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TABLE 9-1

LIST OF SURFACE WATER AND SEDIMENT DATA GROUPS
USED FOR ECOLOGICAL RISK ASSESSSMENT
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Sedimentation Pond 4	Sedimentation[2] Ponds 2 & 3 and Stream Channels	Upper Simmons Reservoir		Lower Simmons Reservoir	Almy Reservoir	Almy Watershed	Background
SW/SED95-24	SW/SED95-14	SED93-21-I	SED93-31-O	SW/SED95-01	SW/SED95-10	SW/SED95-27	SW/SED95-30
	SW/SED95-15	SED93-23-I	SED93-32-ORE[3]	SW/SED95-02	SW/SED95-11	SW/SED95-28	SW/SED95-31
	SW/SED95-21	SED93-21-O	SW-95-04	SW/SED95-03	SW/SED95-12	SW/SED95-29	SW/SED95-38
	SW/SED95-22	SED93-22-O	SW-95-05	SW/SED98-53	SW/SED95-13	SW/SED95-32	SW/SED95-39
	SW/SED95-23	SED93-23-O	SW-95-06	SW/SED98-54		SW/SED96-48	SW/SED95-44
	SW/SED95-34	SED93-24-O	SW-95-07				SW/SED95-45
	SW/SED95-35	SED93-25-O	SW/SED-95-08				SW96-46
	SW/SED95-37	SED93-26-O	SW-95-09				SW/SED96-49
	SW/SED95-40	SED93-27-O	SW/SED95-42				
	SW/SED95-41	SED93-28-O	SW/SED95-43				Samples Eliminated from ERC[1a]
		SED93-29-ORE	SW/SED-98-50				
	Samples Eliminated from ERC[1]	SED93-30-O	SW/SED-98-51				SED96-46
			SW/SED-98-52				
	SW/SED95-16	Samples Eliminated from ERC[4]					
	SW/SED95-17						
	SW/SED95-19	SED93-24-I	SED-95-04				
	SW/SED95-20	SED93-26-I	SED-95-05				
	SW/SED95-25	SED93-27-I	SED-95-07				
	SW/SED95-26	SED93-30-I					
	SW96-47						

Notes:

1. These samples were eliminated from the ERC because of landscape changes that occurred at the landfill, or because the medium sampled was not representative of ecological exposure points, or due to the dredging of the Upper Simmons Reservoir. See Section 9.13.1 of the report text for details.

1a. This sample was eliminated from the sediment background data set because contaminant concentrations in the sample may have been significantly influenced by a know off-site source.

2. This exposure point includes data from the existing portions of Quarry Stream and Cedar Swamp Brook. Samples SW96-47 and SW95-19 were not used to develop EPCs for the Ecological Risk Assessment. These surface water samples were collected from groundwater seeps or Landfill leachate and were intended to characterize contaminant distribution and transport; not to characterize exposure. Data from locations SW/SED-16, -17, -20, -25, and -26 were not used because these stream sections and Sedimentation Pond 1 location are no longer present.

3. Sample SED93-32-0RE was a blind duplicate for SED93-26-O.

4. Data from landfill-derived sediment samples SED93-24-I, -26-I, -27-I, -30-I, SED95-04, -05, and -06 were not used because these sediments were dredged in 1996.

TABLE 9-2

SEDIMENTATION POND 4 SEDIMENT
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Benchmark [3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments [4]
Metals (mg/kg)						
Aluminum, total	58030	5590	5590	16700	No	Max < Benchmark & Background Max
Barium, total	-	98	98	88	Yes	No Benchmark Available
Beryllium, total	-	0.1	0.1	15	No	Max < Background Max
Chromium, total	26	8	8	14	No	Max < Benchmark & Background Max
Cobalt, total	50	7	7.1	7.4	No	Max < Benchmark & Background Max
Copper, total	16	11	11	15	No	Max < Benchmark & Background Max
Iron, total	20000	9470	9470	21500	No	Max < Benchmark & Background Max
Manganese, total	460	144	144	654	No	Max < Benchmark & Background Max
Nickel, total	16	3	3	16	No	Max < Benchmark & Background Max
Vanadium, total	-	11	11	41	No	Max < Background Max
Zinc, total	120	24	24	276	No	Max < Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-15 for benchmark sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. ND = Not Detected.

TABLE 9-3

SEDIMENTATION PONDS 2 AND 3 AND STREAM CHANNELS SEDIMENT
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Benchmark[3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained[4]	Comments[4]
Volatile Organic Compounds (mg/kg TOC)						
1,1,1-Trichloroethane	17	0.14	0.14		No	Max < Benchmark
Acetone	0.87	11.76	4.57		Yes	Max > Benchmark
Chlorobenzene	82	2.99	0.94		No	Max < Benchmark
Methyl ethyl Ketone	27	3.88	1.62		No	Max < Benchmark
Toluene	67	0.35	0.32		No	Max < Benchmark
Semivolatile Organic Compounds (mg/kg TOC)						
1,4-Dichlorobenzene	35	1.46	1.46		No	Max < Benchmark
4-Methylphenol	1.2	15.88	9.07		Yes	Max > Benchmark
Acenaphthene	62	3.74	3.46		No	Max < Benchmark
Anthracene	22	10	7.15		No	Max < Benchmark
Benzo(a)anthracene	11	31.75	19.02		Yes	Max > Benchmark
Benzo(a)pyrene	14	31.11	18.11		Yes	Max > Benchmark
Benzo(b)fluoranthene	24	48.24	26.75		Yes	Max > Benchmark
Benzo(g,h,i)perylene	17	10.79	7.58		No	Max < Benchmark
Benzo(k)fluoranthene	24	13.53	8.69		No	Max < Benchmark
bis(2-Ethylhexyl)phthalate	89000	182.35	102.74		No	Max < Benchmark
Butylbenzylphthalate	1100	212.60	40.53		No	Max < Benchmark
Carbazole	-	3.96	3.72		Yes	No Benchmark Available
Chrysene	34	31.75	18.67		No	Max < Benchmark
Di-n-butylphthalate	1100	28.95	14.86		No	Max < Benchmark
Di-n-octylphthalate	6.39E+08	21.76	10.49		No	Max < Benchmark
Dibenzofuran	200	2.83	2.83		No	Max < Benchmark
Fluoranthene	290	50.79	33.33		No	Max < Benchmark
Fluorene	54	4.59	4.23		No	Max < Benchmark
Indeno(1,2,3-c,d)pyrene	20	9.84	6.53		No	Max < Benchmark
Phenanthrene	85	33.53	21.61		No	Max < Benchmark
Phenol	3.1	5.18	4.18		Yes	Max > Benchmark
Pyrene	49	60.32	37.46		Yes	Max > Benchmark
Pesticides/PCBs (mg/kg TOC)						
Aldrin	0.2	0.71	0.30		Yes	Bioaccumulative, Max > Benchmark
alpha-Chlordane	280	0.26	0.15		Yes	Bioaccumulative
gamma-Chlordane	280	0.31	0.18		Yes	Bioaccumulative
Metals (mg/kg)						
Aluminum, total	58030	19800	13829	16700	No	Max < Benchmark
Arsenic, total	6	11	4	9	Yes	Max > Benchmark & Background Max
Barium, total	-	245	145	88	Yes	No Benchmark Available
Beryllium, total	-	4	2	15	No	Max < Background Max
Cadmium, total	0.60	0.89	0.26	4	No	Max < Background Max
Chromium, total	26	76	32	14	Yes	Max > Benchmark & Background Max
Cobalt, total	50	23	14	7	No	Max < Benchmark
Copper, total	16	82	37	15	Yes	Max > Benchmark & Background Max
Iron, total	20000	37100	24228	21500	Yes	Max > Benchmark & Background Max
Lead, total	31	179	68	209	No	Max < Background Max
Manganese, total	460	1210	673	654	Yes	Max > Benchmark & Background Max
Mercury, total	0.2	1	0.17	0.49	Yes	Max > Benchmark & Background Max
Nickel, total	16	25	11	16	Yes	Max > Benchmark & Background Max
Vanadium, total	-	43	25	41	Yes	No Benchmark Available
Zinc, total	120	467	224	276	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-15 for benchmark sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. ND = Not Detected.

