APPENDIX F-2

Soil and Sediment Data

TABLE F-2A
2007 Contaminants in On-Site Soils Downstream of the WVDP at Franks Creek (SNSP006)

RADIOACTIVE CONSTITUENTS

Isotope	*Units*	*N*	*SNSP006*	*Consultation Triggers [a] For Soil Contamination*		*NUREG-1757 Soil Screening Contamination Levels [b]*
				Residential	*Industrial Commercial*	
Gross Alpha	µCi/g	1	7.38±1.59E-06	--	--	--
Gross Beta	µCi/g	1	2.36±0.19E-05	--	--	--
K-40	µCi/g	1	1.56±0.13E-05	--	--	--
Co-60	µCi/g	1	1.05±2.16E-08	4E-06	6E-06	3.8E-06
Sr-90	µCi/g	1	4.90±0.95E-07	2.3E-05[c]	1.07E-03[c]	1.7E-06
Cs-137	µCi/g	1	5.00±0.41E-06	6E-06[c]	1.1E-05[c]	1.1E-05
U-232	µCi/g	1	1.92±3.32E-08	--	--	--
U-233/234	µCi/g	1	6.28±1.37E-07	4.01E-04	3.31E-03	1.3E-05
U-235/236	µCi/g	1	4.72±4.20E-08	2.0E-05[c]	3.9E-05[c]	8.0E-06[d]
U-238	µCi/g	1	5.84±1.33E-07	7.4E-05[c]	1.79E-04[c]	1.4E-05[d]
Total U	µg/g	1	2.24±0.07E+00	4.7E+01	1.23E+03	--
Pu-238	µCi/g	1	1.79±2.25E-08	2.97E-04	1.64E-03	2.5E-06
Pu-239/240	µCi/g	1	3.41±2.34E-08	2.59E-04	1.43E-03	2.3E-06
Am-241	µCi/g	1	4.34±3.78E-08	1.87E-04	5.68E-04	2.1E-06

N - Number of samples

-- No reference trigger available

[a] Memorandum of Understanding between the EPA and the NRC "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites."

[b] U.S. Nuclear Regulatory Commission. "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria." NUREG-1757, Vol. 2, Rev. 1. September 2006.

[c] Concentrations apply to the parent radionuclide but assume that the daughter products are present in equilibrium.

[d] WVDP-related uranium isotopes are not assumed to be in equilibrium with daughter products because of their relatively recent origin as processed nuclear materials. Therefore, the single-nuclide screening levels for U-235 and U-238 were selected for comparison with radionuclide concentrations in on-site soils.

TABLE F-2A *(concluded)*
2007 Contaminants in On-Site Soils Downstream of the WVDP at Franks Creek (SNSP006)

METALS

Analyte	*Units*	*N*	*SNSP006*	*Guidance Values*		
				Lowest Effect Level [a]	*Severe Effect Level* [a]	*No Appreciable Contamination Level* [b]
Aluminum	mg/kg (ppm)	1	6,550	--	--	--
Antimony	mg/kg (ppm)	1	<6.00	2.0	25.0	--
Arsenic	mg/kg (ppm)	1	8.8	6.0	33.0	14
Barium	mg/kg (ppm)	1	53	--	--	--
Beryllium	mg/kg (ppm)	1	<0.50	--	--	--
Cadmium	mg/kg (ppm)	1	<0.50	0.6	9.0	<1.2
Calcium	mg/kg (ppm)	1	13,900	--	--	--
Chromium	mg/kg (ppm)	1	9.2	26.0	110.0	--
Cobalt	mg/kg (ppm)	1	10	--	--	--
Copper	mg/kg (ppm)	1	13.8	16.0	110.0	<33
Iron	%	1	1.7	2.0	4.0	--
Lead	mg/kg (ppm)	1	11.8	31.0	110.0	<33
Magnesium	mg/kg (ppm)	1	5,620	--	--	--
Manganese	mg/kg (ppm)	1	629	460.0	1,100.0	--
Mercury	mg/kg (ppm)	1	<0.02	0.15	1.3	0.17
Nickel	mg/kg (ppm)	1	17.4	16.0	50.0	--
Potassium	mg/kg (ppm)	1	758	--	--	--
Selenium	mg/kg (ppm)	1	4.05	--	--	--
Silver	mg/kg (ppm)	1	2.3	1.0	2.2	--
Sodium	mg/kg (ppm)	1	<500	--	--	--
Thallium	mg/kg (ppm)	1	1.3	--	--	--
Vanadium	mg/kg (ppm)	1	14.5	--	--	--
Zinc	mg/kg (ppm)	1	67.6	120.0	270.0	--

N - Number of samples
-- No reference standard available
[a] Screening guidelines for chemical constituents obtained from NYSDEC "Technical Guidance for Screening Contaminated Sediments"
[b] NYSDEC: Draft Technical & Operational Guidance Series 5.1.9, "In-Water and Riparian Management of Sediment and Dredge Material," January 2003.

