



Nuclear Fuel Services, Inc.

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Erwin, TN 37650

(423) 743-9141

www.atnfs.com

**CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

21G-01-0185

GOV-01-55-03

ACF-01-0208

August 28, 2001

Mr. Luis A. Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II, Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303

References: 1) Docket No. 70-143; SNM License 124

Subject: **Bi-Annual Effluent Monitoring Report January - June 2001**

Dear Mr. Reyes:

In accordance with the requirements set forth in 10 CFR, Part 70.59, Nuclear Fuel Services, Inc. (NFS) submits the attached reports. Attachment A reports the Radioactivity in Effluent Liquid for the period January-June 2001. Attachment B reports the Radioactivity in Effluent Air for the period January-June 2001. Attachment C summarizes an evaluation of the dose and air activity concentration for the maximally exposed offsite individual, due to effluents during the period January-June 2001. Attachment D reports the revised Radioactivity in Effluent Liquid for the period of July-December 2000, because November's discharge volume for the Sanitary Sewer was incorrect due to a data entry error. The correction reduces the Sanitary Sewer's sum-of-fractions for the period of July-December 2000.

If you or your staff have any questions, require additional information, or wish to discuss this, please contact me or Ms. Janice Greene, Environmental Safety Manager, at (423) 743-1730. Please reference our unique document identification number (21G-01-0185) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

B. Marie Moore
Vice President
Safety and Regulatory

BPG/pkr

Attachments

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B. M. Moore to Mr. Luis Reyes (NRC)
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xc: Mr. William Gloersen, Project Inspector
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Region II, Atlanta Federal Center
61 Forsyth Street, SW
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Atlanta, GA 30303

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U. S. Nuclear Regulatory Commission
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21G-01-0185
GOV-01-55-03
ACF-01-0208

Attachment A
To Letter Dated August 28, 2001
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Radioactivity in Effluent Liquid for the Period
January - June 2001

