,000	0.00E+00	8.57E-11	2.28E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	472,037,000	0.00E+00	9.41E-11	2.40E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	472,037,000	0.00E+00	3.44E-08	6.10E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	472,037,000	1.08E-11	1.43E-10	2.99E-10	5.10E-06	6.22E-09	5.40E-05
Th-230	472,037,000	3.59E-11	1.81E-10	3.66E-10	1.70E-05	8.40E-04	3.59E-04
Th-232	472,037,000	0.00E+00	1.00E-10	2.67E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	472,037,000	2.73E-10	2.51E-10	3.43E-10	1.29E-04	2.07E-02	9.11E-04
U-235/236	472,037,000	1.90E-11	1.42E-10	2.89E-10	8.96E-06	4.15E+00	6.33E-05
U-238	472,037,000	5.64E-11	1.58E-10	2.82E-10	2.66E-05	7.95E+01	1.88E-04
						Total:	**1.58E-03**
Sewer							
Pu-238	25,036,000	0.00E+00	1.11E-10	2.41E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	25,036,000	0.00E+00	1.22E-10	2.92E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	25,036,000	3.62E-09	3.74E-08	6.55E-08	9.05E-05	5.36E-03	6.03E-06
Th-228	25,036,000	1.88E-11	2.43E-10	4.88E-10	4.71E-07	5.75E-10	9.41E-06
Th-230	25,036,000	1.58E-10	3.08E-10	4.97E-10	3.97E-06	1.96E-04	1.58E-04
Th-232	25,036,000	0.00E+00	1.68E-10	3.93E-10	0.00E+00	0.00E+00	0.00E+00
U-232	25,036,000	3.03E-11	1.83E-10	3.74E-10	7.59E-07	3.55E-08	5.05E-05
U-233/234	25,036,000	1.81E-08	1.40E-09	2.91E-10	4.54E-04	7.27E-02	6.04E-03
U-235/236	25,036,000	7.02E-10	3.03E-10	2.56E-10	1.76E-05	8.14E+00	2.34E-04
U-238	25,036,000	2.57E-09	5.38E-10	2.55E-10	6.44E-05	1.92E+02	8.58E-04
						Total:	**7.36E-03**
West Ditch							
Pu-238	169,304,000	0.00E+00	1.12E-10	2.79E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	169,304,000	0.00E+00	1.22E-10	3.45E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	169,304,000	5.83E-09	3.48E-08	6.06E-08	9.87E-04	5.84E-02	9.72E-05
Th-228	169,304,000	1.17E-11	1.76E-10	3.92E-10	1.98E-06	2.41E-09	5.84E-05
Th-230	169,304,000	7.71E-11	2.15E-10	4.03E-10	1.30E-05	6.46E-04	7.71E-04
Th-232	169,304,000	0.00E+00	1.25E-10	2.76E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	169,304,000	1.51E-08	1.40E-09	3.14E-10	2.56E-03	4.11E-01	5.05E-02
U-235/236	169,304,000	7.09E-10	3.51E-10	2.51E-10	1.20E-04	5.56E+01	2.36E-03
U-238	169,304,000	1.53E-09	4.51E-10	2.33E-10	2.59E-04	7.72E+02	5.09E-03
						Total:	**5.89E-02**
WWTF							
Am-241	3,947,307	0.00E+00	9.48E-11	2.19E-10	0.00E+00	0.00E+00	0.00E+00
Cs-137	3,947,307	0.00E+00	1.24E-09	1.43E-09	0.00E+00	0.00E+00	0.00E+00
Na-22	3,947,307	8.95E-11	8.13E-10	1.39E-09	3.53E-07	5.66E-11	1.49E-05
Np-237	3,947,307	2.61E-11	2.74E-10	5.62E-10	1.03E-07	1.46E-04	1.31E-03
Pb-212	3,947,307	1.20E-09	3.35E-09	3.02E-09	4.72E-06	3.41E-12	5.98E-04
Pu-238	3,947,307	1.33E-11	5.35E-11	1.07E-10	5.27E-08	3.08E-09	6.67E-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, 2021 to June 30, 2021