TABLE 9-4

UPPER SIMMONS RESERVOIR SEDIMENT
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Benchmark [2]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained? [4]	Comments [4]
Volatile Organic Compounds (mg/kg TOC)						
1,1-Dichloroethane	2.7	0.03	0.03		No	Max < Benchmark
2-Hexanone	2.2	0.36	0.18		No	Max < Benchmark
Acetone	0.87	2.71	0.90		Yes	Max > Benchmark
Benzene	5.7	0.13	0.08		No	Max < Benchmark
Carbon Disulfide	0.085	0.71	0.24		Yes	Max > Benchmark
Chlorobenzene	82	2.66	0.38		No	Max < Benchmark
Methyl ethyl Ketone	27	0.74	0.28		No	Max < Benchmark
Methylene Chloride	37	0.32	0.17		No	Max < Benchmark
Styrene	-	0.03	0.03		Yes	No Benchmark Available
Tetrachloroethene	53	0.08	0.07		No	Max < Benchmark
Toluene	67	1.03	0.22		No	Max < Benchmark
Trichloroethene	160	0.08	0.07		No	Max < Benchmark
Xylenes	2.5	0.13	0.09		No	Max < Benchmark
Semivolatile Organic Compounds (mg/kg TOC)						
2-Methylnaphthalene	13	0.42	0.39		No	Max < Benchmark
Acenaphthene	62	0.68	0.62		No	Max < Benchmark
Acenaphthylene	-	0.53	0.36		Yes	No Benchmark Available
Anthracene	22	5.24	2.74		No	Max < Benchmark
Benzo(a)anthracene	11	20.6	5.33		Yes	Max > Benchmark
Benzo(a)pyrene	14	17.5	4.84		Yes	Max > Benchmark
Benzo(b)fluoranthene	24	24.8	6.30		Yes	Max > Benchmark
Benzo(g,h,i)perylene	17	7.34	3.28		No	Max < Benchmark
Benzo(k)fluoranthene	24	7.69	3.15		No	Max < Benchmark
bis(2-Ethylhexyl)phthalate	89000	1417	125.21		No	Max < Benchmark
Butylbenzylphthalate	1100	3.11	1.97		No	Max < Benchmark
Carbazole	-	2.27	1.87		Yes	No Benchmark Available
Chrysene	34	21.7	5.2		No	Max < Benchmark
Di-n-butylphthalate	1100	3.47	1.33		No	Max < Benchmark
Di-n-octylphthalate	6.39E+08	1850	374.2		No	Max < Benchmark
Dibenz(a,h)anthracene	6	3.22	1.98		No	Max < Benchmark
Dibenzofuran	200	2.90	2.07		No	Max < Benchmark
Diethylphthalate	63	0.54	0.34		No	Max < Benchmark
Fluoranthene	290	38.5	7.87		No	Max < Benchmark
Fluorene	54	2.06	1.2		No	Max < Benchmark
Indeno(1,2,3-c,d)pyrene	20	6.99	3.22		No	Max < Benchmark
Naphthalene	48	0.46	0.39		No	Max < Benchmark
Phenanthrene	85	14.3	5.2		No	Max < Benchmark
Pyrene	49	42	7.95		No	Max < Benchmark
Pesticides/PCBs (mg/kg TOC)						
4,4'-DDD	11	0.42	0.11		Yes	Bioaccumulative
4,4'-DDE	11	0.11	0.05		Yes	Bioaccumulative
4,4'-DDT	34	0.42	0.10		Yes	Bioaccumulative
Aldrin	0.2	0.02	0.01		Yes	Bioaccumulative
alpha-Chlordane	280	0.06	0.03		Yes	Bioaccumulative
delta-BHC	0.3	0.08	0.05		Yes	Bioaccumulative
Endosulfan-sulfate	0.54	0.02	0.02		Yes	Bioaccumulative
Endosulfan I	0.54	0.05	0.02		Yes	Bioaccumulative
gamma-Chlordane	280	0.04	0.02		Yes	Bioaccumulative
Methoxychlor	1.9	0.09	0.08		Yes	Bioaccumulative
PCB 1232	60	0.58	0.40		Yes	Bioaccumulative
PCB 1242	17	2.10	0.68		Yes	Bioaccumulative
PCB 1254	81	0.79	0.43		Yes	Bioaccumulative
Metals (mg/kg)						
Aluminum, total	58030	21300	12623	16700	No	Max < Benchmark
Arsenic, total	6	13.8	3.93	9	Yes	Max > Benchmark & Background Max
Barium, total	-	145	73.4	88	Yes	No Benchmark Available
Beryllium, total	-	29.8	12.7	15	Yes	No Benchmark Available
Cadmium, total	0.6	4.7	1.81	4	Yes	Max > Benchmark & Background Max
Chromium, total	26	19.8	12.0	14	No	Max < Benchmark
Cobalt, total	50	12.2	4.32	7	No	Max < Benchmark
Copper, total	16	36.1	20.5	15	Yes	Max > Benchmark & Background Max
Cyanide, total	-	14.90	5.09	ND	Yes	No Benchmark Available
Iron, total	20,000	37,500	14,532	21,500	Yes	Max > Benchmark & Background Max
Lead, total	31	88	43	209	No	Max < Background Max
Manganese, total	460	1130	481	654	Yes	Max > Benchmark & Background Max
Mercury, total	0.2	0.16	0.13	0.49	No	Max < Benchmark & Background Max
Nickel, total	16	55.4	13.62	16	Yes	Max > Benchmark & Background Max
Selenium, total	2.5	2.05	1.04	ND	No	Max < Benchmark
Vanadium, total	-	223	39.04	41	Yes	No Benchmark Available
Zinc, total	120	351	143.9	276	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location
3. See Table 9-15 for benchmark sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. ND = Not Detected.

TABLE 9-5

LOWER SIMMONS RESERVOIR SEDIMENT
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Benchmark[5]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments[4]
Volatile Organic Compounds (mg/kg TOC)						
Acetone	0.87	4.97	2.68		Yes	Max > Benchmark
Chloromethane	-	0.09	0.08		Yes	No Benchmark Available
Methyl ethyl Ketone	27	0.99	0.72		No	Max < Benchmark
Semivolatile Organic Compounds (mg/kg TOC)						
4-Chloro-3-methylphenol	-	3.08	3.08		Yes	No Benchmark Available
Benzo(a)anthracene	11	2.14	2.14		No	Max < Benchmark
Benzo(a)pyrene	14	2.71	2.71		No	Max < Benchmark
Benzo(b)fluoranthene	24	4.97	3.95		No	Max < Benchmark
Benzo(k)fluoranthene	24	2.17	2.17		No	Max < Benchmark
bis(2-Ethylhexyl)phthalate	89000	20.54	14.78		No	Max < Benchmark
Butylbenzylphthalate	1100	34.36	24.21		No	Max < Benchmark
Chrysene	34	3.16	3.16		No	Max < Benchmark
Fluoranthene	290	4.29	2.89		No	Max < Benchmark
Phenanthrene	85	1.83	1.83		No	Max < Benchmark
Pyrene	49	4.51	2.74		No	Max < Benchmark
Pesticides/PCBs (mg/kg TOC)						
4,4'-DDD	11	0.19	0.16		Yes	Bioaccumulative
4,4'-DDE	11	0.29	0.19		Yes	Bioaccumulative
alpha-Chlordane	280	0.10	0.08		Yes	Bioaccumulative
delta-BHC	0.3	0.18	0.13		Yes	Bioaccumulative
Endosulfan I	0.54	0.10	0.10		Yes	Bioaccumulative
Metals (mg/kg)						
Aluminum, total	58030	22400	11844	16700	No	Max < Benchmark
Antimony, total	2	1.3	0.71	ND	No	Max < Benchmark
Arsenic, total	6	16.3	9.72	8.8	Yes	Max > Benchmark & Background Max
Barium, total	-	287	172.8	88	Yes	No Benchmark Available
Beryllium, total	-	18	9.54	14.5	Yes	No Benchmark Available
Cadmium, total	0.6	5.9	3.54	3.8	Yes	Max > Benchmark & Background Max
Chromium, total	26	32.9	18.95	14.1	Yes	Max > Benchmark & Background Max
Cobalt, total	50	22.6	13.68	7.4	No	Max < Benchmark
Copper, total	16	37.2	22.08	14.7	Yes	Max > Benchmark & Background Max
Cyanide, total	-	12.1	6.31	ND	Yes	No Benchmark Available
Iron, total	20000	34800	24666	21500	Yes	Max > Benchmark & Background Max
Lead, total	31	93	61.66	209	No	Max <Background Max
Manganese, total	460	13900	8422	654	Yes	Max > Benchmark & Background Max
Mercury, total	0.2	0.37	0.24	0.49	No	Max <Background Max
Nickel, total	16	35.40	16.41	16.30	Yes	Max > Benchmark & Background Max
Selenium, total	2.5	5.00	2.86	ND	Yes	Max > Benchmark
Thallium, total	-	26.40	10.11	ND	Yes	No Benchmark Available
Vanadium, total	-	80.30	40.78	40.50	Yes	No Benchmark Available
Zinc, total	120	438.00	268.40	276.00	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-15 for benchmark sources.
4. Max = Maximum detected ; Background Max = Background Maximum
5. ND = Not Detected.

TABLE 9-6

ALMY RESERVOIR SEDIMENT
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Benchmark [3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments [4]
Semivolatile Organic Compounds (mg/kg TOC)						
4-Methylphenol	1.2	0.53	0.53		No	Max < Benchmark
Benzo(a)pyrene	14	0.97	0.97		No	Max < Benchmark
Benzo(b)fluoranthene	24	1.53	0.97		No	Max < Benchmark
Benzo(g,h,i)perylene	17	1.11	1.11		No	Max < Benchmark
bis(2-Ethylhexyl)phthalate	89000	6.14	3.74		No	Max < Benchmark
Butylbenzylphthalate	1100	1.50	1.25		No	Max < Benchmark
Chrysene	34	0.90	0.90		No	Max < Benchmark
Di-n-butylphthalate	1100	0.82	0.73		No	Max < Benchmark
Fluoranthene	290	1.53	1.05		No	Max < Benchmark
Phenanthrene	85	0.86	0.86		No	Max < Benchmark
Pyrene	49	1.41	0.96		No	Max < Benchmark
Metals (mg/kg)						
Aluminum, total	58030	21,000	17,325	16,700	No	Max < Benchmark
Arsenic, total	6	12.2	10.3	8.8	Yes	Max > Benchmark & Background Max
Barium, total	-	95.0	76.5	88	Yes	No Benchmark Avaialble
Beryllium, total	-	30.4	24.4	15	Yes	No Benchmark Avaialble
Cadmium, total	0.6	4.30	3.27	3.8	Yes	Max > Benchmark & Background Max
Chromium, total	26	11.9	10.5	14	No	Max < Benchmark & Backgrpound Max
Cobalt, total	50	13.6	11.6	7.4	No	Max < Benchmark
Copper, total	16	31.0	26.2	15	Yes	Max > Benchmark & Background Max
Iron, total	20000	29,600	25,550	21,500	Yes	Max > Benchmark & Background Max
Lead, total	31	262	194	209	Yes	Max > Benchmark & Background Max
Manganese, total	460	1,050	691	654	Yes	Max > Benchmark & Background Max
Mercury, total	0.2	0.50	0.42	0.49	Yes	Max > Benchmark & Background Max
Thallium, total	-	1.40	1.16	ND	Yes	No Benchmark Avaialble
Vanadium, total	-	51.9	48	41	Yes	No Benchmark Avaialble
Zinc, total	120	629	497	276	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-15 for benchmark sources.
4. Max = Maximum detected ; Background Max = Background maximum.
5. ND = Not Detected