(One Page to Follow)

Radioactivity in Effluent Liquid January 1, 2001 to June 30, 2001

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	247,043,068	3.14E-10	1.42E-10	1.06E-10	7.76E-05	4.54E-06	1.57E-02
Pu-239/240	247,043,068	1.04E-10	9.87E-11	1.16E-10	2.58E-05	4.14E-04	5.21E-03
Tc-99	247,043,068	5.87E-10	7.06E-09	1.72E-08	1.45E-04	8.58E-03	9.78E-06
Th-228	247,043,068	2.95E-11	1.77E-10	3.54E-10	7.29E-06	8.90E-09	1.47E-04
Th-230	247,043,068	1.86E-10	1.24E-10	1.22E-10	4.58E-05	2.27E-03	1.86E-03
Th-232	247,043,068	7.31E-11	7.75E-11	9.47E-11	1.81E-05	1.66E+02	2.44E-03
U-234	247,043,068	1.11E-08	1.66E-09	1.68E-10	2.73E-03	4.38E-01	3.69E-02
U-235/236	247,043,068	3.26E-10	1.81E-10	1.89E-10	8.06E-05	3.73E+01	1.09E-03
U-238	247,043,068	1.74E-09	4.40E-10	1.26E-10	4.29E-04	1.28E+03	5.79E-03
						Total:	6.91E-02
Sewer							
Pu-238	31,217,770	2.19E-11	4.84E-11	1.10E-10	6.83E-07	3.99E-08	1.09E-04
Pu-239/240	31,217,770	3.32E-11	4.75E-11	9.24E-11	1.04E-06	1.66E-05	1.66E-04
Tc-99	31,217,770	9.55E-09	9.25E-09	2.04E-08	2.98E-04	1.76E-02	1.59E-05
Th-228	31,217,770	4.53E-11	1.34E-10	2.79E-10	1.41E-06	1.73E-09	2.26E-05
Th-230	31,217,770	9.49E-11	8.63E-11	1.04E-10	2.96E-06	1.47E-04	9.49E-05
Th-232	31,217,770	3.95E-12	3.89E-11	1.13E-10	1.23E-07	1.13E+00	1.32E-05
U-234	31,217,770	1.66E-08	2.26E-09	1.61E-10	5.18E-04	8.30E-02	5.53E-03
U-235/236	31,217,770	7.52E-10	2.72E-10	1.57E-10	2.35E-05	1.09E+01	2.51E-04
U-238	31,217,770	2.13E-09	4.90E-10	1.25E-10	6.65E-05	1.99E+02	7.10E-04
						Total:	6.91E-03
WWTF							
Cs-137	4,452,928	2.52E-10	2.13E-09	2.82E-09	1.12E-06	1.29E-08	2.52E-04
Na-22	4,452,928	-4.21E-10	1.71E-09	2.82E-09	-1.87E-06	-3.00E-10	-7.01E-05
Pu-238	4,452,928	1.43E-11	2.66E-10	1.17E-10	6.35E-08	3.71E-09	7.13E-04
Pu-239/240	4,452,928	6.41E-11	2.83E-10	7.46E-11	2.86E-07	4.59E-06	3.21E-03
Ra-224	4,452,928	2.76E-08	8.02E-09	1.29E-08	1.23E-04	7.74E-10	1.38E-01
Tc-99	4,452,928	8.84E-08	1.67E-08	2.55E-08	3.94E-04	2.33E-02	1.47E-03
Th-228	4,452,928	1.92E-10	1.96E-10	3.30E-10	8.56E-07	1.04E-09	9.61E-04
Th-230	4,452,928	1.22E-10	1.14E-10	1.40E-10	5.44E-07	2.69E-05	1.22E-03
Th-232	4,452,928	-3.78E-11	4.33E-10	2.14E-10	-1.68E-07	-1.54E+00	-1.26E-03
U-234	4,452,928	7.75E-08	8.68E-09	1.73E-10	3.45E-04	5.53E-02	2.58E-01
U-235/236	4,452,928	2.13E-09	4.61E-10	1.29E-10	9.48E-06	4.39E+00	7.09E-03
U-238	4,452,928	7.15E-10	2.52E-10	1.36E-10	3.18E-06	9.50E+00	2.38E-03
						Total:	4.13E-01