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	3,947,307	0.00E+00	6.32E-11	1.57E-10	0.00E+00	0.00E+00	0.00E+00
Pu-241	3,947,307	4.56E-10	1.01E-08	1.74E-08	1.80E-06	1.75E-08	4.56E-04
Ra-224	3,947,307	1.20E-08	6.69E-09	1.20E-08	4.73E-05	2.98E-10	5.99E-02
Tc-99	3,947,307	4.75E-09	1.30E-07	2.24E-07	1.87E-05	1.11E-03	7.91E-05
Th-228	3,947,307	0.00E+00	1.51E-10	3.74E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	3,947,307	1.16E-10	2.23E-10	3.87E-10	4.60E-07	2.28E-05	1.16E-03
Th-231	3,947,307	0.00E+00	3.98E-08	3.89E-08	0.00E+00	0.00E+00	0.00E+00
Th-232	3,947,307	3.63E-11	1.33E-10	2.37E-10	1.43E-07	1.31E+00	1.21E-03
U-232	3,947,307	0.00E+00	1.18E-10	2.45E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	3,947,307	1.34E-08	9.28E-10	1.75E-10	5.30E-05	8.50E-03	4.48E-02
U-235/236	3,947,307	5.96E-10	2.06E-10	1.06E-10	2.35E-06	1.09E+00	1.99E-03
U-238	3,947,307	9.75E-11	1.02E-10	1.34E-10	3.85E-07	1.15E+00	3.25E-04
						Total:	**1.13E-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 16, 2021

Report of Radioactivity in Effluent Air for the Period January to June 2021

(3 Pages to Follow)

Radioactivity in Effluent Air
January 1, 2021 to June 30, 2021

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		**1070.66 m^3/min**	**17.84 m^3/sec**				
Th-228	282,139,411	6.58E-16	1.50E-16	8.16E-17	1.86E-07	2.27E-10	3.29E-02
Th-230	282,139,411	6.58E-16	1.50E-16	8.16E-17	1.86E-07	9.19E-06	3.29E-02
Th-232	282,139,411	4.94E-16	1.13E-16	6.12E-17	1.39E-07	1.28E+00	1.23E-01
U-234	282,139,411	1.55E-13	3.54E-14	1.92E-14	4.38E-05	7.02E-03	3.10E+00
U-235	282,139,411	5.92E-15	1.35E-15	7.35E-16	1.67E-06	7.74E-01	9.87E-02
U-238	282,139,411	1.65E-15	3.76E-16	2.04E-16	4.64E-07	1.39E+00	2.74E-02
						Total:	**3.42E+00**
Stack 185 Bldg. 131		**112.74 m^3/min**	**1.88 m^3/sec**				
Pu-241	29,384,273	4.92E-16	9.20E-16	1.62E-15	1.45E-08	1.40E-10	6.16E-04
Tc-99	29,384,273	1.59E-14	2.98E-14	5.23E-14	4.68E-07	2.77E-05	1.77E-05
