Appendix G-1

Summary of Soil and Aquatic Sediment Guidelines and Standards

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Table G-1A
Eastern U.S. Background Concentrations for Elements in Soils[a]

Analyte	Units	Eastern U.S. Background Concentrations for Soil
Aluminum	mg/kg (ppm)	33,000
Antimony	mg/kg (ppm)	--
Arsenic	mg/kg (ppm)	3–12[b]
Barium	mg/kg (ppm)	15–600
Beryllium	mg/kg (ppm)	0–1.75
Cadmium	mg/kg (ppm)	0.1–1
Calcium	mg/kg (ppm)	130–35,000
Chromium	mg/kg (ppm)	1.5–40[b]
Cobalt	mg/kg (ppm)	2.5–60[b]
Copper	mg/kg (ppm)	1–50
Iron	mg/kg (ppm)	2,000–550,000
Lead	mg/kg (ppm)	4–61[c]
Magnesium	mg/kg (ppm)	100–5,000
Manganese	mg/kg (ppm)	50–5,000
Mercury	mg/kg (ppm)	0.001–0.2
Nickel	mg/kg (ppm)	0.5–25
Potassium	mg/kg (ppm)	8,500–43,000[b]
Selenium	mg/kg (ppm)	0.1–3.9
Silver	mg/kg (ppm)	--
Sodium	mg/kg (ppm)	6,000–8,000
Thallium	mg/kg (ppm)	--
Vanadium	mg/kg (ppm)	1–300
Zinc	mg/kg (ppm)	9–50

-- No reference level available for these analytes

[a] Source: New York State Department of Environmental Conservation "Technical and Administrative Guidance Memorandum (TAGM) #4046"

[b] New York State background

[c] Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4–61 ppm. Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200–500 ppm.

Table G-1B
Screening Concentrations for Elements in Contaminated Sediments[a]

Analyte	Units	Lowest Effect Level[b]	Severe Effect Level[c]
Aluminum	mg/kg (ppm)	--	--
Antimony	mg/kg (ppm)	2.0 (L)	25.0 (L)
Arsenic	mg/kg (ppm)	6.0 (P)	33.0 (P)
Barium	mg/kg (ppm)	--	--
Beryllium	mg/kg (ppm)	--	--
Cadmium	mg/kg (ppm)	0.6 (P)	9.0 (L)
Calcium	mg/kg (ppm)	--	--
Chromium	mg/kg (ppm)	26.0 (P)	110.0 (P)
Cobalt	mg/kg (ppm)	--	--
Copper	mg/kg (ppm)	16.0 (P)	110.0 (P)
Iron	%	2.0 (P)	4.0 (P)
Lead	mg/kg (ppm)	31.0 (P)	110.0 (L)
Magnesium	mg/kg (ppm)	--	--
Manganese	mg/kg (ppm)	460.0 (P)	1,100.0 (L)
Mercury	mg/kg (ppm)	0.15 (L)	1.3 (L)
Nickel	mg/kg (ppm)	16.0 (P)	50.0 (L)
Potassium	mg/kg (ppm)	--	--
Selenium	mg/kg (ppm)	--	--
Silver	mg/kg (ppm)	1.0 (L)	2.2 (L)
Sodium	mg/kg (ppm)	--	--
Thallium	mg/kg (ppm)	--	--
Vanadium	mg/kg (ppm)	--	--
Zinc	mg/kg (ppm)	120.0 (P/L)	270.0 (L)

-- No reference value available for these analytes

[a] Source: New York State Department of Environmental Conservation "Technical Guidance for Screening Contaminated Sediments," January 1999

[b] The Lowest Effect Level for each metal is the lowest of the either the Persaud et al. (1992) Lowest Effect Level or the Long and Morgan (1990) Effect Range-Low

[c] The Severe Effect Level for each metal is the lowest of either the Persaud et al. (1992) Severe Effect Level or the Long and Morgan (1990) Effect Range-Moderate

L - An "L" following a criterion indicates that it was taken from Long and Morgan (1990).

P - A "P" following a criterion indicates that it was taken from Persaud et al. (1992).