TABLE 9-7

ALMY WATERSHED SEDIMENT
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Benchmark [3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments [4]
Volatile Organic Compounds (mg/kg TOC)						
Tetrachloroethene	53	3.38	0.74		No	Max < Benchmark
Semivolatile Organic Compounds (mg/kg TOC)						
Benzo(a)anthracene	11	0.67	0.67		No	Max < Benchmark
Benzo(a)pyrene	14	0.86	0.86		No	Max < Benchmark
Benzo(b)fluoranthene	24	1.22	1.22		No	Max < Benchmark
Benzo(g,h,i)perylene	17	0.67	0.67		No	Max < Benchmark
Butylbenzylphthalate	1100	26.3	7.74		No	Max < Benchmark
Chrysene	34	0.98	0.98		No	Max < Benchmark
Di-n-butylphthalate	1100	12.4	3.52		No	Max < Benchmark
Fluoranthene	290	2.04	1.54		No	Max < Benchmark
Phenanthrene	85	0.68	0.68		No	Max < Benchmark
Pyrene	49	2.14	1.76		No	Max < Benchmark
Pesticides/PCBs (mg/kg TOC)						
4,4'-DDD	11	0.37	0.10		Yes	Bioaccumulative
4,4'-DDE	11	0.66	0.16		Yes	Bioaccumulative
4,4'-DDT	34	0.10	0.042		Yes	Bioaccumulative
Endosulfan II	0.54	0.12	0.044		Yes	Bioaccumulative
Metals (mg/kg)						
Aluminum, total	58030	18,500	10,624	16,700	No	Max < Benchmark
Arsenic, total	6	3.00	1.72	8.8	No	Max < Benchmark & Background Max
Barium, total	-	152	80	88	Yes	No Benchmark Available
Beryllium, total	-	34.3	20.4	15	Yes	No Benchmark Available
Cadmium, total	0.6	6.90	3.88	3.8	Yes	Max > Benchmark & Background Max
Chromium, total	26	22.8	8.83	14	No	Max < Benchmark
Cobalt, total	50	24.5	9.52	7.4	No	Max < Benchmark
Copper, total	16	18.4	8.98	15	Yes	Max > Benchmark & Background Max
Iron, total	20,000	22,500	12,292	21,500	Yes	Max > Benchmark & Background Max
Lead, total	31	187	139	209	No	Max < Background Max
Manganese, total	460	8,670	2,477	654	Yes	Max > Benchmark & Background Max
Mercury, total	0.2	0.41	0.35	0.49	No	Max < Background Max
Nickel, total	16	13.2	5.59	16	No	Max < Benchmark & Background Max
Selenium, total	2.5	5.40	1.72	ND	Yes	Max > Benchmark
Silver, total	1	0.92	0.30	ND	No	Max < Benchmark
Thallium, total	-	16.2	5.0	ND	Yes	No Benchmark Available
Vanadium, total	-	25.7	17.9	41	No	Max < Background Max
Zinc, total	120	754	344	276	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-15 for benchmarks sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. ND = Not Detected.

TABLE 9-8

SEDIMENTATION POND 4 SURFACE WATER
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark [1]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments
Semivolatile Organic Compounds						
Butylbenzylphthalate	0.0019	0.01	0.01		Yes	Max > Benchmark
Total Metals						
Aluminum, total	0.087	0.0419	0.0419	0.3285	No	Max < Benchmark & Background Max
Arsenic, total	0.15	0.0035	0.0035	0.0034	No	Max < Benchmark
Barium, total	0.004	0.0383	0.0383	0.0274	Yes	Max > Benchmark & Background Max
Chromium, total	0.17 [5]	0.0017	0.0017	0.0015	No	Max < Benchmark
Cobalt, total	0.023	0.0006	0.0006	0.0008	No	Max < Benchmark & Background Max
Copper, total	0.019 [5]	0.0086	0.0086	0.0039	No	Max < Benchmark
Iron, total	1	0.1363	0.1363	0.5246	No	Max < Benchmark & Background Max
Manganese, total	6.85	0.0443	0.0443	0.0829	No	Max < Benchmark & Background Max
Mercury, total	0.00077	0.0006	0.0006	0.0008	No	Max < Benchmark & Background Max
Nickel, total	0.106 [5]	0.0027	0.0027	0.0010	No	Max < Benchmark
Vanadium, total	0.02	0.0016	0.0016	0.0019	No	Max < Benchmark & Background Max
Zinc,total	0.24 [5]	0.0340	0.0340	0.0538	No	Max < Benchmark & Background Max
Dissolved Metals						
Arsenic (As)	0.15	0.0028	0.0028	0.0043	No	Max < Benchmark & Background Max
Barium (Ba)	0.0040	0.0313	0.0313	0.0315	No	Max < Background Max
Beryllium (Be)	0.0053	0.0004	0.0004	0.0028	No	Max < Benchmark & Background Max
Chromium (Cr)	0.15 [5]	0.0009	0.0009	0.0018	No	Max < Benchmark & Background Max
Cobalt (Co)	0.023	0.0014	0.0014	0.0222	No	Max < Benchmark & Background Max
Copper (Cu)	0.018 [5]	0.0115	0.0115	0.0051	No	Max < Benchmark
Iron (Fe)	1	0.0073	0.0073	0.3640	No	Max < Benchmark & Background Max
Manganese (Mn)	6.50	0.0045	0.0045	0.0968	No	Max < Benchmark & Background Max
Nickel (Ni)	0.11 [5]	0.0019	0.0019	0.0036	No	Max < Benchmark & Background Max
Wet Chemistry						
Ammonia (N)	2.28	0.200	0.20	0.20	No	Max = Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-14 for benchmarks sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. Chronic AWQC based on the average hardness value of 230 mg/L from Sedimentation Pond 4 surface water.
6. ND = Not Detected.

TABLE 9-9

SEDIMENTATION PONDS 2 & 3 SURFACE WATER
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark[3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments[4]
Volatile Organic Compounds						
1,1,1-Trichloroethane	0.011	0.0007	0.0005		No	Max < Benchmark
Benzene	0.0059	0.0005	0.0005		No	Max < Benchmark
Chlorobenzene	0.018	0.0055	0.0026		No	Max < Benchmark
Chloromethane	2.2	0.0013	0.0007		No	Max < Benchmark
Ethylbenzene	0.036	0.0013	0.0006		No	Max < Benchmark
Toluene	0.014	0.0050	0.0010		No	Max < Benchmark
Semivolatile Organic Compounds						
4-Methylphenol	0.013	0.0053	0.0028		No	Max < Benchmark
Phenol	0.0056	0.0148	0.0039		Yes	Max > Benchmark
Pesticides/PCBs						
Aldrin	0.0003	0.00002	0.00001		Yes	Bioaccumulative
Total Metals						
Aluminum, total	0.087	1.62	0.63	0.33	Yes	Max > Benchmark & Background Max
Barium, total	0.004	0.0679	0.0550	0.027	Yes	Max > Benchmark & Background Max
Beryllium, total	0.00017	0.0036	0.0012	0.0024	Yes	Max > Benchmark & Background Max
Cadmium, total	0.0035 [5]	0.0010	0.0002	0.0004	No	Max < Benchmark
Chromium, total	0.13 [5]	0.0021	0.0012	0.0015	No	Max < Benchmark
Cobalt, total	0.023	0.0019	0.0011	0.0008	No	Max < Benchmark
Cyanide, total	0.0052	0.0115	0.0057	ND	Yes	Max > Benchmark
Iron, total	1	4.20	2.65	0.52	Yes	Max > Benchmark & Background Max
Lead, total	0.0057 [5]	0.0047	0.0025	ND	No	Max < Benchmark
Manganese, total	6.34	2.90	1.5329	0.083	No	Max < Benchmark
Mercury, total	0.00077	0.00083	0.0003	0.00080	Yes	Max > Benchmark & Background Max
Nickel, total	0.077 [5]	0.0059	0.0031	0.001	No	Max < Benchmark
Selenium, total	0.00461	0.0039	0.0020	ND	No	Max < Benchmark
Vanadium, total	0.02	0.0057	0.0027	0.0019	No	Max < Benchmark
Zinc, total	0.177 [5]	0.3873	0.0722	0.054	Yes	Max > Benchmark & Background Max
Dissolved Metals						
Barium (Ba)	0.0040	0.105	0.0614	0.032	Yes	Max > Benchmark & Background Max
Cadmium (Cd)	0.0031 [5]	0.0004	0.0002	ND	No	Max < Benchmark
Chromium (Cr)	0.11 [5]	0.0013	0.0007	0.0018	No	Max < Benchmark &Background Max
Lead (Pb)	0.0041 [5]	0.0017	0.0006	0.0019	No	Max < Benchmark &Background Max
Manganese (Mn)	6.02	4.20	1.7894	0.097	No	Max < Benchmark
Selenium (Se)	0.00461	0.0090	0.0039	0.0077	Yes	Max > Benchmark & Background Max
Vanadium (V)	0.02	0.0048	0.0027	ND	No	Max < Benchmark
Wet Chemistry						
Ammonia (N)	2.28	8.75	4.1278	0.2	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-14 for benchmark sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. Chronic AWQC based on the average hardness value of 159 mg/L from Sedimentation Ponds 2 & 3surface water.
6. ND = Not Detected.