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B.

21G-01-0185
GOV-01-55-03
ACF-01-0208

Attachment B
To Letter Dated August 28, 2001
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Radioactivity in Effluent Air for the Period
January - June 2001

(Four Pages to Follow)

Radioactivity in Effluent Air January 1, 2001 to June 30, 2001

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		1231.49 m ³ /min		20.52 m ³ /sec			
Tc-99	320,634,203	3.88E-13	3.73E-14	4.20E-14	1.24E-04	7.36E-03	4.31E-04
Th-228	171,407,103	2.40E-18	2.72E-19	2.62E-19	4.12E-10	5.03E-13	1.20E-04
Th-230	149,227,099	1.47E-17	1.41E-18	1.12E-18	2.20E-09	1.09E-07	7.37E-04
Thorium-231	149,227,099	6.25E-15	5.17E-16	5.26E-16	9.33E-07	1.75E-12	6.95E-07
U-232	171,407,103	1.20E-17	1.36E-18	1.31E-18	2.06E-09	9.63E-11	1.20E-03
U-234	320,634,203	2.61E-13	2.68E-14	2.34E-14	8.38E-05	1.34E-02	5.23E+00
U-235	320,634,203	4.65E-15	4.80E-16	4.23E-16	1.49E-06	6.91E-01	7.76E-02
U-236	171,407,103	3.45E-14	3.90E-15	3.76E-15	5.91E-06	9.10E-02	5.75E-01
U-238	320,634,203	6.85E-17	7.87E-18	7.54E-18	2.20E-08	6.56E-02	1.14E-03
						Total:	5.88E+00
Stack 185 Bldg. 131		62.05 m ³ /min		1.03 m ³ /sec			
Tc-99	15,815,400	1.86E-13	3.30E-14	4.87E-14	2.94E-06	1.74E-04	2.06E-04
Th-230	8,670,175	1.40E-18	7.57E-19	1.29E-18	1.21E-11	6.00E-10	6.99E-05
Thorium-231	8,670,175	4.17E-15	4.67E-16	6.06E-16	3.62E-08	6.80E-14	4.64E-07
U-234	15,815,400	1.74E-14	1.14E-14	2.07E-14	2.75E-07	4.41E-05	3.48E-01
U-235	8,670,175	5.26E-16	2.85E-16	4.86E-16	4.56E-09	2.11E-03	8.77E-03
U-238	15,815,400	5.26E-16	4.10E-15	9.37E-15	8.31E-09	2.48E-02	8.76E-03
						Total:	3.66E-01
Stack 234 Bldg. 234		291.81 m ³ /min		4.86 m ³ /sec			
Am-241	76,056,173	-1.16E-16	3.74E-16	7.98E-16	-8.83E-09	-2.57E-09	-5.81E-03
Pu-238	76,056,173	-2.31E-17	7.42E-17	1.58E-16	-1.76E-09	-1.03E-10	-1.16E-03
Pu-239	76,056,173	-2.25E-16	7.36E-16	1.57E-15	-1.71E-08	-2.75E-07	-1.13E-02
Pu-240	76,056,173	-7.72E-17	2.52E-16	5.36E-16	-5.87E-09	-2.57E-08	-3.86E-03
Pu-241	76,056,173	-3.70E-16	2.84E-15	5.10E-15	-2.81E-08	-2.73E-10	-4.62E-04
						Total:	-2.25E-02
Stack 27 Bldg. 234		100.53 m ³ /min		1.68 m ³ /sec			
Am-241	26,202,746	3.33E-16	4.73E-16	8.18E-16	8.71E-09	2.54E-09	1.66E-02
Pu-238	26,202,746	6.72E-17	9.54E-17	1.65E-16	1.76E-09	1.03E-10	3.36E-03
Pu-239	26,202,746	5.82E-16	8.71E-16	1.52E-15	1.52E-08	2.45E-07	2.91E-02
Pu-240	26,202,746	2.04E-16	3.03E-16	5.27E-16	5.34E-09	2.34E-08	1.02E-02
Pu-241	26,202,746	1.66E-15	3.00E-15	5.12E-15	4.36E-08	4.23E-10	2.08E-03
						Total:	6.13E-02
Stack 28 Bldg. 234		35.62 m ³ /min		0.59 m ³ /sec			
Am-241	9,284,021	2.47E-16	4.63E-16	8.19E-16	2.29E-09	6.69E-10	1.24E-02
Pu-238	9,284,021	4.98E-17	9.34E-17	1.65E-16	4.63E-10	2.71E-11	2.49E-03
Pu-239	9,284,021	4.54E-16	8.63E-16	1.53E-15	4.21E-09	6.77E-08	2.27E-02
Pu-240	9,284,021	1.58E-16	2.99E-16	5.30E-16	1.46E-09	6.42E-09	7.89E-03
Pu-241	9,284,021	2.02E-15	3.02E-15	5.11E-15	1.88E-08	1.82E-10	2.53E-03
						Total:	4.79E-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.