Table G-1C
Consultation Triggers for Residential and Commercial/Industrial Soil Contamination[a]

Radionuclide	Units	Residential Soil Concentration	Industrial/Commercial Soil Concentration
Co-60	µCi/g	4.0E-06	6.0E-06
Sr-90[b]	µCi/g	2.3E-05	1.1E-03
Cs-137[b]	µCi/g	6.0E-06	1.1E-05
U-234	µCi/g	4.0E-04	3.3E-03
U-235[b]	µCi/g	2.0E-05	3.9E-05
U-238[b]	µCi/g	7.4E-05	1.8E-04
Total U	µg/g	4.7E+01	1.2E+03
Pu-238	µCi/g	3.0E-04	1.6E-03
Pu-239	µCi/g	2.6E-04	1.4E-03
Am-241	µCi/g	1.9E-04	5.7E-04

[a] *Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites"*
[b] *Although concentrations triggers for these radionuclides were set taking the daughter products into consideration, values in this table are based on single contaminant concentrations. These concentrations may be directly compared with analytical results from the data tables.*

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Appendix G-2

Soil and Sediment Data

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Table G-2A
2005 Contaminants in On-Site Soils Downstream of the WVDP at Frank's Creek (SNSP006)

RADIOACTIVE CONSTITUENTS

Isotope	Units	N	SNSP006	Consultation Triggers[a] For Soil Contamination	
				Residential	Industrial/Commercial
Gross Alpha	µCi/g	1	1.12±0.14E-05	--	--
Gross Beta	µCi/g	1	3.02±0.20E-05	--	--
K-40	µCi/g	1	1.65±0.12E-05	--	--
Co-60	µCi/g	1	0.41±1.38E-08	4.0E-06	6.0E-06
Sr-90	µCi/g	1	4.14±0.54E-07	2.3E-05	1.1E-03
Cs-137	µCi/g	1	1.30±0.09E-05	6.0E-06	1.1E-05
U-232	µCi/g	1	6.77±4.99E-08	--	--
U-233/234	µCi/g	1	7.12±1.07E-07	4.0E-04	3.3E-03
U-235/236	µCi/g	1	7.31±3.86E-08	2.0E-05	3.9E-05
U-238	µCi/g	1	7.40±1.07E-07	7.4E-05	1.8E-04
Total U	µg/g	1	2.04±0.12E+00	4.7E+01	1.2E+03
Pu-238	µCi/g	1	2.80±2.19E-08	3.0E-04	1.6E-03
Pu-239/240	µCi/g	1	2.83±2.29E-08	2.6E-04	1.4E-03
Am-241	µCi/g	1	4.10±2.40E-08	1.9E-04	5.7E-04

Note: Effects of radiological soils and sediments are addressed with the evaluation of radiological dose to biota in Chapter 2.
N - Number of samples
-- No reference standard available
[a] Source: Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites"

Table G-2A (concluded)
2005 Contaminants in On-Site Soils Downstream of the WVDP at Frank's 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	1	7,755	--	--	--
Antimony	mg/kg	1	<0.42	2.0	25.0	--
Arsenic	mg/kg	1	8.8	6.0	33.0	14
Barium	mg/kg	1	65.6	--	--	--
Beryllium	mg/kg	1	0.42	--	--	--
Cadmium	mg/kg	1	0.16	0.6	9.0	<1.2
Calcium	mg/kg	1	13,700	--	--	--
Chromium	mg/kg	1	11.2	26.0	110.0	--
Cobalt	mg/kg	1	10.1	--	--	--
Copper	mg/kg	1	18.8	16.0	110.0	<33
Iron	%	1	1.8	2.0	4.0	--
Lead	mg/kg	1	12.4	31.0	110.0	<33
Magnesium	mg/kg	1	5,625	--	--	--
Manganese	mg/kg	1	628	460.0	1,100.0	--
Mercury	mg/kg	1	0.04	0.15	1.3	0.17
Nickel	mg/kg	1	21.6	16.0	50.0	--
Potassium	mg/kg	1	1,150	--	--	--
Selenium	mg/kg	1	<1.48	--	--	--
Silver	mg/kg	1	<0.10	1.0	2.2	--
Sodium	mg/kg	1	111	--	--	--
Thallium	mg/kg	1	<2.07	--	--	--
Vanadium	mg/kg	1	14.6	--	--	--
Zinc	mg/kg	1	73.2	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 and Operational Guidance Series 5.1.9, "In-Water Riparian Management of Sediment and Dredge Material," January 2003.*