TABLE 9-10

UPPER SIMMONS RESERVOIR SURFACE WATER
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark [3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments [4]
Volatile Organic Compounds						
1,1,2-Trichloroethane	0.02	0.0006	0.00051		No	Max < Benchmark
1,2-Dichlorobenzene	0.0018	0.002	0.00062		Yes	Max > Benchmark
1,2-Dichloropropane	0.058	0.0008	0.00053		No	Max < Benchmark
1,4-Dichlorobenzene	0.0012	0.004	0.00088		Yes	Max > Benchmark
Acetone	1.5	0.004	0.00292		No	Max < Benchmark
Benzene	0.0059	0.002	0.00065		No	Max < Benchmark
Carbon Tetrachloride	0.0098	0.0007	0.00052		No	Max < Benchmark
Chlorobenzene	0.018	0.088	0.010		Yes	Max > Benchmark
cis-1,2-Dichloroethene	0.59	0.0008	0.00052		No	Max < Benchmark
Tetrachloroethene	0.0053	0.0006	0.00051		No	Max < Benchmark
Semivolatile Organic Compounds						
bis(2-Ethylhexyl)phthalate	0.0120	0.006	0.0028		No	Max < Benchmark
Butylbenzylphthalate	0.0019	0.004	0.0027		Yes	Max > Benchmark
Di-n-butylphthalate	0.035	0.002	0.0020		No	Max < Benchmark
Diethylphthalate	0.058	0.002	0.002		No	Max < Benchmark
Pesticides/PCBs						
delta-BHC	0.0022	0.000012	5.58E-06		Yes	Bioaccumulative
Total Metals						
Aluminum, total	0.087	1.35	0.26	0.33	Yes	Max > Benchmark & Background Max
Arsenic, total	0.15	0.0023	0.0012	0.0027	No	Max < Benchmark & Background Max
Barium, total	0.004	0.189	0.08	0.027	Yes	Max > Benchmark & Background Max
Beryllium, total	0.00017	0.0016	0.0004	0.0024	No	Max < Background Max
Cadmium, total	0.0037 [5]	0.00055	0.0002	0.0004	No	Max < Benchmark
Chromium, total	0.131 [5]	0.0072	0.002	0.0015	No	Max < Benchmark
Cobalt, total	0.023	0.0047	0.001	0.0008	No	Max < Benchmark
Copper, total	0.014 [5]	0.0075	0.004	0.0039	No	Max < Benchmark
Cyanide, total	0.0052	0.01	0.005	ND	Yes	Max > Benchmark
Manganese, total	6.35	14.9	3.25	0.083	Yes	Max > Benchmark & Backgrd Max
Nickel, total	0.08 [5]	0.0227	0.01	0.001	No	Max < Benchmark
Selenium, total	0.00461	0.006	0.0022	ND	Yes	Max > Benchmark
Thallium, total	0.001	0.02	0.003	ND	Yes	Max > Benchmark
Vanadium, total	0.02	0.0115	0.003	0.0019	No	Max < Benchmark
Zinc,total	0.18 [5]	0.0605	0.02	0.054	No	Max < Benchmark
Dissolved Metals						
Barium (Ba)	0.004	0.167	0.06	0.032	Yes	Max > Benchmark & Background Max
Cobalt (Co)	0.023	0.0027	0.001	0.022	No	Max < Benchmark & Background Max
Copper (Cu)	0.0138 [5]	0.0148	0.003	0.0051	Yes	Max > Benchmark & Background Max
Iron (Fe)	1	0.605	0.11	0.36	No	Max < Benchmark
Manganese (Mn)	6.09	11.6	2.52	0.097	Yes	Max > Benchmark & Background Max
Nickel (Ni)	0.08 [5]	0.0154	0.004	0.0036	No	Max < Benchmark
Selenium (Se)	0.00461	0.0179	0.01	0.0077	Yes	Max > Benchmark & Background Max
Vanadium (V)	0.02	0.011	0.003	ND	No	Max < Benchmark
Zinc (Zn)	0.182 [5]	0.0088	0.0049	ND	No	Max < Benchmark
Wet Chemistry						
Ammonia (N)	2.28	33	10.32	0.2	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-14 for benchmarks sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. Chronic AWQC based on the average hardness value of 166 mg/L from Upper Simmons Reservoir surface water
6. ND = Not Detected.

TABLE 9-11

LOWER SIMMONS RESERVOR SURFACE WATER
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark [3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments [4]
Volatile Organic Compounds						
Acetone	1.5	0.004	0.0034		No	Max < Benchmark
Xylenes	0.0018	0.0010	0.0006		No	Max < Benchmark
Pesticides/PCBs						
4,4'-DDT	0.000013	1.00E-04	3.17E-05		Yes	Max > Benchmark & Bioaccumulative
Aldrin	0	2.50E-05	1.17E-05		Yes	Bioaccumulative
Endosulfan I	0.000051	1.10E-05	9.20E-06		Yes	Bioaccumulative
Total Metals						
Aluminum, total	0.087	1.44	0.36	0.330	Yes	Max > Benchmark & Background Max
Arsenic, total	0.15	0.0045	0.0021	0.00270	No	Max < Benchmark
Barium, total	0.004	0.112	0.07	0.0270	Yes	Max > Benchmark & Background Max
Beryllium, total	0.00017	0.00091	0.0004	0.0024	No	Max < Background Max
Chromium, total	0.11 [5]	0.0028	0.0018	0.002	No	Max < Benchmark
Cobalt, total	0.023	0.0022	0.0011	0.001	No	Max < Benchmark
Copper, total	0.013 [5]	0.007	0.01	0.004	No	Max < Benchmark
Iron, total	1	3	1.41	0.520	Yes	Max > Benchmark & Background Max
Manganese, total	6.20	2.55	1.84	0.083	No	Max < Benchmark
Nickel, total	0.07 [5]	0.0075	0.0040	0.001	No	Max < Benchmark
Silver, total	0.00012	0.0063	0.0016	0.001	Yes	Max > Benchmark & Background Max
Vanadium, total	0.02	0.0067	0.0035	0.002	No	Max < Benchmark
Zinc,total	0.16 [5]	0.0184	0.01	0.05	No	Max < Benchmark & Background Max
Dissolved Metals						
Arsenic (As)	0.15	0.0036	0.002	0.0043	No	Max < Benchmark & Background Max
Barium (Ba)	0.004	0.058	0.04	0.032	Yes	Max > Benchmark & Background Max
Beryllium (Be)	0.0053	0.0006	0.0003	0.0028	No	Max < Benchmark & Background Max
Chromium (Cr)	0.0986 [5]	0.0022	0.0008	0.0018	No	Max < Benchmark
Cobalt (Co)	0.023	0.002	0.0007	0.022	No	Max < Benchmark & Background Max
Copper (Cu)	0.012 [5]	0.0053	0.0028	0.0051	No	Max < Benchmark
Iron (Fe)	1	0.0374	0.04	0.36	No	Max < Benchmark & Background Max
Manganese (Mn)	5.89	1.71	1.32	0.097	No	Max < Benchmark
Nickel (Ni)	0.07 [5]	0.007	0.0039	0.0036	No	Max < Benchmark
Selenium (Se)	0.005	0.0077	0.0044	0.0077	No	Max = Background Max
Vanadium (V)	0.02	0.0063	0.0029	ND	No	Max < Benchmark
Zinc (Zn)	0.159 [5]	0.0055	0.0038	ND	No	Max < Benchmark
Wet Chemistry						
Ammonia (N)	2.28	5.7	3.36	0.20	Yes	Max > Benchmark & Background Max

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-14 for benchmarks sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. Chronic AWQC based on the average hardness value of 142 mg/L from Lower Simmons Reservoir surface water.
6. ND = Not Detected.

TABLE 9-12

ALMY RESERVOIR SURFACE WATER
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark [3]	Maximum Detected	Arithmetic Mean Concentration	Maximum Background	Retained?	Comments [4]
Total Metals						
Aluminum, total	0.087	0.044	0.026	0.33	No	Max < Benchmark & Background Max
Arsenic, total	0.15	0.0021	0.0019	0.0027	No	Max < Benchmark & Background Max
Barium, total	0.004	0.0081	0.0075	0.027	No	Max < Background Max
Beryllium, total	0.00017	0.0003	0.0002	0.0024	No	Max < Background Max
Chromium, total	0.0277	0.0010	0.0008	0.0015	No	Max < Benchmark & Background Max
Cobalt, total	0.023	0.0006	0.0004	0.0008	No	Max < Benchmark & Background Max
Copper, total	0.0029	0.0048	0.0036	0.0039	Yes	Max > Benchmark & Background Max
Iron, total	1	0.11	0.10	0.52	No	Max < Benchmark & Background Max
Manganese, total	4.33	0.031	0.025	0.083	No	Max < Benchmark & Background Max
Nickel, total	0.016	0.0012	0.0009	0.001	No	Max < Benchmark
Vanadium, total	0.02	0.0009	0.0006	0.0019	No	Max < Benchmark & Background Max
Zinc, total	0.037	0.011	0.0085	0.054	No	Max < Benchmark & Background Max
Dissolved Metals						
Aluminum (Al)	-	0.12	0.081	0.39	No	Max < Background Max
Arsenic (As)	0.150	0.0053	0.0046	0.0043	No	Max < Benchmark
Barium (Ba)	0.004	0.018	0.015	0.032	No	Max < Background Max
Beryllium (Be)	0.005	0.0008	0.0007	0.0028	No	Max < Benchmark & Background Max
Chromium (Cr)	0.024	0.0020	0.0014	0.0018	No	Max < Benchmark
Cobalt (Co)	0.023	0.0035	0.0029	0.022	No	Max < Benchmark & Background Max
Copper (Cu)	0.003	0.0093	0.0071	0.0051	Yes	Max > Benchmark & Background Max
Iron (Fe)	1	0.14	0.070	0.36	No	Max < Benchmark & Background Max
Lead (Pb)	0.001	0.0018	0.0008	0.0019	No	Max < Background Max
Manganese (Mn)	4.11	0.012	0.0091	0.097	No	Max < Benchmark & Background Max
Nickel (Ni)	0.016	0.0037	0.0029	0.0036	No	Max < Benchmark

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-14 for benchmark sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. ND = Not Detected.