U-234	29,384,273	2.42E-16	7.61E-15	1.93E-14	7.12E-09	1.14E-06	4.85E-03
U-235	29,384,273	7.50E-18	2.36E-16	5.98E-16	2.20E-10	1.02E-04	1.25E-04
						Total:	**5.61E-03**
Stack 234 Bldg. 234		**328.49 m^3/min**	**5.47 m^3/sec**				
Am-241	85,678,107	5.83E-17	2.63E-17	4.34E-17	5.00E-09	1.46E-09	2.92E-03
Pu-238	85,678,107	7.13E-17	3.22E-17	5.30E-17	6.11E-09	3.57E-10	3.56E-03
Pu-239/240	85,678,107	2.53E-16	1.14E-16	1.88E-16	2.16E-08	3.48E-07	1.26E-02
Pu-241	85,678,107	4.78E-15	4.34E-15	7.13E-15	4.09E-07	3.98E-09	5.97E-03
Th-228	85,678,107	3.89E-17	1.75E-17	2.89E-17	3.33E-09	4.07E-12	1.94E-03
Th-230	85,678,107	4.86E-16	2.19E-16	3.62E-16	4.16E-08	2.06E-06	2.43E-02
Th-232	85,678,107	6.15E-16	2.78E-16	4.58E-16	5.27E-08	4.84E-01	1.54E-01
U-234	85,678,107	1.33E-15	5.99E-16	9.89E-16	1.14E-07	1.82E-05	2.66E-02
U-238	85,678,107	3.89E-16	1.75E-16	2.89E-16	3.33E-08	9.94E-02	6.48E-03
						Total:	**2.38E-01**
Stack 327 Bldg. 330		**1036.36 m^3/min**	**17.27 m^3/sec**				
Pu-241	270,157,102	2.50E-15	5.19E-16	7.28E-16	6.75E-07	6.55E-09	3.12E-03
Tc-99	270,157,102	8.08E-14	1.68E-14	2.35E-14	2.18E-05	1.29E-03	8.98E-05
U-234	270,157,102	1.40E-13	1.31E-14	8.78E-15	3.77E-05	6.05E-03	2.79E+00
U-235	270,157,102	4.32E-15	4.05E-16	2.71E-16	1.17E-06	5.40E-01	7.20E-02
						Total:	**2.87E+00**
Stack 421 Bldg. 100		**32.96 m^3/min**	**0.55 m^3/sec**				
Pu-241	8,590,906	3.61E-15	1.28E-15	1.95E-15	3.10E-08	3.01E-10	4.51E-03
Tc-99	8,590,906	1.17E-13	4.15E-14	6.30E-14	1.00E-06	5.93E-05	1.30E-04
U-234	8,590,906	1.26E-14	1.29E-14	2.12E-14	1.08E-07	1.74E-05	2.52E-01
U-235	8,590,906	3.90E-16	3.98E-16	6.55E-16	3.35E-09	1.55E-03	6.50E-03
						Total:	**2.63E-01**
Stack 424 Bldg. 100		**32.62 m^3/min**	**0.54 m^3/sec**				
Pu-241	8,502,340	1.29E-15	1.02E-15	1.57E-15	1.09E-08	1.06E-10	1.61E-03
Tc-99	8,502,340	4.16E-14	3.31E-14	5.08E-14	3.54E-07	2.09E-05	4.62E-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, 2021 to June 30, 2021