TABLE F-2B
2007 Contaminants in On-Site Soils From North Swamp (SNSW74A)

RADIOACTIVE CONSTITUENTS

Isotope	*Units*	*N*	*SNSW74A*	*Consultation Triggers [a] For Soil Contamination*		*NUREG-1757 Soil Screeening Contamination Levels [b]*
				Residential	*Industrial/ Commercial*	
Gross Alpha	µCi/g	1	1.33±0.19E-05	--	--	--
Gross Beta	µCi/g	1	2.04±0.17E-05	--	--	--
K-40	µCi/g	1	1.41±0.12E-05	--	--	--
Co-60	µCi/g	1	1.11±2.48E-08	4E-06	6E-06	3.8E-06
Sr-90	µCi/g	1	1.96±0.67E-07	2.3E-05[c]	1.07E-03[c]	1.7E-06
Cs-137	µCi/g	1	2.57±0.23E-06	6E-06[c]	1.1E-05[c]	1.1E-05
U-232	µCi/g	1	1.40±3.45E-08	--	--	--
U-233/234	µCi/g	1	8.71±1.58E-07	4.01E-04	3.31E-03	1.3E-05
U-235/236	µCi/g	1	1.01±0.54E-07	2.0E-05[c]	3.9E-05[c]	8E-06[d]
U-238	µCi/g	1	8.06±1.52E-07	7.4E-05[c]	1.79E-04[c]	1.4E-05[d]
Total U	µg/g	1	2.43±0.08E+00	4.7E+01	1.23E+03	--
Pu-238	µCi/g	1	1.14±2.07E-08	2.97E-04	1.64E-03	2.5E-06
Pu-239/240	µCi/g	1	7.31±3.29E-08	2.59E-04	1.43E-03	2.3E-06
Am-241	µCi/g	1	4.04±3.63E-08	1.87E-04	5.68E-04	2.1E-06

N - Number of samples
-- No reference trigger available

[a] Memorandum of Understanding between the EPA and the NRC "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites."

[b] U.S. Nuclear Regulatory Commission. "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria." NUREG-1757, Vol. 2, Rev. 1. September 2006.

[c] Concentrations apply to the parent radionuclide but assume that the daughter products are in equilibrium.

[d] WVDP-related uranium isotopes are not assumed to be in equilibrium with daughter products because of their relatively recent origin as processed nuclear materials. Therefore, the single-nuclide screening levels for U-235 and U-238 were selected for comparison with radionuclide concentrations in on-site soils.

TABLE F-2B *(concluded)*
2007 Contaminants in On-Site Soils From North Swamp (SNSW74A)

METALS

Analyte	*Units*	*N*	*SNSW74A*	*TAGM #4046 Recommended Soil Cleanup Objective* [a]	*6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objective* [b]
Aluminum	mg/kg (ppm)	1	6,330	33,000	--
Antimony	mg/kg (ppm)	1	<6.00	--	--
Arsenic	mg/kg (ppm)	1	8.4	3–12[c]	13
Barium	mg/kg (ppm)	1	45.1	15–600	350
Beryllium	mg/kg (ppm)	1	<0.50	0–1.75	7.2
Cadmium	mg/kg (ppm)	1	<0.50	0.1–1	2.5
Calcium	mg/kg (ppm)	1	39,000	130–35,000	--
Chromium	mg/kg (ppm)	1	9.6	1.5–40[c]	30
Cobalt	mg/kg (ppm)	1	5.3	2.5–60[c]	--
Copper	mg/kg (ppm)	1	21.8	1–50	50
Iron	mg/kg (ppm)	1	17,400	2,000–550,000	--
Lead	mg/kg (ppm)	1	13.8	4–61[d]	63
Magnesium	mg/kg (ppm)	1	7,320	100–5,000	--
Manganese	mg/kg (ppm)	1	496	50–5,000	1,600
Mercury	mg/kg (ppm)	1	0.02	0.001–0.2	0.18
Nickel	mg/kg (ppm)	1	13.7	0.5–25	30
Potassium	mg/kg (ppm)	1	648	8,500–43,000[c]	--
Selenium	mg/kg (ppm)	1	8.9	0.1–3.9	3.9
Silver	mg/kg (ppm)	1	<1.00	--	2
Sodium	mg/kg (ppm)	1	<500	6,000–8,000	--
Thallium	mg/kg (ppm)	1	<1.00	--	--
Vanadium	mg/kg (ppm)	1	10.4	1–300	--
Zinc	mg/kg (ppm)	1	146	9–50	109