TABLE 9-13

ALMY RESERVOIR WATERSHED SURFACE WATER
SELECTION OF CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark[3]	Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments[4]
Volatile Organic Compounds						
Carbon Disulfide	0.0009	0.0023	0.0010	0.06	Yes	Max > Benchmark
Tetrachloroethene	0.0053	0.0098	0.0024	ND	Yes	Max > Benchmark
Semivolatile Organic Compounds						
Butylbenzylphthalate	0.0019	0.0048	0.0031	0.0020	Yes	Max > Benchmark
Total Metals						
Aluminum, total	0.087	0.21	0.15	0.33	No	Max < Background Max
Arsenic, total	0.15	0.0034	0.0016	0.00270	No	Max < Benchmark
Barium, total	0.0040	0.020	0.011	0.0270	No	Max < Background Max
Beryllium, total	0.0002	0.0018	0.0013	0.0024	No	Max < Background Max
Chromium, total	0.0277	0.0005	0.0002	0.0015	No	Max < Benchmark & Background Max
Cobalt, total	0.0230	0.0011	0.0004	0.0008	No	Max < Benchmark
Copper, total	0.0029	0.0025	0.0014	0.0039	No	Max < Benchmark & Background Max
Iron, total	1	0.87	0.29	0.52	No	Max < Benchmark
Manganese, total	4.33	0.11	0.040	0.0830	No	Max < Benchmark
Mercury, total	0.0008	0.0003	0.0002	0.00080	No	Max < Benchmark & Background Max
Silver, total	0.0001	0.0055	0.0015	0.0014	Yes	Max > Benchmark & Background Max
Vanadium, total	0.020	0.0019	0.0007	0.0019	No	Max < Benchmark & Background Max
Zinc, total	0.037	0.043	0.026	0.05	No	Max < Background Max
Dissolved Metals						
Aluminum (Al)	-	0.36	0.21	0.39	No	Max < Background Max
Antimony (Sb)	0.030	0.0054	0.0028	ND	No	Max < Benchmark
Arsenic (As)	0.150	0.0038	0.0019	0.0043	No	Max < Benchmark & Background Max
Barium (Ba)	0.004	0.022	0.01355	0.032	No	Max < Background Max
Beryllium (Be)	0.005	0.0019	0.0013	0.0028	No	Max < Benchmark & Background Max
Cadmium (Cd)	0.001	0.0005	0.0003	ND	No	Max < Benchmark
Chromium (Cr)	0.024	0.0011	0.0005	0.002	No	Max < Benchmark & Background Max
Cobalt (Co)	0.023	0.0027	0.0010	0.022	No	Max < Benchmark & Background Max
Copper (Cu)	0.003	0.0075	0.0031	0.0051	Yes	Max > Benchmark & Background Max
Iron (Fe)	1	0.26	0.13	0.360	No	Max < Benchmark & Background Max
Lead (Pb)	0.00054	0.0028	0.0013	0.0019	Yes	Max > Benchmark & Background Max
Manganese (Mn)	4.11	0.10	0.079	0.0970	No	Max < Benchmark
Nickel (Ni)	0.016	0.0039	0.0018	0.0036	No	Max < Benchmark
Selenium (Se)	0.0046	0.005	0.0033	0.0077	No	Max < Background Max
Wet Chemistry						
Ammonia (N)	2.28	1	0.30	0.20	No	Max < Benchmark

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. See Table 9-14 for benchmark sources.
4. Max = Maximum Detected ; Background Max = Background Maximum.
5. ND = Not Detected.

TABLE 9-14

WATER QUALITY BENCHMARK CONCENTRATIONS
FOR PROTECTION OF AQUATIC LIFE
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Water Quality Benchmarks (mg/l)
Volatile Organic Compounds	
1,1,1-Trichloroethane	0.011 [4a]
1,1,2-Trichloroethane	0.02 [3]
1,2-Dichlorobenzene	0.0018 [3]
1,2-Dichloropropane	0.058 [3]
1,4-Dichlorobenzene	0.0012 [3]
Acetone	1.5 [4a]
Benzene	0.0059 [3]
Carbon Disulfide	0.00092 [4a]
Carbon Tetrachloride	0.0098 [4a]
Chlorobenzene	0.018 [3]
Chloroethane	-
Chloromethane	2.2 [4a]
cis-1,2-Dichloroethene	0.59 [4b]
Ethylbenzene	0.036 [3]
Methyl ethyl ketone	14 [4a]
Tetrachloroethene	0.0053 [3]
Toluene	0.014 [3]
Trichloroethene	0.043 [3]
Xylenes	0.0018 [4]
Semivolatile Organic Compounds	
2-Methylphenol	0.013 [4c]
4-Methylphenol	0.013 [4c]
bis(2-Ethylhexyl)phthalate	0.012 [3]
Butylbenzylphthalate	0.0019 [3]
Di-n-butylphthalate	0.035 [4a]
Diethylphthalate	0.058 [3]
Naphthalene	0.012 [4a]
N-Nitrosodiphenylamines	0.0065 [3]
Phenol	0.0056 [3]

TABLE 9-14

WATER QUALITY BENCHMARK CONCENTRATIONS
FOR PROTECTION OF AQUATIC LIFE
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Water Quality Benchmarks (mg/l)
Pesticides/PCBs	
alpha-BHC	0.0022 [4a]
delta-BHC	0.0022 [4a]
4,4'-DDD	0.000011 [4a]
4,4'-DDT	0.000013 [4]
Dieldrin	0.000056 [1]
Endosulfan I	0.000051 [4]
gamma-BHC(Lindane)	0.00095 [1]
Total Metals	
Aluminum, total	0.087 [2]
Antimony, total	0.03 [2]
Arsenic, total	0.15 [1]
Barium, total	0.004 [4a]
Beryllium, total	0.00017 [3]
Cadmium, total	0.0008 [1a]
Calcium, total	-
Chromium, total	0.028 [1a]
Cobalt, total	0.023 [4a]
Copper, total	0.0029 [1a]
Cyanide, total	0.0052 [1]
Iron, total	1 [1]
Lead, total	0.0005 [1a]
Magnesium, total	-
Manganese, total	4.33 [5]
Mercury, total	0.00077 [1]
Nickel, total	0.016 [1a]
Potassium, total	-
Selenium, total	0.005 [1]
Silver, total	0.00012 [2]
Sodium, total	-
Thallium, total	0.001 [3]
Vanadium, total	0.02 [4a]
Zinc, total	0.037 [1a]

TABLE 9-14

WATER QUALITY BENCHMARK CONCENTRATIONS
FOR PROTECTION OF AQUATIC LIFE
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Water Quality Benchmarks (mg/l)
Dissolved Metals	
Aluminum (Al)	-
Antimony (Sb)	0.03 [2]
Arsenic (As)	0.15 [1]
Barium (Ba)	0.004 [4a]
Beryllium (Be)	0.0053 [2]
Cadmium (Cd)	0.0008 [1a]
Calcium (Ca)	-
Chromium (Cr)	0.02 [1]
Cobalt (Co)	0.023 [4a]
Copper (Cu)	0.003 [1a]
Iron (Fe)	1 [1]
Lead (Pb)	0.0005 [1a]
Magnesium (Mg)	-
Manganese (Mn)	4.11 [5a]
Mercury (Hg)	7.70E-04 [1]
Nickel (Ni)	0.016 [1a]
Potassium (K)	-
Selenium (Se)	0.00461 [1]
Sodium (Na)	-
Vanadium (V)	0.02 [4a]
Zinc (Zn)	0.036 [1a]
Wet Chemistry	
Ammonia (N)	2.28 [1b]

Notes:

1. U.S. EPA Chronic Ambient Water Quality Criterion (AWQC) and Rhode Island Water Quality Standard (WQS).
1a. U.S. EPA Chronic AWQC based on a default hardness value of 25. Equations used for calculating total and dissolved metals criteria are presented in USEPA National Recommended Water Quality Criteria, Federal Register, December 10, 1998.
1b. Ammonia benchmark is the chronic AWQC based on a pH of 7.5 which is conservatively representative of conditions at the site at the time the surface water samples were collected.
2. Chronic Lowest Observed Effects Level (LOEL) cited by U.S. EPA in the Ambient Water Quality Criteria Document.
3. Chronic Minimum Data Base Guideline (MDBG) developed by Rhode Island DEM, derived by dividing an Acute LOEL by a factor of 900.
4. Chronic Tier II values presented as Ecotox Thresholds by the EPA Office of Solid Waste and Emergency Response (EPA, 1996).
4a. Many of the Tier II chronic Ecotox values used by EPA (1996) were developed by Oak Ridge National Laboratories in 1994. These values are updated ORNL Screening values presented in Suter and Tsao, 1996.
4b. The Tier II value for 1,2-dichloroethene was used as the benchmark for cis-1,2-dichloroethene (Suter, and Tsao,1996).
4c. The Tier II value for 2-methylphenol was used as the benchmark for 4-methylphenol (Suter, and Tsao,1996).
5. This benchmark for total manganese is the 25% Inhibition Concentration (IC25) for survival and growth of brown trout presented in Stubblefield et al., 1997, based on a hardness value of 25.
5a. This benchmark for dissolved manganese is 95% of the total manganese benchmark value (Stubblefield et al., 1997).

TABLE 9-15

SEDIMENT QUALITY BENCHMARK CONCENTRATIONS
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Sediment Quality Benchmarks
Volatile Organic Compounds (mg/kg TOC)	
1,1,1-Trichloroethane	17 [2a]
1,1-Dichloroethane	2.7 [4]
2-Hexanone	2.20 [4]
Acetone	0.87 [4]
Benzene	5.7 [2a]
Carbon Disulfide	0.09 [4]
Chlorobenzene	82 [2a]
Methyl ethyl Ketone	27 [4]
Methylene Chloride	37 [4]
Styrene	-
Tetrachloroethene	53 [2a]
Toluene	67 [2a]
Trichloroethene	160 [2a]
Xylenes	2.5 [2b]
Semivolatile Organic Compounds (mg/kg TOC)	
1,4-Dichlorobenzene	35 [2a]
2-Methylnaphthalene	13 [4c]
4-Methylphenol	1.2 [4d]
Acenaphthene	62 [2]
Acenaphthylene	-
Anthracene	22 [4]
Benzo(a)anthracene	11 [4]
Benzo(a)pyrene	14 [4]
Benzo(b)fluoranthene	24 [3]
Benzo(g,h,i)perylene	17 [1a]
Benzo(k)fluoranthene	24 [1a]
bis(2-Ethylhexyl)phthalate	8.90E+04 [4]
Butylbenzylphthalate	1100 [2a]
Carbazole	-
Chrysene	34 [1a]
Di-n-butylphthalate	1100 [2a]
Di-n-octylphthalate	6.39E+08 [4b]
Dibenz(a,h)anthracene	6 [1a]
Dibenzofuran	200 [2a]
Diethylphthalate	63 [2a]
Fluoranthene	290 [2]
Fluorene	54 [2a]
Indeno(1,2,3-c,d)pyrene	20 [1a]
Naphthalene	48 [2a]
Phenanthrene	85 [2]
Phenol	3.10 [4]
Pyrene	49 [1a]