Table G-2B
2005 Contaminants in On-Site Soils From North Swamp (SNSW74A)

RADIOACTIVE CONSTITUENTS

Isotope	Units	N	SNSW74A	Consultation Triggers[a] For Soil Contamination	
				Residential	Industrial/Commercial
Gross Alpha	µCi/g	1	1.10±0.13E-05	--	--
Gross Beta	µCi/g	1	2.38±0.18E-05	--	--
K-40	µCi/g	1	1.55±0.05E-05	--	--
Co-60	µCi/g	1	0.31±1.32E-08	4.0E-06	6.0E-06
Sr-90	µCi/g	1	6.93±2.23E-08	2.3E-05	1.1E-03
Cs-137	µCi/g	1	2.70±0.05E-06	6.0E-06	1.1E-05
U-232	µCi/g	1	-0.68±4.44E-08	--	--
U-233/234	µCi/g	1	7.50±1.00E-07	4.0E-04	3.3E-03
U-235/236	µCi/g	1	1.26±0.43E-07	2.0E-05	3.9E-05
U-238	µCi/g	1	7.12±0.98E-07	7.4E-05	1.8E-04
Total U	µg/g	1	1.74±0.06E+00	4.7E+01	1.2E+03
Pu-238	µCi/g	1	2.04±1.51E-08	3.0E-04	1.6E-03
Pu-239/240	µCi/g	1	5.24±2.55E-08	2.6E-04	1.4E-03
Am-241	µCi/g	1	6.10±2.66E-08	1.9E-04	5.7E-04

Note: Effects of radiological soils and sediments are addressed with the evaluation of radiological dose to biota in Chapter 2.
N - Number of samples
-- No reference standard available
[a] Source: Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites"

Table G-2B (concluded)
2005 Contaminants in On-Site Soils From North Swamp (SNSW74A)

METALS

Analyte	Units	N	SNSW74A	Reference Value[a]
Aluminum	mg/kg	1	4,910	33,000
Antimony	mg/kg	1	<0.36	--
Arsenic	mg/kg	1	6.5	3–12[b]
Barium	mg/kg	1	41.6	15–600
Beryllium	mg/kg	1	0.39	0–1.75
Cadmium	mg/kg	1	0.32	0.1–1
Calcium	mg/kg	1	119,000	130–35,000
Chromium	mg/kg	1	10.2	1.5–40[b]
Cobalt	mg/kg	1	4.3	2.5–60[b]
Copper	mg/kg	1	16.0	1–50
Iron	mg/kg	1	11,800	2,000–550,000
Lead	mg/kg	1	12.0	4–61[c]
Magnesium	mg/kg	1	8,440	100–5,000
Manganese	mg/kg	1	524	50–5,000
Mercury	mg/kg	1	0.02	0.001–0.2
Nickel	mg/kg	1	13.5	0.5–25
Potassium	mg/kg	1	1,060	8,500–43,000[b]
Selenium	mg/kg	1	<0.52	0.1–3.9
Silver	mg/kg	1	<0.10	--
Sodium	mg/kg	1	121.0	6,000–8,000
Thallium	mg/kg	1	<0.89	--
Vanadium	mg/kg	1	9.7	1–300
Zinc	mg/kg	1	114.0	9–50

N - Number of samples
-- No reference standard available
[a] *NYSDEC: Technical and Administrative Guidance Memorandum (TAGM) #4046.*
[b] *New York State background*
[c] *Background levels 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 G-2C
2005 Contaminants in On-Site Soils From Northeast Swamp (SNSWAMP)

RADIOACTIVE CONSTITUENTS

Isotope	Units	N	SNSWAMP	Consultation Triggers[a] For Soil Contamination	
				Residential	Industrial/Commercial
Gross Alpha	µCi/g	1	1.73±0.17E-05	--	--
Gross Beta	µCi/g	1	5.99±0.28E-05	--	--
K-40	µCi/g	1	1.39±0.07E-05	--	--
Co-60	µCi/g	1	1.65±1.66E-08	4.0E-06	6.0E-06
Sr-90	µCi/g	1	2.96±0.13E-06	2.3E-05	1.1E-03
Cs-137	µCi/g	1	5.22±0.09E-06	6.0E-06	1.1E-05
U-232	µCi/g	1	4.53±3.74E-08	--	--
U-233/234	µCi/g	1	8.37±1.05E-07	4.0E-04	3.3E-03
U-235/236	µCi/g	1	1.19±0.41E-07	2.0E-05	3.9E-05
U-238	µCi/g	1	7.87±0.99E-07	7.4E-05	1.8E-04
Total U	µg/g	1	1.88±0.15E+00	4.7E+01	1.2E+03
Pu-238	µCi/g	1	2.97±0.59E-07	3.0E-04	1.6E-03
Pu-239/240	µCi/g	1	3.59±0.64E-07	2.6E-04	1.4E-03
Am-241	µCi/g	1	6.06±0.88E-07	1.9E-04	5.7E-04