N - Number of samples
-- No reference standard available
[a] NYSDEC: Technical and Administrative Guidance Memorandum (TAGM) #4046.
[b] 6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objectives
[c] New York State background
[d] Background levels for lead vary widely. Average levels in undeveloped rural areas may range from 4–61 ppm (reported here). Average background levels in metropolitain or suburban areas, or near highways are much higher and typically range from 200–500 ppm.

TABLE F-2C
2007 Contaminants in On-Site Soils From Northeast Swamp (SNSWAMP)

RADIOACTIVE CONSTITUENTS

Isotope	Units	N	SNSWAMP	Consultation Triggers [a] For Soil Contamination		NUREG-1757 Soil Screening Contamination Levels [b]
				Residential	Industrial/ Commercial	
Gross Alpha	µCi/g	1	2.02±0.27E-05	--	--	--
Gross Beta	µCi/g	1	6.45±0.28E-05	--	--	--
K-40	µCi/g	1	1.96±0.17E-05	--	--	--
Co-60	µCi/g	1	-0.52±2.69E-08	4E-06	6E-06	3.8E-06
Sr-90	µCi/g	1	1.71±0.06E-05	2.3E-05[c]	1.07E-03[c]	1.7E-06
Cs-137	µCi/g	1	1.66±0.13E-05	6E-06[c]	1.1E-05[c]	1.1E-05
U-232	µCi/g	1	4.79±4.23E-08	--	--	--
U-233/234	µCi/g	1	8.76±1.60E-07	4.01E-04	3.31E-03	1.3E-05
U-235/236	µCi/g	1	1.02±0.56E-07	2.0E-05[c]	3.9E-05[c]	8E-06[d]
U-238	µCi/g	1	9.07±1.63E-07	7.4E-05[c]	1.79E-04[c]	1.4E-05[d]
Total U	µg/g	1	2.55±0.09E+00	4.7E+01	1.23E+03	--
Pu-238	µCi/g	1	2.94±0.88E-07	2.97E-04	1.64E-03	2.5E-06
Pu-239/240	µCi/g	1	4.99±1.15E-07	2.59E-04	1.43E-03	2.3E-06
Am-241	µCi/g	1	9.80±1.69E-07	1.87E-04	5.68E-04	2.1E-06

N - Number of samples
-- No reference trigger available

[a] Memorandum of Understanding between the EPA and the NRC "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites."

[b] U.S. Nuclear Regulatory Commission. "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria." NUREG-1757, Vol. 2, Rev. 1. September 2006.

[c] Concentrations apply to the parent radionuclide but assume that the daughter products are in equilibrium.

[d] WVDP-related uranium isotopes are not assumed to be in equilibrium with daughter products because of their relatively recent origin as processed nuclear materials. Therefore, the single-nuclide screening levels for U-235 and U-238 were selected for comparison with radionuclide concentrations in on-site soils.

TABLE F-2C *(concluded)*
2007 Contaminants in On-Site Soils From Northeast Swamp (SNSWAMP)

METALS

Analyte	*Units*	*N*	*SNSWAMP*	*TAGM #4046 Recommended Soil Cleanup Objective* [a]	*6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objectives* [b]
Aluminum	mg/kg (ppm)	1	11,400	33,000	--
Antimony	mg/kg (ppm)	1	<6.00	--	--
Arsenic	mg/kg (ppm)	1	15.3	3–12[c]	13
Barium	mg/kg (ppm)	1	101	15–600	350
Beryllium	mg/kg (ppm)	1	0.65	0–1.75	7.2
Cadmium	mg/kg (ppm)	1	0.64	0.1–1	2.5
Calcium	mg/kg (ppm)	1	3,300	130–35,000	--
Chromium	mg/kg (ppm)	1	16	1.5–40[c]	30
Cobalt	mg/kg (ppm)	1	11.8	2.5–60[c]	--
Copper	mg/kg (ppm)	1	25.6	1–50	50
Iron	mg/kg (ppm)	1	29,900	2,000–550,000	--
Lead	mg/kg (ppm)	1	22.3	4–61[d]	63
Magnesium	mg/kg (ppm)	1	4,710	100–5,000	--
Manganese	mg/kg (ppm)	1	841	50–5,000	1,600
Mercury	mg/kg (ppm)	1	0.03	0.001–0.2	0.18
Nickel	mg/kg (ppm)	1	24.3	0.5–25	30
Potassium	mg/kg (ppm)	1	1,190	8,500–43,000[c]	--
Selenium	mg/kg (ppm)	1	3.81	0.1–3.9	3.9
Silver	mg/kg (ppm)	1	5.4	--	2
Sodium	mg/kg (ppm)	1	<500	6,000–8,000	--
Thallium	mg/kg (ppm)	1	<1.00	--	--
Vanadium	mg/kg (ppm)	1	19.3	1–300	--
Zinc	mg/kg (ppm)	1	109	9–50	109