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		**32.62 m^3/min**		**0.54 m^3/sec**			
U-234	8,502,340	8.14E-15	1.09E-14	1.88E-14	6.92E-08	1.11E-05	1.63E-01
U-235	8,502,340	2.52E-16	3.38E-16	5.81E-16	2.14E-09	9.91E-04	4.20E-03
						Total:	**1.69E-01**
Stack 573 Bldg 306-W		**120.88 m^3/min**		**2.01 m^3/sec**			
Pu-241	31,507,371	3.97E-16	8.18E-16	1.49E-15	1.25E-08	1.21E-10	4.96E-04
Tc-99	31,507,371	1.28E-14	2.64E-14	4.81E-14	4.04E-07	2.39E-05	1.43E-05
U-234	31,507,371	1.78E-16	6.65E-15	1.80E-14	5.60E-09	8.98E-07	3.56E-03
U-235	31,507,371	5.50E-18	2.06E-16	5.57E-16	1.73E-10	8.02E-05	9.16E-05
						Total:	**4.16E-03**
Stack 600 Bldg. 110		**319.61 m^3/min**		**5.33 m^3/sec**			
Pu-241	83,303,746	1.23E-15	5.93E-16	9.73E-16	1.03E-07	9.99E-10	1.54E-03
Tc-99	83,303,746	3.99E-14	1.92E-14	3.15E-14	3.33E-06	1.97E-04	4.44E-05
U-234	83,303,746	2.46E-14	8.07E-15	1.22E-14	2.05E-06	3.29E-04	4.92E-01
U-235	83,303,746	7.61E-16	2.50E-16	3.78E-16	6.34E-08	2.94E-02	1.27E-02
						Total:	**5.06E-01**
Stack 615 Bldg. 306-W		**48.41 m^3/min**		**0.81 m^3/sec**			
Pu-241	12,618,460	3.07E-16	8.62E-16	1.57E-15	3.88E-09	3.77E-11	3.84E-04
Tc-99	12,618,460	9.94E-15	2.79E-14	5.08E-14	1.25E-07	7.42E-06	1.10E-05
U-234	12,618,460	3.02E-16	7.32E-15	1.88E-14	3.81E-09	6.10E-07	6.03E-03
U-235	12,618,460	9.33E-18	2.26E-16	5.81E-16	1.18E-10	5.45E-05	1.55E-04
						Total:	**6.58E-03**
Stack 646 Bldg. 110		**37.49 m^3/min**		**0.62 m^3/sec**			
Pu-241	9,771,787	5.32E-16	9.01E-16	1.57E-15	5.20E-09	5.05E-11	6.65E-04
Tc-99	9,771,787	1.72E-14	2.91E-14	5.07E-14	1.68E-07	9.94E-06	1.91E-05
U-234	9,771,787	9.59E-16	7.68E-15	1.88E-14	9.38E-09	1.50E-06	1.92E-02
U-235	9,771,787	2.97E-17	2.38E-16	5.80E-16	2.90E-10	1.34E-04	4.95E-04
						Total:	**2.04E-02**
Stack 701 Bldg. 307		**119.13 m^3/min**		**1.99 m^3/sec**			
Pu-241	31,049,779	3.58E-16	9.91E-16	1.80E-15	1.11E-08	1.08E-10	4.47E-04
Tc-99	31,049,779	1.16E-14	3.20E-14	5.84E-14	3.59E-07	2.13E-05	1.29E-05
U-234	31,049,779	2.60E-15	9.65E-15	2.16E-14	8.07E-08	1.29E-05	5.20E-02
U-235	31,049,779	8.04E-17	2.99E-16	6.67E-16	2.50E-09	1.16E-03	1.34E-03
						Total:	**5.38E-02**
Stack 702 Bldg. 307		**158.63 m^3/min**		**2.64 m^3/sec**			
Pu-241	41,345,582	3.63E-16	8.72E-16	1.57E-15	1.50E-08	1.46E-10	4.53E-04
Tc-99	41,345,582	1.17E-14	2.82E-14	5.08E-14	4.85E-07	2.87E-05	1.30E-05
U-234	41,345,582	2.35E-15	8.30E-15	1.88E-14	9.71E-08	1.56E-05	4.70E-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.