Radioactivity in Effluent Air January 1, 2001 to June 30, 2001

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 332 Bldg. 120		51.13 m³/min		0.85 m³/sec			
Tc-99	13,031,442	2.48E-14	2.88E-14	4.77E-14	3.23E-07	1.91E-05	2.75E-05
Th-228	5,255,245	3.78E-16	9.09E-16	1.82E-15	1.99E-09	2.43E-12	1.89E-02
Th-230	13,031,442	7.12E-17	1.71E-16	3.43E-16	9.27E-10	4.59E-08	3.56E-03
Th-232	5,255,245	3.72E-16	8.93E-16	1.79E-15	1.95E-09	1.79E-02	9.29E-02
Thorium-231	7,776,197	3.40E-16	3.60E-16	5.89E-16	2.65E-09	4.97E-15	3.78E-08
U-234	13,031,442	4.80E-15	1.13E-14	2.26E-14	6.26E-08	1.00E-05	9.61E-02
U-235	13,031,442	2.58E-16	6.16E-16	1.23E-15	3.36E-09	1.56E-03	4.30E-03
U-238	13,031,442	8.55E-16	2.05E-15	4.11E-15	1.11E-08	3.32E-02	1.42E-02
						Total:	2.30E-01
Stack 376 Bldg. 301		247.09 m³/min		4.12 m³/sec			
Tc-99	62,558,700	-6.20E-15	1.69E-14	3.41E-14	-3.88E-07	-2.29E-05	-6.88E-06
Th-230	22,285,615	4.51E-19	4.57E-19	8.90E-19	1.01E-11	4.98E-10	2.26E-05
Thorium-231	22,285,615	-7.45E-18	2.12E-16	4.18E-16	-1.66E-10	-3.12E-16	-8.28E-10
U-234	62,558,700	6.76E-15	9.96E-15	2.07E-14	4.23E-07	6.78E-05	1.35E-01
U-235	62,558,700	1.09E-16	1.57E-16	3.27E-16	6.80E-09	3.15E-03	1.81E-03
U-236	40,273,085	2.50E-18	4.99E-18	1.08E-17	1.01E-10	1.55E-06	4.17E-05
U-238	62,558,700	1.03E-18	2.03E-18	4.36E-18	6.47E-11	1.93E-04	1.72E-05
						Total:	1.37E-01
Stack 421 Bldg. 100		18.94 m³/min		0.32 m³/sec			
Tc-99	4,851,438	1.30E-13	2.63E-14	3.36E-14	6.32E-07	3.74E-05	1.45E-04
Th-228	1,974,387	3.18E-16	3.37E-17	2.15E-17	6.27E-10	7.66E-13	1.59E-02
Th-230	2,877,051	1.42E-17	1.57E-18	8.93E-19	4.08E-11	2.02E-09	7.09E-04
Thorium-231	2,877,051	1.73E-15	3.38E-16	4.19E-16	4.96E-09	9.33E-15	1.92E-07
U-232	1,974,387	1.43E-15	1.52E-16	9.68E-17	2.82E-09	1.32E-10	1.43E-01
U-234	4,851,438	2.91E-13	3.17E-14	1.88E-14	1.41E-06	2.26E-04	5.82E+00
U-235	4,851,438	4.65E-15	5.06E-16	2.99E-16	2.25E-08	1.04E-02	7.75E-02
U-236	1,974,387	5.85E-14	6.21E-15	3.96E-15	1.16E-07	1.78E-03	9.75E-01
U-238	4,851,438	6.83E-17	7.46E-18	4.73E-18	3.31E-10	9.89E-04	1.14E-03
						Total:	7.03E+00
Stack 547 Bldg. 100		45.85 m³/min		0.76 m³/sec			
Tc-99	11,685,580	1.61E-14	2.76E-14	4.80E-14	1.88E-07	1.11E-05	1.78E-05
Th-228	5,214,876	5.05E-18	1.50E-17	3.13E-17	2.63E-11	3.22E-14	2.52E-04
Th-230	6,470,704	2.79E-19	6.35E-19	1.26E-18	1.81E-12	8.94E-11	1.40E-05
Thorium-231	6,470,704	2.41E-16	3.47E-16	5.92E-16	1.56E-09	2.94E-15	2.68E-08
U-232	5,214,876	2.27E-17	6.77E-17	1.41E-16	1.19E-10	5.54E-12	2.27E-03
U-234	11,685,580	5.25E-15	1.32E-14	2.68E-14	6.14E-08	9.84E-06	1.05E-01
U-235	11,685,580	8.41E-17	2.09E-16	4.24E-16	9.82E-10	4.55E-04	1.40E-03
U-236	5,214,876	9.30E-16	2.77E-15	5.77E-15	4.85E-09	7.47E-05	1.55E-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.