Note: Effects of radiological soils and sediments are addressed with the evaluation of radiological dose to biota in Chapter 2.
N - Number of samples
-- No reference standard available
[a] *Source: Memorandum of Understanding between the Environmental Protection Agency and the Nuclear Regulatory Commission "Consultation and Finality on Decommissioning and Decontamination of Contaminated Sites"*

Table G-2C (concluded)
2005 Contaminants in On-Site Soils From Northeast Swamp (SNSWAMP)

METALS

Analyte	Units	N	SNSWAMP	Reference Value[a]
Aluminum	mg/kg	1	10,900	33,000
Antimony	mg/kg	1	0.43	--
Arsenic	mg/kg	1	10.7	3–12[b]
Barium	mg/kg	1	74.1	15–600
Beryllium	mg/kg	1	0.67	0–1.75
Cadmium	mg/kg	1	<0.05	0.1–1
Calcium	mg/kg	1	3,090	130–35,000
Chromium	mg/kg	1	14.2	1.5–40[b]
Cobalt	mg/kg	1	8.5	2.5–60[b]
Copper	mg/kg	1	27.9	1–50
Iron	mg/kg	1	24,200	2,000–550,000
Lead	mg/kg	1	20	4–61[c]
Magnesium	mg/kg	1	3,720	100–5,000
Manganese	mg/kg	1	648	50–5,000
Mercury	mg/kg	1	0.04	0.001–0.2
Nickel	mg/kg	1	21.5	0.5–25
Potassium	mg/kg	1	1,280	8,500–43,000[b]
Selenium	mg/kg	1	<0.52	0.1–3.9
Silver	mg/kg	1	<0.10	--
Sodium	mg/kg	1	159	6,000–8,000
Thallium	mg/kg	1	<0.88	--
Vanadium	mg/kg	1	16.3	1–300
Zinc	mg/kg	1	92.1	9–50

N - Number of samples
-- No reference standard available
[a] *NYSDEC: Technical and Administrative Guidance Memorandum (TAGM) #4046.*
[b] *New York State background*
[c] *Background levels 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 G-2D
2005 Radioactivity in Surface Soils Collected at Air Stations Around the WVDP

In 2005, collection frequency was reduced to once every three years at these locations. The samples will next be collected in CY 2007.

Table G-2E
2005 Radioactivity in Stream Sediments Around the WVDP

Analyte	Units	N	SFCCSED	SFSDSED	N	Background Location SFBISED[a]
Gross Alpha	µCi/g	1	8.35±3.87E-06	1.34±0.50E-05	10	1.16±0.35E-05
Gross Beta	µCi/g	1	1.57±0.50E-05	2.68±0.56E-05	10	1.69±0.29E-05
K-40	µCi/g	1	1.30±0.11E-05	1.63±0.08E-05	10	1.37±0.15E-05
Co-60	µCi/g	1	1.34±2.37E-08	-0.80±1.92E-08	10	0.02±1.62E-08
Sr-90	µCi/g	1	1.35±2.76E-08	0.41±2.44E-08	10	0.04±4.97E-08
Cs-137	µCi/g	1	1.41±0.37E-07	-1.27±1.74E-08	10	3.73±2.27E-08
U-232	µCi/g	1	1.10±3.01E-08	1.41±2.93E-08	10	0.00±3.25E-08
U-233/234	µCi/g	1	6.38±1.39E-07	6.49±1.26E-07	10	5.42±1.19E-07
U-235/236	µCi/g	1	5.84±4.47E-08	1.21±0.56E-07	10	5.73±3.88E-08
U-238	µCi/g	1	6.70±1.43E-07	8.01±1.40E-07	10	5.30±1.14E-07
Total U	µg/g	1	1.76±0.05E+00	2.28±0.06E+00	10	1.91±0.04E+00
Pu-238	µCi/g	1	0.25±1.23E-08	0.00±1.11E-08	10	1.11±1.86E-08
Pu-239/240	µCi/g	1	-0.29±1.27E-08	1.43±1.96E-08	10	1.44±1.44E-08
Am-241	µCi/g	1	-0.09±1.35E-08	-0.60±1.28E-08	10	1.70±2.24E-08