N - Number of samples
-- No reference standard available
[a] NYSDEC: Technical and Administrative Guidance Memorandum (TAGM) #4046.
[b] 6 NYCRR Subpart 375-6.8(a) Remedial Program Soil Cleanup Objectives
[c] New York State background
[d] Background levels for lead vary widely. Average levels in undeveloped rural areas may range from 4–61 ppm (reported here). Average background levels in metropolitain or suburban areas, or near highways are much higher and typically range from 200–500 ppm.

TABLE F-2D
2007 Radioactivity in Surface Soils Collected at Air Stations Around the WVDP

Analyte	Units	N	SFRSPRD		Background Location SFGRVAL
Gross Alpha	µCi/g	1	1.73±0.42E-05	--	1.69±0.47E-05
Gross Beta	µCi/g	1	2.11±0.31E-05	--	2.18±0.32E-05
K-40	µCi/g	1	1.11±0.12E-05	--	1.28±0.10E-05
Co-60	µCi/g	1	1.61±2.82E-08	--	1.35±1.69E-08
Sr-90	µCi/g	1	8.26±3.75E-08	--	6.62±3.74E-08
Cs-137	µCi/g	1	1.47±0.14E-06	--	5.20±0.58E-07
U-232	µCi/g	1	0.45±2.01E-08	--	-1.85±8.63E-09
U-233/234	µCi/g	1	7.89±1.31E-07	--	6.75±1.18E-07
U-235/236	µCi/g	1	4.51±3.34E-08	--	4.78±3.27E-08
U-238	µCi/g	1	7.15±1.24E-07	--	7.98±1.27E-07
Total U	µg/g	1	1.83±0.05E+00	--	2.26±0.06E+00
Pu-238	µCi/g	1	0.95±1.86E-08	--	0.94±1.79E-08
Pu-239/240	µCi/g	1	3.80±3.72E-08	--	2.60±2.64E-08
Am-241	µCi/g	1	1.16±1.80E-08	--	0.41±1.75E-08
Analyte	**Units**	**N**	**SFFXVRD**	**SFRT240**	**Background Location SFGRVAL**
Gross Alpha	µCi/g	1	1.21±0.43E-05	1.51±0.45E-05	1.69±0.47E-05
Gross Beta	µCi/g	1	1.91±0.32E-05	2.04±0.29E-05	2.18±0.32E-05
K-40	µCi/g	1	9.75±0.88E-06	1.20±0.11E-05	1.28±0.10E-05
Co-60	µCi/g	1	1.65±2.29E-08	2.63±2.78E-08	1.35±1.69E-08
Sr-90	µCi/g	1	-1.68±2.54E-08	1.66±0.48E-07	6.62±3.74E-08
Cs-137	µCi/g	1	1.21±0.11E-06	5.10±0.60E-07	5.20±0.58E-07
Pu-238	µCi/g	1	0.00±1.28E-08	0.32±1.29E-08	0.94±1.79E-08
Pu-239/240	µCi/g	1	3.60±3.16E-08	1.56±2.15E-08	2.60±2.64E-08
Am-241	µCi/g	1	1.36±1.83E-08	-0.73±1.39E-08	0.41±1.75E-08
Analyte	**Units**	**N**	**SFWEVAL**	**SFSPRVL**	**Background Location SFGRVAL**
Gross Alpha	µCi/g	1	1.09±0.43E-05	1.65±0.46E-05	1.69±0.47E-05
Gross Beta	µCi/g	1	1.78±0.30E-05	2.07±0.32E-05	2.18±0.32E-05
K-40	µCi/g	1	1.31±0.12E-05	1.20±0.13E-05	1.28±0.10E-05
Co-60	µCi/g	1	1.73±2.76E-08	2.41±2.57E-08	1.35±1.69E-08
Sr-90	µCi/g	1	-2.68±2.64E-08	1.73±3.04E-08	6.62±3.74E-08
Cs-137	µCi/g	1	2.49±0.48E-07	4.55±0.75E-07	5.20±0.58E-07
Pu-238	µCi/g	1	0.72±1.40E-08	-3.03±4.20E-09	0.94±1.79E-08
Pu-239/240	µCi/g	1	1.80±2.47E-08	0.63±1.24E-08	2.60±2.64E-08
Am-241	µCi/g	1	0.96±1.68E-08	-0.86±1.28E-08	0.41±1.75E-08