Radioactivity in Effluent Air January 1, 2001 to June 30, 2001

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 547 Bldg. 100		45.85 m³/min		0.76 m³/sec			
U-238	11,685,580	1.19E-18	3.51E-18	7.29E-18	1.39E-11	4.16E-05	1.99E-05
						Total:	1.25E-01
Stack 573 Bldg 306-W		80.47 m³/min		1.34 m³/sec			
Tc-99	21,028,115	2.62E-15	2.22E-14	4.30E-14	5.50E-08	3.26E-06	2.91E-06
Th-230	11,672,776	3.32E-19	5.57E-19	1.16E-18	3.88E-12	1.92E-10	1.66E-05
Thorium-231	11,672,776	8.00E-17	2.84E-16	5.43E-16	9.34E-10	1.76E-15	8.89E-09
U-234	21,028,115	7.95E-15	1.26E-14	2.62E-14	1.67E-07	2.68E-05	1.59E-01
U-235	21,028,115	1.28E-16	2.02E-16	4.22E-16	2.68E-09	1.24E-03	2.13E-03
U-236	9,355,339	4.37E-18	6.47E-18	1.35E-17	4.09E-11	6.30E-07	7.28E-05
U-238	21,028,115	1.25E-18	1.90E-18	3.95E-18	2.62E-11	7.82E-05	2.08E-05
						Total:	1.61E-01
Stack 583 Bldg. 234		7.36 m³/min		0.12 m³/sec			
Am-241	1,917,463	6.51E-16	5.14E-16	7.73E-16	1.25E-09	3.64E-10	3.25E-02
Pu-238	1,917,463	1.31E-16	1.03E-16	1.55E-16	2.51E-10	1.47E-11	6.54E-03
Pu-239	1,917,463	1.30E-15	1.03E-15	1.55E-15	2.50E-09	4.02E-08	6.52E-02
Pu-240	1,917,463	4.48E-16	3.54E-16	5.32E-16	8.59E-10	3.77E-09	2.24E-02
Pu-241	1,917,463	1.73E-14	3.98E-15	5.16E-15	3.32E-08	3.23E-10	2.17E-02
						Total:	1.48E-01
Stack 600 Bldg. 110		289.42 m³/min		4.82 m³/sec			
Tc-99	75,434,906	3.70E-14	2.54E-14	4.33E-14	2.79E-06	1.65E-04	4.11E-05
Th-228	38,737,247	4.29E-17	1.77E-17	2.72E-17	1.66E-09	2.03E-12	2.14E-03
Th-230	36,697,659	8.41E-19	6.52E-19	1.16E-18	3.09E-11	1.53E-09	4.21E-05
Thorium-231	36,697,659	3.92E-16	3.13E-16	5.43E-16	1.44E-08	2.70E-14	4.36E-08
U-232	38,737,247	1.93E-16	7.97E-17	1.22E-16	7.47E-09	3.49E-10	1.93E-02
U-234	75,434,906	2.67E-14	1.43E-14	2.37E-14	2.02E-06	3.23E-04	5.34E-01
U-235	75,434,906	4.07E-16	2.23E-16	3.72E-16	3.07E-08	1.42E-02	6.79E-03
U-236	38,737,247	7.90E-15	3.26E-15	5.00E-15	3.06E-07	4.71E-03	1.32E-01
U-238	75,434,906	1.12E-17	4.77E-18	7.34E-18	8.44E-10	2.52E-03	1.86E-04
						Total:	6.95E-01
Stack 615 Bldg. 306-W		32.74 m³/min		0.55 m³/sec			
Tc-99	8,498,670	-3.09E-15	2.21E-14	4.37E-14	-2.63E-08	-1.55E-06	-3.44E-06
Th-230	3,197,185	3.02E-19	5.54E-19	1.18E-18	9.66E-13	4.78E-11	1.51E-05
Thorium-231	3,197,185	4.17E-17	2.85E-16	5.52E-16	1.33E-10	2.50E-16	4.63E-09
U-234	8,498,670	8.34E-15	1.28E-14	2.66E-14	7.09E-08	1.14E-05	1.67E-01
U-235	8,498,670	1.31E-16	2.02E-16	4.21E-16	1.11E-09	5.16E-04	2.19E-03
U-236	5,301,485	4.72E-18	6.61E-18	1.36E-17	2.50E-11	3.86E-07	7.87E-05
U-238	8,498,670	1.82E-18	2.60E-18	5.34E-18	1.54E-11	4.61E-05	3.03E-05
						Total:	1.69E-01

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.