TABLE 9-15

SEDIMENT QUALITY BENCHMARK CONCENTRATIONS
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Sediment Quality Benchmarks
Pesticides/PCBs (mg/kg TOC)	
4,4'-DDD	11 [4]
4,4'-DDE	11 [4c]
4,4'-DDT	34 [4]
Aldrin	0.20 [1a]
alpha-Chlordane	280 [4a]
delta-BHC	0.3 [1d]
Endosulfan-sulfate	0.54 [2c]
Endosulfan I	0.54 [2c]
Endosulfan II	0.54 [2c]
gamma-Chlordane	280 [4a]
Methoxychlor	1.9 [2a]
PCB 1232	60 [4]
PCB 1242	17 [4]
PCB 1254	81 [4]
Metals (mg/kg dry wgt.)	
Aluminum, total	58,030 [5]
Antimony, total	2 [1c]
Arsenic, total	6 [1a]
Barium, total	-
Beryllium, total	-
Cadmium, total	0.6 [1a]
Calcium, total	-
Chromium, total	26 [1a]
Cobalt, total	50 [1b]
Copper, total	16 [1a]
Iron, total	20,000 [1a]
Lead, total	31 [1a]
Magnesium, total	-
Manganese, total	460 [1a]
Mercury, total	0.2 [1a]
Nickel, total	16 [1a]
Potassium, total	-
Selenium, total	2.5 [6]
Silver, total	1 [1c]
Sodium, total	-
Thallium, total	-
Vanadium, total	-
Zinc, total	120 [1a]

TABLE 9-15

SEDIMENT QUALITY BENCHMARK CONCENTRATIONS
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Notes:

1a. Lowest Effect Levels (LELs) from Ontario Ministry of the Environment (Persaud et al., 1993), as presented in Jones and Suter, 1997. LELs are levels at or below which sediment contaminants are not expected to adversely, effect most benthic species.
1b. Ontario Ministry of the Environment Open Water Disposal Guidelines (Persaud et al., 1993).
1c. Effects Range - Low (ER-L) from Long and Morgan (1990). ER-Ls are the tenth percentile of sediment contaminant levels which resulted in observed or predicted adverse effects to benthic organisms.
1d. This value is the LEL for lindane (gamma BHC) presented in the same source as 1a.
2. EPA Sediment Quality Criterion (SQC) for freshwater. SQCs are presented in the Ecotox Thresholds document from the EPA Office of Solid Waste and Emergency Response (EPA, 1996).
2a. Sediment Quality Benchmark based on Equilibrium Partitioning method. SQBs are Ecotox Thresholds from EPA Office of Solid Waste and Emergency Response (EPA, 1996).
2b The benchmark for xylenes is the SQB for m-xylene from same source as 2a above.
2c. This value is the SQB for endosulfan, mixed isomers from the same source as 2a above.
3. Lowest Effect Level for benzo(k)fluoranthene from Persaud et al. (1993), normalized to mg/kg TOC.
4. Sediment Quality Benchmark based on Equilibrium Partitioning (EpP) method from Jones and Suter, 1997
4a. Values for alpha and gamma chlordanes are the SQB for chlordane based on EpP method from the same source as 4 above.
4b. Equilibrium partitioning-based sediment quality benchmark for di-n-octylphthalate calculated using log Koc from EPA (1986),and water quality benchmark (Lowest Chronic Value) from Suter and Tsao, (1996). Because higher molecular weight esters (6 or more C atoms) are not considered to be toxic to aquatic organisms (Staples et al., 1997), this value is considered to be a suitable benchmark for di-n-octylphtalate.
4c. This value is the SQB for 1-methylnaphthalene based on the EqP method from the same source as 4.
4d. This value is the SQB for 2-methylphenol based on the EqP method from the same source as 4 above.
4e. This value is the SQB for p,p'-DDD based on the EqP method from the same source as 4 above.
5. This value is the Probable Effect Concentration calculated as part of the Assessment and Remediation of Contaminated Sediment (ARCS) Project (EPA, 1996) presented in Jones and Suter 1997.
6. Selenium sediment benchmark was developed using the same methods as Long and Morgan (1990) ER-Ls by Van Derveer and Canton (1997). "Predicted Effects" data for freshwater sediment were used to develop ER-L, which was a lower benchmark than that based on "Observed Effects" data (4.0 ppm).

TABLE 9-16

COMPARIONS OF METAL CONCENTRATION RANGES IN OU2 EXOPOSURE AREA SEDIMENT TO
NORMAL METAL CONCENTRATIONS IN MASSACHUSETTS LAKE SEDIMENTS
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island
(mg/kg)

Contaminant	Normal Concentrations In Massachusetts Lake Sediments	Sedimentation Ponds 2 &3 and Channels		Sedimentation Pond 4	Upper Simmons Reservoir		Lower Simmons Reservoir		Almy Reservoir		Almy Reservoir Watershed	
		Average	Max	Average	Average	Max	Average	Max	Average	Max	Average	Max
Metals												
Arsenic, total	< 25	4.44	10.8	ND	3.93	13.8	9.7	16.3	10.3	12.2	1.72	3
Cadmium, total	< 5	0.26	0.89	ND	1.81	4.7	4.4	5.9	3.27	4.3	3.88	6.9
Chromium, total	< 30	32	76.2	8.4	12.0	19.8	19	32.9	10.5	11.9	8.83	22.8
Copper, total	< 70	37	81.8	10.9	20.5	36.1	22.1	37.2	26.2	31	8.98	18.4
Iron, total	< 30,000	24,228	37,100	9,470	14,532	37,500	24,666	34,800	25,550	29,600	12,292	22,500
Lead, total	< 200	68	179	ND	43.1	87.9	61.7	93	194	262	139	187
Manganese, total	< 350	673	1210	144	481	1130	8,422	13,900	691	1,050	2,477	8,670
Mercury, total	< 0.35	0.17	0.6	ND	0.13	0.16	0.24	0.37	0.42	0.5	0.35	0.41
Nickel, total	< 35	11	24.7	3.2	13.6	55.4	16.4	35.4	ND		5.59	13.2
Vanadium, total	< 60	25	42.7	11.4	39	223	40.8	80.3	48.3	51.9	18	25.7
Zinc, total	< 250	224	467	24	144	351	268	438	497	629	344	754

Notes:
1. From Rojoko, 1996.

TABLE 9-17

SURFICIAL SOIL
SELECTION OF CONTAMINANTS OF CONCERN
Central Landfill - OU2
Johnston, Rhode Island
(mg/kg)

Contaminant	Benchmark[2]		Maximum Detected	Arithmetic Mean Concentration	Background Maximum	Retained?	Comments[1]
Volatile Organic Compounds							
1,1,1-Trichloroethane	-		0.092	0.019	0.017	Yes	No bncmk available
1,1-Dichloroethane	20	[4]	0.022	0.0067	0.006	No	max < bnchmk
Methyl ethyl ketone	-		0.0020	0.002	ND	Yes	No bncmk available
Toluene	200	P	0.0020	0.0013	ND	No	max < bnchmk
Xylenes	20	[4]	0.0030	0.0025	ND	No	max < bnchmk
Semivolatile Organic Compounds							
2-Methylphenol	-		0.13	0.13	ND	Yes	No bncmk available
Anthracene	-		0.073	0.073	ND	Yes	No bncmk available
Benzo(a)anthracene	-		0.29	0.16	ND	Yes	No bncmk available
Benzo(a)pyrene	-		0.28	0.17	ND	Yes	No bncmk available
Benzo(b)fluoranthene	-		0.59	0.19	ND	Yes	No bncmk available
Benzo(g,h,i)perylene	-		0.15	0.13	ND	Yes	No bncmk available
Benzo(k)fluoranthene	-		0.18	0.12	ND	Yes	No bncmk available
bis(2-Ethylhexyl)phthalate	-		24	2.4	0.098	Yes	No bncmk available
Carbazole	-		0.075	0.075	ND	Yes	No bncmk available
Chrysene	-		0.35	0.14	ND	Yes	No bncmk available
Di-n-butylphthalate	200	P	0.17	0.11	ND	No	max < bnchmk
Fluoranthene	-		0.63	0.21	0.055	Yes	No bncmk available
Indeno(1,2,3-c,d)pyrene	-		0.11	0.076	ND	Yes	No bncmk available
Phenanthrene	-		0.42	0.17	ND	Yes	No bncmk available
Pyrene	-		0.77	0.25	0.067	Yes	No bncmk available
Pesticides/PCBs							
4,4'-DDD	-		0.010	0.0037	ND	Yes	Bioaccumulative
4,4'-DDE	-		0.037	0.0099	0.0140	Yes	Bioaccumulative
4,4'-DDT	-		0.11	0.022	0.0087	Yes	Bioaccumulative
Aldrin	-		0.0037	0.0015	ND	Yes	Bioaccumulative
alpha-Chlordane	-		0.0040	0.0017	ND	Yes	Bioaccumulative
Endosulfan-sulfate	-		0.0059	0.0029	ND	Yes	Bioaccumulative
Metals							
Aluminum, total	50	P	12,900	6335	15300	No	max < backgrd max
Arsenic, total	10	P	9.78	4.2	9.6	No	max < bnchmk
Barium, total	500	P	69	33	37.8	No	max < bnchmk
Beryllium, total	10	P	2.88	1.2	4.8	No	max < bnchmk & bckgrd max
Cadmium, total	4	P	0.52	0.18	0.26	No	max < bnchmk
Calcium, total	-		3,150	1050	513	No	
Chromium, total	0.4	E	12.3	6.4	8.3	Yes	
Cobalt, total	20	P	5.80	3.1	5	No	max < bnchmk
Copper, total	50	E	21.7	11	7.1	No	max < bnchmk
Cyanide, total	-		2.50	1.3	ND	Yes	No bncmk available
Iron, total	-		20,600	10567	18600	Yes	No bncmk available
Lead, total	50	P	145	66	63.9	Yes	
Magnesium, total	-		1,468	569	956	No	
Manganese, total	500	P	556	194	215	Yes	
Nickel, total	30	P	8.60	4.3	ND	No	max < bnchmk
Potassium, total	-		2620	741	907	No	
Selenium, total	1	P	1.43	0.65	ND	Yes	
Sodium, total	-		405	97	ND	No	
Vanadium, total	2	P	38.9	23	30	Yes	
Zinc, total	50	P	3393	298	85.9	Yes	

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (U).
2. If a location was sampled more than once, the summary statistics are based on the average concentrations at that location.
3. Benchmarks are P = Soil plant toxicity benchmarks or E = Soil invertebrate toxicity benchmarks presented in Efroymson et al. (1997a and b, respectively), unless otherwise noted.
4. Plant benchmark concentrations for trichloroethane and xylenes were presented by Efroymson et al., (1997a) in terms of soil solution as 100 mg/L. These benchmarks were converted to a soil dry weight basis by multiplying by the lowest soil moisture content (0.20, as a fraction) measured for surficial soil samples from OU2.
5. max = Maximum Detected ; bnchmk = Benchmark ; bckgrd max = Background Maximum.