Radioactivity in Effluent Air
January 1, 2021 to June 30, 2021

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		**158.63 m^3/min**	**2.64 m^3/sec**				
U-235	41,345,582	7.27E-17	2.57E-16	5.81E-16	3.00E-09	1.39E-03	1.21E-03
						Total:	**4.87E-02**
Stack 703 Exhaust Room Air		**776.96 m^3/min**	**12.95 m^3/sec**				
Pu-241	202,506,263	9.09E-15	2.57E-14	4.69E-14	1.84E-06	1.79E-08	1.14E-02
Th-228	202,506,263	1.76E-16	7.41E-16	1.72E-15	3.56E-08	4.35E-11	8.80E-03
Th-230	202,506,263	1.01E-16	4.26E-16	9.88E-16	2.05E-08	1.02E-06	5.06E-03
Th-232	202,506,263	1.44E-16	6.06E-16	1.40E-15	2.91E-08	2.67E-01	3.60E-02
U-234	202,506,263	1.10E-15	4.64E-15	1.07E-14	2.23E-07	3.58E-05	2.20E-02
U-235	202,506,263	1.14E-16	4.79E-16	1.11E-15	2.30E-08	1.07E-02	1.90E-03
U-238	202,506,263	1.39E-16	5.84E-16	1.35E-15	2.81E-08	8.38E-02	2.31E-03
						Total:	**8.74E-02**
Stack 773 Bldg. 440		**166.92 m^3/min**	**2.78 m^3/sec**				
Pu-241	43,576,819	2.10E-14	3.53E-14	6.18E-14	9.17E-07	8.90E-09	2.63E-02
Th-228	43,576,819	1.98E-16	1.31E-15	3.23E-15	8.61E-09	1.05E-11	9.88E-03
Th-230	43,576,819	2.54E-16	1.68E-15	4.15E-15	1.11E-08	5.48E-07	1.27E-02
Th-232	43,576,819	1.69E-16	1.12E-15	2.76E-15	7.38E-09	6.77E-02	4.23E-02
U-234	43,576,819	5.22E-16	3.46E-15	8.52E-15	2.28E-08	3.65E-06	1.04E-02
U-235	43,576,819	9.18E-17	6.07E-16	1.50E-15	4.00E-09	1.85E-03	1.53E-03
U-238	43,576,819	1.84E-16	1.21E-15	2.99E-15	8.00E-09	2.39E-02	3.06E-03
						Total:	**1.06E-01**
Stack 774 Bldg. 301		**319.16 m^3/min**	**5.32 m^3/sec**				
Th-228	83,185,658	5.43E-18	1.71E-16	4.29E-16	4.52E-10	5.51E-13	2.71E-04
Th-230	83,185,658	1.85E-17	5.81E-16	1.46E-15	1.54E-09	7.62E-08	9.25E-04
Th-232	83,185,658	1.10E-17	3.45E-16	8.67E-16	9.12E-10	8.37E-03	2.74E-03
U-234	83,185,658	4.94E-17	1.55E-15	3.91E-15	4.11E-09	6.59E-07	9.88E-04
U-235	83,185,658	3.21E-18	1.01E-16	2.54E-16	2.67E-10	1.24E-04	5.35E-05
U-238	83,185,658	2.33E-17	7.31E-16	1.84E-15	1.94E-09	5.78E-03	3.88E-04
						Total:	**5.37E-03**
Stack 796 Bldg. 100		**19.37 m^3/min**	**0.32 m^3/sec**				
Pu-241	5,048,265	8.86E-16	9.59E-16	1.57E-15	4.47E-09	4.34E-11	1.11E-03
Tc-99	5,048,265	2.87E-14	3.10E-14	5.08E-14	1.45E-07	8.56E-06	3.18E-05
U-234	5,048,265	0.00E+00	7.14E-15	1.88E-14	0.00E+00	0.00E+00	0.00E+00
U-235	5,048,265	0.00E+00	2.21E-16	5.81E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**1.14E-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.

Attachment 3
To Letter Dated August 16, 2021

Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January to June 2021

(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 2021

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 2021. 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 3.2E-03 mrem for gaseous effluents released during the first half of 2021. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 1.7E-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 2021)**
Adrenals	2.2E-04
Urinary Bladder Wall	2.6E-04
Bone Surface	9.2E-03
Brain	2.2E-04
Breasts	2.3E-04
Stomach Wall	3.7E-03
Small Intestine	2.5E-04
Upper Large Intestine Wall	1.1E-03
Lower Large Intestine Wall	2.8E-03
Kidneys	2.8E-03
Liver	8.0E-04
Muscle	2.3E-04
Ovaries	2.4E-04
Pancreas	2.2E-04
Red Bone Marrow	1.2E-03
Skin	4.5E-04
Spleen	2.2E-04
Testes	2.5E-04
Thymus	2.2E-04
Thyroid	1.9E-03
Gall Bladder Wall	2.2E-04
Heart Wall	2.2E-04
Uterus	2.2E-04
Extra-thoracic	1.5E-02
Lungs	1.7E-02
Total Effective Dose Equivalent	**3.2E-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 5.8E-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	1.5E-17	NNE	450	9.E-10	1.6E-08
^{228}Th	5.5E-20	NNE	650	2.E-14	2.8E-06
^{230}Th	8.1E-20	NNE	400	2.E-14	4.0E-06
^{232}Th	9.3E-20	NNE	300	4.E-15	2.3E-05
^{234}U	2.6E-17	NNE	550	5.E-14	5.3E-04
^{235}U	8.7E-19	NNE	550	6.E-14	1.5E-05
^{238}U	1.2E-19	NNE	650	6.E-14	2.0E-06
^{238}Pu	9.0E-21	NNE	250	2.E-14	4.5E-07
^{239}Pu	3.2E-20	NNE	250	2.E-14	1.6E-06
^{241}Pu	2.5E-18	NNE	400	8.E-13	3.2E-06
^{241}Am	7.4E-21	NNE	250	2.E-14	3.7E-07
				Sum of Fractions:	5.8E-04