Radioactivity in Effluent Air January 1, 2001 to June 30, 2001

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 646 Bldg. 110		64.84 m ³ /min		1.08 m ³ /sec			
Tc-99	16,516,222	-1.41E-14	2.11E-14	4.43E-14	-2.33E-07	-1.38E-05	-1.57E-05
Th-228	8,587,481	8.10E-18	1.32E-17	2.80E-17	6.95E-11	8.49E-14	4.05E-04
Th-230	7,928,741	1.19E-18	6.26E-19	1.17E-18	9.40E-12	4.66E-10	5.93E-05
Thorium-231	7,928,741	-8.19E-17	2.67E-16	5.50E-16	-6.50E-10	-1.22E-15	-9.10E-09
U-232	8,587,481	3.64E-17	5.95E-17	1.26E-16	3.13E-10	1.46E-11	3.64E-03
U-234	16,516,222	1.61E-14	1.22E-14	2.41E-14	2.66E-07	4.26E-05	3.22E-01
U-235	16,516,222	2.63E-16	1.91E-16	3.76E-16	4.34E-09	2.01E-03	4.38E-03
U-236	8,587,481	1.49E-15	2.44E-15	5.15E-15	1.28E-08	1.97E-04	2.49E-02
U-238	16,516,222	2.35E-18	3.65E-18	7.68E-18	3.88E-11	1.16E-04	3.92E-05
						Total:	3.55E-01
Stack 649 Bldg. 330		13.93 m ³ /min		0.23 m ³ /sec			
Tc-99	3,531,388	-3.68E-15	1.70E-14	3.40E-14	-1.30E-08	-7.68E-07	-4.08E-06
Th-230	1,355,158	1.66E-19	4.03E-19	8.92E-19	2.25E-13	1.11E-11	8.29E-06
Thorium-231	1,355,158	-3.92E-17	2.09E-16	4.19E-16	-5.31E-11	-9.97E-17	-4.35E-09
U-234	3,531,388	5.50E-15	8.47E-15	1.78E-14	1.94E-08	3.11E-06	1.10E-01
U-235	3,531,388	1.62E-16	2.30E-16	4.76E-16	5.71E-10	2.65E-04	2.70E-03
U-238	3,531,388	1.09E-15	1.36E-15	2.77E-15	3.84E-09	1.15E-02	1.81E-02
						Total:	1.31E-01
Stack 667 Bldg. 410		1512.66 m ³ /min		25.21 m ³ /sec			
Actinium-228	189,505,770	4.00E-15	4.20E-16	5.22E-16	7.58E-07	3.38E-13	2.00E-04
Am-241	396,838,393	1.17E-15	2.79E-16	3.61E-16	4.65E-07	1.36E-07	5.86E-02
Protactinium-234m	189,505,770	6.93E-14	7.27E-15	9.05E-15	1.31E-05	1.91E-14	
Pu-238	396,838,393	2.12E-16	5.04E-17	6.53E-17	8.43E-08	4.93E-09	1.06E-02
Pu-239	396,838,393	2.40E-15	5.72E-16	7.41E-16	9.54E-07	1.53E-05	1.20E-01
Pu-240	396,838,393	8.08E-16	1.92E-16	2.49E-16	3.21E-07	1.41E-06	4.04E-02
Pu-241	396,838,393	2.28E-14	7.56E-15	1.21E-14	9.05E-06	8.78E-08	2.85E-02
Ra-224	396,838,393	1.72E-15	3.45E-16	4.21E-16	6.81E-07	4.28E-12	8.58E-04
Radium-228	189,505,770	4.00E-15	4.20E-16	5.22E-16	7.58E-07	2.78E-09	2.00E-03
Th-228	396,838,393	1.72E-15	3.45E-16	4.21E-16	6.81E-07	8.31E-10	8.58E-02
Th-230	396,838,393	9.07E-16	1.83E-16	2.24E-16	3.60E-07	1.78E-05	4.54E-02
Th-232	396,838,393	1.72E-15	3.45E-16	4.21E-16	6.81E-07	6.24E+00	4.29E-01
Th-234	189,505,770	6.93E-14	7.27E-15	9.05E-15	1.31E-05	5.68E-10	3.46E-04
Thorium-231	189,505,770	2.15E-15	2.25E-16	2.81E-16	4.07E-07	7.65E-13	2.39E-07
U-234	396,838,393	2.37E-14	4.05E-15	4.59E-15	9.39E-06	1.50E-03	4.73E-01
U-235	396,838,393	8.58E-16	1.67E-16	2.02E-16	3.41E-07	1.58E-01	1.43E-02
U-238	396,838,393	2.19E-14	3.74E-15	4.24E-15	8.68E-06	2.59E+01	3.65E-01
						Total:	1.67E+00

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.

The radionuclide Protactinium-234m does not have an ECV because 10 CFR 20 does not provide a value.

21G-01-0185
GOV-01-55-03
ACF-01-0208

Attachment C
To Letter Dated August 28, 2001
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Dose and Activity Concentration for the Maximally Exposed
Off-Site Individual for the Release Period
January - June 2001

(Three Pages to Follow)

Report on Potential Dose to the Maximally Exposed Offsite Individual and on Maximum Radionuclide Concentrations for the Period: January through June 2001 (Effluent Air)

Introduction

Average radionuclide concentrations in air effluents from stacks 416, 421, and 667 (as measured at the point of release) exceeded concentration values listed in 10 CFR Part 20, Appendix B, Table 2, Column 1 during the release period (i.e., the sum of fractions exceeded 1.0 at the point of release). For this reason, an evaluation was performed in accordance with SNM-124, Part I, Section 5.1.1.3 to estimate the potential dose to the maximally exposed off-site individual (MEI) and the maximum off-site activity concentrations in air. The source term for this evaluation was gaseous effluents released by NFS stacks and vents from January 1, 2001 through June 30, 2001 (provided in Attachment B of this transmittal). Methods used and results of this evaluation are summarized below.