TABLE 9-18

UPPER SIMMONS RESERVOIR
FUTURE SURFACE WATER CONTAMINANT OF POTENTIAL ECOLOGICAL CONCERN (mg/l)
Central Landfill - OU2
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark	Arithmetic Mean Concentration	Retained?	Commnets
Semivolatile Organic Compounds				
bis(2-Ethylhexyl)phthalate	0.012	0.0014	No	Mean < Benchmark
Di-n-butylphthalate	0.035	0.0007	No	Mean < Benchmark
Naphthalene	0.012	0.0004	No	Mean < Benchmark
Pesticides/PCBs				
4,4'-DDD	0.000011	0.000002	Yes	Bioaccumulative
4,4'-DDT	0.000013	0.000002	Yes	Bioaccumulative
Aldrin	0	0.0000009	Yes	Bioaccumulative
alpha-BHC	0.0022	0.0000009	Yes	Bioaccumulative
Dieldrin	0.000056	0.000002	Yes	Bioaccumulative
Endosulfan I	0.000051	0.0000009	Yes	Bioaccumulative
gamma-BHC(Lindane)	0.00095	0.000001	Yes	Bioaccumulative
Total Metals				
Aluminum, total	0.087	0.049	No	Mean < Benchmark
Antimony, total	0.03	0.015	No	Mean < Benchmark
Arsenic, total	0.15	0.0003	No	Mean < Benchmark
** Barium, total	0.004	0.018	Yes	Mean > Benchmark
Beryllium, total	0.00017	0.0001	No	Mean < Benchmark
Cadmium, total	0.0037	0.0001	No	Mean < Benchmark
Calcium, total	-	2.47		
Chromium, total	0.314	0.0013	No	Mean < Benchmark
Cobalt, total	0.023	0.0008	No	Mean < Benchmark
Copper, total	0.0183	0.0005	No	Mean < Benchmark
Cyanide, total	0.0052	0.0005	No	Mean < Benchmark
Iron, total	1	0.55	No	Mean < Benchmark
Lead, total	0.006	0.0008	No	Mean < Benchmark
Magnesium, total	-	1.45		
Manganese, total	4.33	0.12	No	Mean < Benchmark
Mercury, total	0.00077	0.00001	No	Mean < Benchmark
Nickel, total	0.243	0.0033	No	Mean < Benchmark
Potassium, total	-	3.59		
Selenium, total	0.0046	0.0005	No	Mean < Benchmark
Sodium, total	-	11.6		
** Thallium, total	0.001	0.0057	Yes	Mean > Benchmark
Vanadium, total	0.020	0.0015	No	Mean < Benchmark
Zinc, total	0.163	0.011	No	Mean < Benchmark

Notes:

1. ** Indicates that the maximum detected concentration was greater than the maximum background concentration, and both the average and maximum concentrations were greater than the benchmark. Site values were considered to be "greater than" if they were more than 5 percent higher than the background or the benchmark (i.e., ratio or TQ greater than 1.05).

TABLE 9-19

ALMY RESERVOIR
FUTURE SURFACE WATER CONTAMINANT OF POTENTIAL ECOLOGICAL CONCERN
Central Landfill - OU2
Johnston, Rhode Island
(mg/l)

Contaminant	Benchmark	Arithmetic Mean Concentration	Retained?	Comments
Semivolatile Organic Compounds				
2-Methylphenol	0.013	0.00005714	No	Mean < Benchmark
bis(2-Ethylhexyl)phthalate	0.012	0.00017	No	Mean < Benchmark
Di-n-butylphthalate	0.035	0.000048	No	Mean < Benchmark
Pesticides/PCBs				
Dieldrin	0.000056	0.00000051	Yes	Bioaccumulative
Total Metals				
Aluminum, total	0.087	0.02168	No	Mean < Benchmark
Barium, total	0.004	0.0014	No	Mean < Benchmark
Beryllium, total	0.00017	0.00009	No	Mean < Benchmark
Cadmium, total	0.0008	0.00004	No	Mean < Benchmark
Calcium, total	-	0.03496		
Chromium, total	0.067	0.00022	No	Mean < Benchmark
Copper, total	0.004	0.00013	No	Mean < Benchmark
Cyanide, total	0.005	0.0008	No	Mean < Benchmark
Iron, total	1	0.13724	No	Mean < Benchmark
Lead, total	0.0005	0.00026	No	Mean < Benchmark
Magnesium, total	-	0.01457		
Manganese, total	4.33	0.00581	No	Mean < Benchmark
Mercury, total	0.00077	0.00005	No	Mean < Benchmark
Nickel, total	0.0488	0.0002	No	Mean < Benchmark
Potassium, total	-	0.01457		
Selenium, total	0.00461	0.00008	No	Mean < Benchmark
Sodium, total	-	0.06391		
Zinc, total	0.0327	0.00479	No	Mean < Benchmark

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (ND), and one time the method detection limit was used to represent the concentrations of constituents reported as "BMQL".

2. If a location was sampled more than once, the summary statistics are based on the average concentration over time at that location.

TABLE 9-20

SUMMARY OF SURFACE WATER CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN BY EXPOSURE AREA
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Sedimentation Pond 4	Sedimentation Ponds 1 & 3 and Stream Channels	Upper Simmons Reservoir	Lower Simmons Reservoir	Almy Reservoir	Almy Watershed
		1,2-Dichlorobenzene 1,4-Dichlorobenzene			
		Chlorobenzene			Carbon Disulfide
					Tetrachloroethene
Butylbenzylphthalate		Butylbenzylphthalate			Butylbenzylphthalate
	Phenol				
	Aldrin		4,4'-DDT Aldrin		
		delta-BHC			
			Endosulfan I		
Barium, total	Aluminum, total Barium, total Beryllium, total	Aluminum, total Barium, total	Aluminum, total Barium, total		
	Cyanide, total Iron, total	Cyanide, total		Copper, total	
		Manganese, total	Iron, total		
	Mercury, total				
		Selenium, total			
		Thallium, total	Silver, total		Silver, total
	Zinc, total				
	Barium, dissolved	Barium, dissolved Copper, dissolved	Barium, dissolved	Copper, dissolved	Copper, dissolved Lead, dissolved
		Manganese, dissolved Selenium, dissolved			
	Selenium, dissolved				
	Ammonia	Ammonia	Ammonia		

TABLE 9-21

SUMMARY OF SEDIMENT CONTAMINANTS OF POTENTIAL ECOLOGICAL CONCERN BY EXPOSURE AREA
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Sedimentation Pond 4	Sedimentation Ponds 2 & 3 and Stream Channels	Upper Simmons Reservoir	Lower Simmons Reservoir	Almy Reservoir	Almy Watershed
	Acetone	Acetone Carbon Disulfide	Acetone		
		Styrene	Chloromethane		
		Acenaphthylene			
	4-Methylphenol		4-Chloro-3-methylphenol		
	Benzo(a)anthracene	Benzo(a)anthracene			
	Benzo(a)pyrene	Benzo(a)pyrene			
	Benzo(b)fluoranthene	Benzo(b)fluoranthene			
	Carbazole	Carbazole			
	Phenol				
	Pyrene				
		4,4'-DDD	4,4'-DDD		4,4'-DDD
		4,4'DDE	4,4'-DDE		4,4'-DDE
		4,4'-DDT			4,4'-DDT
	Aldrin	Aldrin			
	alpha-Chlordane	alpha-Chlordane	alpha-Chlordane		
		delta-BHC	delta-BHC		
		Endosulfan-sulfate			
		Endosulfan I	Endosulfan I		
					Endosulfan II
	gamma-Chlordane	gamma-Chlordane			
		Methoxychlor			
		PCB 1232			
		PCB 1242			
		PCB 1254			
	Arsenic	Arsenic	Arsenic	Aresenic	
Barium	Barium	Barium	Barium	Barium	Barium
		Beryllium	Beryllium	Beryllium	Beryllium
		Cadmium	Cadmium	Cadmium	Cadmium
	Chromium	Chromium	Chromium		
	Copper	Copper	Copper	Copper	Copper
		Cyanide	Cyanide		
	Iron	Iron	Iron	Iron	Iron
				Lead	
	Manganese	Manganese	Manganese	Manganese	Manganese
	Mercury			Mercury	
	Nickel	Nickel	Nickel		
			Selenium		Selenium
			Thallium	Thallium	Thallium
	Vanadium	Vanadium	Vanadium	Vanadium	
	Zinc	Zinc	Zinc	Zinc	Zinc

TABLE 9-22

SURFICIAL SOIL DATA COMPARED TO TYPICAL CONCENTRATIONS
Central Landfill - OU2
Johnston, Rhode Island

Contaminant	Maximum Detected (mg/kg)	Arithmetic Mean Concentration (mg/kg)	Conterminous United States[3]		90th Percentile MA DEP[4] Non-Urban Background
			Average	Range	
Metals					
Chromium, total	12.3	6.4	54	1 - 2,000	29
Cyanide, total	2.5	1.3	NA	NA	NA
Iron, total	20600	10567	26,000	100 - >100,000	17,000
Lead, total	145	66	19	<10 - 700	99
Manganese, total	556	194	550	<2 - 7,000	300
Selenium, total	1.43	0.65	8.9	<5 - 50	0.5
Vanadium, total	38.9	23	80	<7 - 500	29
Zinc, total[2]	3393	298	60	<5 - 2,900	116

Notes:

1. For the purpose of calculating arithmetic mean concentrations, one-half the method detection limit was used to represent the concentrations of constituents reported as non-detects (ND), and one time the method detection limit was used to represent the concentrations of constituents reported as "BMQL".
2. If anomolous high detectection in sample SS95-02 (6702 ppm for first round, average of 3393 ppm between the two rounds) is eliminated, the average concentration of zinc is about 76 ppm.
3. These values are from Shacklette, H.T., and J.G. Boerngen, 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S.G.S. Professional Paper 1270.
4. From Massachusetts Department of Environmental Protection, 1996. Guidance for Disposal Site Risk Characterization in Support of Massachusetts Contingency Plan. Interim Final Policy WSC/ORS-95-141. Section 9.0, Method 3 Environmental Risk Characterization. Massachusetts Protection, Office of Research and Standards. April.