Analyte	Units	N	SFTCSED		N	Background Location SFBCSED[b]
Gross Alpha	µCi/g	1	6.52±3.81E-06	--	10	9.18±3.16E-06
Gross Beta	µCi/g	1	1.86±0.50E-05	--	10	1.80±0.30E-05
K-40	µCi/g	1	1.30±0.10E-05	--	10	1.40±0.15E-05
Co-60	µCi/g	1	0.42±1.56E-08	--	10	-0.09±1.94E-08
Sr-90	µCi/g	1	1.62±2.28E-08	--	10	3.11±5.32E-08
Cs-137	µCi/g	1	7.16±0.80E-07	--	10	3.41±2.77E-08
U-232	µCi/g	1	0.73±2.52E-08	--	10	2.16±6.13E-08
U-233/234	µCi/g	1	5.49±1.23E-07	--	10	6.35±1.19E-07
U-235/236	µCi/g	1	7.32±4.55E-08	--	10	5.03±3.52E-08
U-238	µCi/g	1	4.86±1.15E-07	--	10	6.79±1.24E-07
Total U	µg/g	1	1.65±0.04E+00	--	10	2.19±0.05E+00
Pu-238	µCi/g	1	0.15±1.11E-08	--	10	2.69±1.90E-08
Pu-239/240	µCi/g	1	0.14±1.10E-08	--	10	0.91±1.24E-08
Am-241	µCi/g	1	0.62±1.12E-08	--	10	0.61±1.23E-08

N - Number of samples

-- 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.

Table G-2F
Metals and Organics From the Lag Storage Area (LSA) #2
Truck Staging Area Shallow Soil Characterization

Analyte	Soil Depth	N	LSA #2 Soil (mg/kg)	TAGM 4046 Action Level (mg/kg)	Proposed Site-Specific TAGM 4046 Soil Cleanup Action Level (mg/kg)
Barium	6–12 inches	2	32.9 22	300 or SB[a]	300
Cadmium	6–12 inches	2	0.31 0.17	1 or SB[a]	1
Chromium	6–12 inches	2	7.7 9.2	10 or SB[a]	19.7[b]
Lead	6–12 inches	2	(J)[c] 22.5 replicate 7.5 4.1 replicate 8.6	SB[a]	16.7[b]
Mercury	6–12 inches	2	<0.02 <0.02	0.1	0.1
Selenium	6–12 inches	2	<0.36 <0.36	2 or SB[a]	2
Silver	6–12 inches	2	<0.14 <0.14	SB[a]	0.37[b]
Benzene	6–12 inches	2	<0.008 <0.005 <0.004	0.06	0.06
PCBs:	0–2 inches	2	<0.14 <0.15	1.0	1.0 (Surface) 10.0 (Subsurface)
pcb 1016					
pcb 1221	0–2 inches	2	<0.14 <0.15		
pcb 1232	0–2 inches	2	<0.14 <0.15		
pcb 1242	0–2 inches	2	<0.14 <0.15		
pcb 1248	0–2 inches	2	<0.14 <0.15		
pcb 1254	0–2 inches	2	<0.14 <0.15		
pcb 1260	0–2 inches	2	(J)[d] 0.071 (J)[d] 0.10		

N - Number of samples

[a] SB - Site background; WVDP site backgrounds values were taken from the "Draft Corrective Measures Study Work Plan for the West Valley Demonstration Project (WVNSCO, January 2006).

[b] Data validation "J" flag indicates analyte was identified but the associated numerical value is an estimated quantity. The results were flagged because of imprecision between the two values.

[c] Data validation "J" flag indicates analyte was identified but the associated numerical value is an estimated quantity because the analyte was identified below the detection limit.

[d] The proposed cleanup action level is presented as the site-specific background level.