Summary of Methods

In accordance with SNM-124, Section 5.1.1.4 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. CAP88-PC accommodates up to six stacks and considers stacks to be co-located (i.e., at the same physical location on the site). NFS operated sixteen (16) radiological stacks during the 1st half of 2001. Based on effluent types and stack physical characteristics, releases from these stacks were grouped into four effective stacks for modeling purposes. To accommodate the co-location limitation of the model, the four 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 taken to be 100 meters for all sectors and is conservative. Meteorological data were based on five-year average wind speed and direction frequencies as presented in NFS' 1996 Environmental 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 microns was assumed for modeling purposes since no information on actual particle sizes exists; this size is consistent with assumptions used in EPA Federal Guidance Report 11.

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 B) 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 a table 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 given above) to convert the "annualized" doses back to those doses that were actually received in the six-month release period. Activity concentrations reported below come directly from the CAP88-PC "Concentration Tables" report; no adjustments are needed for these concentrations. The CAP88PC 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 250 meters North Northeast from the center of the plant site. The effective dose equivalent (EDE) to the MEI was estimated to be 0.0153 mrem for gaseous effluents released during the 1st half of 2001. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 0.0972 mrem to the endosteal tissue (bone surfaces). These MEI doses are well below SNM-124 license action levels and applicable regulatory limits/ALARA constraints.

Table 2 summarizes the maximum off-site air activity concentrations, as determined by CAP88-PC, for radionuclides released. The total sum of fractions based on maximum values indicates that exposures to off-site public from gaseous effluents were much less than 1% of the 10 CFR 20, Appendix B, Table 2, Col. 1 values for all off-site receptors including the site boundary on out. 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 large 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 1. Organ Dose Equivalents and Effective Dose Equivalent at the MEI Location

Organ	Committed Dose Equivalent (mrem per 1st Half of 2001)
Gonads	8.13E-04
Breast	1.59E-04
Red Bone Marrow	7.59E-03
Lungs	8.28E-02
Thyroid	4.62E-04
Endosteal Tissue (Bone Surfaces)	9.72E-02
Remainder Organs	4.30E-03
Effective Dose Equivalent	1.53E-02 mrem
Location of MEI:	250 meters North Northeast

Notes: Dose results are from the CAP88-PC "Synopsis Report" generated for the 1st Half of 2001. CAP88-PC uses organ dose weighting factors equal to those in 10 CFR Part 20.1003 to compute the effective dose equivalent.

Table 2. Maximum Off-site Air Concentrations for Receptors at or Beyond the Site Boundary

Nuclide	Maximum Offsite Airborne Concentration	Location of Maximum Offsite Airborne Concentration		Value from 10 CFR Part 20, Appendix B, Table II, Col. 1	Ratio of Maximum Concentration to 10 CFR Part 20 Value
	(uCi/ml)	Sector	Distance (m)	(uCi/ml)	
Tc-99	1.6E-17	NNE	600	9E-10	1.8E-08
Ra-224	4.7E-19	NNE	250	2E-12	2.4E-07
Ra-228	5.3E-19	NNE	250	2E-12	2.7E-07
Ac-228	5.3E-19	NNE	250	2E-11	2.7E-08
Th-228	4.8E-19	NNE	250	2E-14	2.4E-05
Th-230	2.5E-19	NNE	250	2E-14	1.3E-05
Th-231	3.5E-19	NNE	250	9E-09	3.9E-11
Th-232	4.8E-19	NNE	250	4E-15	1.2E-04
Th-234	9.2E-18	NNE	250	2E-10	4.6E-08
Pa-234m	4.5E-18	NNE	200	not available	
U-232	1.1E-20	NNE	250	1E-14	1.1E-06
U-234	1.4E-17	NNE	450	5E-14	2.8E-04
U-235	3.3E-19	NNE	300	6E-14	5.5E-06
U-236	8.1E-19	NNE	650	6E-14	1.4E-05
U-238	6.1E-18	NNE	250	6E-14	1.0E-04
Pu-238	6.2E-20	NNE	250	2E-14	3.1E-06
Pu-239	6.9E-19	NNE	250	2E-14	3.5E-05
Pu-240	2.3E-19	NNE	250	2E-14	1.2E-05
Pu-241	6.4E-18	NNE	250	8E-13	8.0E-06
Am-241	3.4E-19	NNE	250	2E-14	1.7E-05
Total Sum of Fractions:					6.3E-04

Notes: 1) The maximum activity values shown above were extracted from the CAP88-PC "Concentration" output report generated for the 1st Half of 2001. 2) Appendix B of 10 CFR 20 does not provide any values for Pa-234m.