N - Number of samples

TABLE F-2E
2007 Radioactivity in Stream Sediments Around the WVDP

Analyte	Units	N	SFCCSED	SFSDSED	N	Background Location SFBISED [a]
Gross Alpha	µCi/g	0	NR	NR	10	1.16±0.35E-05
Gross Beta	µCi/g	1	1.72±0.33E-05	1.57±0.30E-05	10	1.69±0.29E-05
K-40	µCi/g	1	1.08±0.08E-05	1.41±0.09E-05	10	1.37±0.15E-05
Co-60	µCi/g	1	-0.29±1.40E-08	0.31±1.08E-08	10	0.02±1.62E-08
Sr-90	µCi/g	1	-2.57±2.70E-08	-3.51±2.68E-08	10	0.04±4.97E-08
Cs-137	µCi/g	1	1.03±0.22E-07	9.99±1.91E-08	10	3.73±2.27E-08
U-232	µCi/g	1	1.36±2.40E-08	0.22±2.36E-08	10	0.00±5.52E-08
U-233/234	µCi/g	1	5.62±0.86E-07	7.16±0.98E-07	10	5.42±1.19E-07
U-235/236	µCi/g	1	4.10±2.74E-08	6.05±2.96E-08	10	5.73±3.88E-08
U-238	µCi/g	1	5.90±0.88E-07	8.45±1.07E-07	10	5.30±1.14E-07
Total U	µg/g	0	NR	NR	10	1.91±0.04E+00
Pu-238	µCi/g	1	0.55±1.33E-08	1.09±1.87E-08	10	1.11±1.86E-08
Pu-239/240	µCi/g	1	0.35±1.36E-08	-0.13±1.07E-08	10	1.44±1.44E-08
Am-241	µCi/g	1	0.16±1.62E-08	0.77±1.70E-08	10	1.70±2.24E-08
Analyte	***Units***	***N***	***SFTCSED***	***--***	***N***	***Background Location SFBCSED [b]***
Gross Alpha	µCi/g	0	NR	--	10	7.71±2.96E-06
Gross Beta	µCi/g	1	1.85±0.33E-05	--	10	1.67±0.30E-05
K-40	µCi/g	1	1.16±0.09E-05	--	10	1.41±0.14E-05
Co-60	µCi/g	1	-0.16±1.21E-08	--	10	0.05±2.01E-08
Sr-90	µCi/g	1	1.66±3.26E-08	--	10	2.69±5.21E-08
Cs-137	µCi/g	1	5.38±0.51E-07	--	10	3.74±2.76E-08
U-232	µCi/g	1	2.80±3.08E-08	--	10	2.01±5.75E-08
U-233/234	µCi/g	1	5.49±0.91E-07	--	10	6.66±1.25E-07
U-235/236	µCi/g	1	1.44±2.02E-08	--	10	5.37±3.72E-08
U-238	µCi/g	1	5.55±0.90E-07	--	10	6.98±1.28E-07
Total U	µg/g	0	NR	--	10	2.14±0.05E+00
Pu-238	µCi/g	1	0.27±1.08E-08	--	10	0.87±1.58E-08
Pu-239/240	µCi/g	1	0.54±1.52E-08	--	10	0.21±1.23E-08
Am-241	µCi/g	1	-0.77±1.67E-08	--	10	0.61±1.49E-08

N - Number of samples
NR - Gross alpha and total uranium results not reported due to failure of analytical quality control.
-- Not applicable; no additional sampling location

[a] Sediment sampling at Bigelow Bridge (SFBISED), the upstream Cattaraugus Creek background, was discontinued in 2005. The ten-year historical average is used as the comparative reference for the Cattaraugus Creek locations.

[b] Sampling data at the location upstream in Buttermilk Creek (SFBCSED) is presented as a ten-year rolling average and is used as a comparative reference for Thomas Corners in Buttermilk Creek (SFTCSED), immediately downstream of facility effluents.