21G-01-0185
GOV-01-55-03
ACF-01-0208

Attachment D
To Letter Dated August 28, 2001
B. M. Moore to Mr. Luis A. Reyes (NRC)

Revised Report of Radioactivity in Effluent Liquid for the Period
July - December 2000

(One Page to Follow)

Radioactivity in Effluent Liquid July 1, 2000 to December 31, 2000

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	252,068,838	3.15E-11	4.20E-10	2.21E-10	7.94E-06	4.65E-07	1.58E-03
Pu-239/240	252,068,838	1.89E-10	1.34E-10	1.52E-10	4.75E-05	7.64E-04	9.43E-03
Tc-99	252,068,838	2.79E-09	8.37E-09	1.94E-08	7.04E-04	4.17E-02	4.66E-05
Th-228	252,068,838	1.95E-10	1.53E-10	2.20E-10	4.92E-05	6.00E-08	9.75E-04
Th-230	252,068,838	2.66E-10	1.53E-10	1.73E-10	6.72E-05	3.32E-03	2.66E-03
Th-232	252,068,838	3.12E-11	4.45E-11	8.96E-11	7.87E-06	7.22E+01	1.04E-03
U-234	252,068,838	7.47E-09	1.24E-09	1.99E-10	1.88E-03	3.02E-01	2.49E-02
U-235/236	252,068,838	2.44E-10	1.55E-10	1.82E-10	6.15E-05	2.85E+01	8.14E-04
U-238	252,068,838	1.35E-09	3.66E-10	1.59E-10	3.42E-04	1.02E+03	4.52E-03
						Total:	4.60E-02
Sewer							
Pu-238	19,773,794	1.84E-11	5.21E-10	2.73E-10	3.64E-07	2.13E-08	9.20E-05
Pu-239/240	19,773,794	3.93E-11	3.01E-10	1.59E-10	7.77E-07	1.25E-05	1.96E-04
Tc-99	19,773,794	1.81E-08	9.82E-09	1.97E-08	3.59E-04	2.12E-02	3.02E-05
Th-228	19,773,794	1.82E-10	2.12E-10	3.46E-10	3.60E-06	4.40E-09	9.11E-05
Th-230	19,773,794	1.29E-10	1.28E-10	1.94E-10	2.56E-06	1.27E-04	1.29E-04
Th-232	19,773,794	3.46E-12	6.65E-11	1.67E-10	6.84E-08	6.28E-01	1.15E-05
U-234	19,773,794	1.61E-08	2.64E-09	2.80E-10	3.18E-04	5.09E-02	5.35E-03
U-235/236	19,773,794	5.14E-10	2.77E-10	2.27E-10	1.02E-05	4.70E+00	1.71E-04
U-238	19,773,794	1.78E-09	5.24E-10	2.08E-10	3.52E-05	1.05E+02	5.93E-04
						Total:	6.67E-03
WWTF							
Cs-137	4,741,217	2.07E-09	2.43E-09	3.10E-09	9.80E-06	1.13E-07	2.07E-03
Na-22	4,741,217	-2.52E-10	1.61E-09	2.86E-09	-1.19E-06	-1.92E-10	-4.20E-05
Pu-238	4,741,217	8.35E-13	3.06E-10	9.49E-11	3.96E-09	2.32E-10	4.18E-05
Pu-239/240	4,741,217	2.71E-11	6.83E-10	7.46E-11	1.29E-07	2.07E-06	1.36E-03
Ra-224	4,741,217	1.65E-08	9.10E-09	1.57E-08	7.81E-05	4.91E-10	8.24E-02
Tc-99	4,741,217	1.02E-07	1.40E-08	1.86E-08	4.81E-04	2.85E-02	1.69E-03
Th-228	4,741,217	1.14E-10	1.18E-10	2.12E-10	5.43E-07	6.62E-10	5.72E-04
Th-230	4,741,217	1.38E-10	9.52E-11	1.24E-10	6.53E-07	3.23E-05	1.38E-03
Th-232	4,741,217	3.19E-12	2.75E-11	8.16E-11	1.51E-08	1.39E-01	1.06E-04
U-234	4,741,217	1.42E-07	1.79E-08	5.01E-10	6.71E-04	1.08E-01	4.72E-01
U-235/236	4,741,217	3.26E-09	8.40E-10	4.33E-10	1.55E-05	7.16E+00	1.09E-02
U-238	4,741,217	8.36E-10	4.28E-10	5.79E-10	3.96E-06	1.18E+01	2.79E-03
						Total:	5.75E-01

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B.