TABLE 9-23

UPPER SIMMONS RESERVOIR SURFACE WATER
TOXICITY TEST SAMPLE SET COMPARED TO DRAFT RISK ASSESSMENT SAMPLE SET (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	Draft RA Data	Toxicity Samples	Draft RA Data	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Data
Volatile Organic Compounds								
1,1,2-Trichloroethane	0 / 3	1 / 10	ND	0.0006	ND	SW95-42	ND	0.0005
1,2-Dichlorobenzene	0 / 3	1 / 10	ND	0.002	ND	SW95-42	ND	0.0007
1,2-Dichloropropane	0 / 0	1 / 10	ND	0.0008	ND	SW95-42	NA	0.0005
1,4-Dichlorobenzene	0 / 3	2 / 10	ND	0.004	ND	SW95-42	ND	0.0010
Acetone	3 / 3	0 / 10	0.004	ND	SW98-51	ND	0.0030	ND
Benzene	0 / 3	2 / 10	ND	0.002	ND	SW95-42	ND	0.0007
Carbon Tetrachloride	0 / 3	1 / 10	ND	0.0007	ND	SW95-42	ND	0.0005
Chlorobenzene	1 / 3	6 / 10	0.003	0.088	SW98-51	SW95-42	0.0013	0.0126
cis-1,2-Dichloroethene	0 / 3	1 / 10	ND	0.0008	ND	SW95-42	ND	0.0005
Tetrachloroethene	0 / 3	1 / 10	ND	0.0006	ND	SW95-42	ND	0.0005
Semivolatile Organic Compounds								
bis(2-Ethylhexyl)phthalate	0 / 3	1 / 10	ND	0.006	ND	SW95-42	ND	0.0029
Butylbenzylphthalate	0 / 3	3 / 10	ND	0.004	ND	SW95-04	ND	0.0028
Di-n-butylphthalate	0 / 3	1 / 10	ND	0.002	ND	SW95-04	ND	0.0020
Diethylphthalate	1 / 3	0 / 10	0.002	ND	SW98-52	ND	0.0020	ND
Pesticides/PCBs								
delta-BHC	0 / 3	1 / 10	ND	0.000012	ND	SW95-42	ND	0.0000058

TABLE 9-23

UPPER SIMMONS RESERVOIR SURFACE WATER
TOXICITY TEST SAMPLE SET COMPARED TO DRAFT RISK ASSESSMENT SAMPLE SET (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	Draft RA Data	Toxicity Samples	Draft RA Data	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Data
Dissolved Metals								
Barium (Ba)	3 / 3	8 / 8	0.044	0.167	SW98-51	SW95-42	0.0380	0.0721
Cobalt (Co)	0 / 3	1 / 8	ND	0.0027	ND	SW95-42	ND	0.0007
Copper (Cu)	1 / 3	1 / 8	0.01	0.0148	SW98-50	SW95-09	0.0041	0.0029
Iron (Fe)	0 / 3	2 / 8	ND	0.605	ND	SW95-43	ND	0.145
Magnesium (Mg)	3 / 3	8 / 8	9.83	37.8	SW98-52	SW95-42	9.13	15.9
Manganese (Mn)	3 / 3	8 / 8	2.21	11.6	SW98-51	SW95-42	1.84	2.77
Nickel (Ni)	1 / 3	1 / 8	0.0063	0.0154	SW98-51	SW95-42	0.004	0.005
Selenium (Se)	0 / 3	6 / 8	ND	0.0179	ND	SW95-42	ND	0.008
Vanadium (V)	0 / 3	2 / 8	ND	0.011	ND	SW95-42	ND	0.004
Zinc (Zn)	3 / 3	0 / 7	0.0088	ND	SW98-52	ND	0.007	ND
Wet Chemistry								
Ammonia (N)	3 / 3	10 / 10	12	33	SW98-51	SW95-42	5.63	1.17E+01

Note:

1. NA = Not Analyzed; ND = Not Detected.

TABLE 9-24

LOWER SIMMONS RESERVOIR SURFACE WATER
COMPARISONS OF CHEMICAL DATA BETWEEN SAMPLES COLLECTED FOR TOXICITY TESTS
AND PREVIOUSLY COLLECTED SAMPLES (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	Previous Samples	Toxicity Samples	Previous Samples	Toxicity Samples	Previous Samples	Toxicity Samples	Previous Samples
Pesticides/PCBs								
4,4'-DDT	1 / 2	0 / 6	0.0001	ND	SW98-54	ND	0.00006	ND
Aldrin	1 / 2	0 / 6	0.000025	ND	SW98-54	ND	0.00002	ND
Endosulfan I	1 / 2	0 / 6	0.000011	ND	SW98-54	ND	0.00001	ND
Dissolved Metals								
Arsenic (As)	0 / 2	1 / 5	ND	0.0036	ND	SW95-02	ND	0.0026
Barium (Ba)	0 / 2	3 / 5	ND	0.058	ND	SW95-03	ND	0.0555
Beryllium (Be)	0 / 2	1 / 5	ND	0.0006	ND	SW95-02	ND	0.00035
Chromium (Cr)	0 / 2	1 / 5	ND	0.0022	ND	SW95-02	ND	0.0012
Cobalt (Co)	0 / 2	1 / 5	ND	0.002	ND	SW95-02	ND	0.0010
Copper (Cu)	0 / 2	1 / 5	ND	0.0053	ND	SW95-02	ND	0.0032
Iron (Fe)	1 / 2	1 / 5	0.111	0.0374	SW98-53	SW95-02	0.07	0.0181
Manganese (Mn)	2 / 2	3 / 5	1.07	1.71	SW98-54	SW95-02	1.05	1.51
Nickel (Ni)	0 / 2	2 / 5	ND	0.007	ND	SW95-01	ND	0.005
Selenium (Se)	0 / 2	2 / 5	ND	0.0077	ND	SW95-02	ND	0.006
Vanadium (V)	0 / 2	1 / 5	ND	0.0063	ND	SW95-01	ND	0.004
Zinc (Zn)	1 / 2	0 / 4	0.0055	ND	SW98-54	ND	0.0038	ND
Wet Chemistry								
Ammonia (N)	2 / 2	3 / 6	5.7	5	SW98-53	SW95-03	4.1	2.99

Note:
1. NA = Not Analyzed; ND = Not Detected.

TABLE 9-25
RESULTS OF QUALITATIVE PLANKTON ANALYSIS
Upper and Lower Simmons Reservoirs
Johnston, Rhode Island

Plankton	Upper Simmons			Lower Simmons
	Delta (North End)	North Basin	South Basin	North End
Zooplankton Taxa				
Cladocera				
Bosmina	X	X	X	X
Daphnia		X	X	X
Copopoda				
Calanoidea			X	
Cyclopoidea			X	
nauplii (immatures)		X	X	X
Rotifera				
Asplanchna		X	X	X
Kellicotia		X	X	
Keratella	X	X	X	X
Polyarthra	X	X	X	X
Phytoplankton Taxa				
Bacillariophyceae (diatoms)				
Asterionella	X	X	X	X
Fragilaria				X
Navicula				X
Pinnularia				X
Stauroneis				X
Synedra	X	X	X	X
Tabellaria				X
Chlorophyta (green algae)				
Pediastrum			X	X
Scenedesmus	X			
Spirogyra	X	X		X
Chrysophyta (yellow-green algae, excluding diatoms)				
Dinobryon	X	X	X	X
Cyanophyta (blue-green algae)				
Spirulina	X	X		
Phaycus	X	X	X	X
testae rhizopods	X	X	X	X
Taxa Richness	11	14	15	18

Note: All samples collected with a a 35 micron net on May 20, 1998.

TABLE 9-26

UPPER SIMMONS RESERVOIR SEDIMENT
TOXICITY TEST SAMPLE SET COMPARED TO
ALL PREVIOUS SAMPLES (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples
Volatile Organic Compounds								
1,1-Dichloroethane	0 / 3	1 / 16	ND	0.004	ND	SED93-26-O	ND	0.004
2-Hexanone	0 / 3	2 / 16	ND	0.006	ND	SED93-26-O	ND	0.02
Acetone	1 / 3	14 / 16	0.3	0.335	SED98-51	SED93-26-O	0.11	0.10
Benzene	0 / 3	4 / 16	ND	0.021	ND	SED93-29-ORE	ND	0.012
Carbon Disulfide	0 / 3	5 / 16	ND	0.1135	ND	SED93-26-O	ND	0.029
Chlorobenzene	2 / 3	4 / 16	0.006	0.076	SED98-52	SED95-42	0.0045	0.022
Methyl ethyl Ketone	3 / 3	6 / 16	0.072	0.1185	SED98-51	SED93-26-O	0.038	0.03
Methylene Chloride	0 / 3	11 / 16	ND	0.045	ND	SED93-27-O	ND	0.019
Styrene	0 / 3	1 / 16	ND	0.005	ND	SED93-26-O	ND	0.005
Tetrachloroethene	0 / 3	1 / 16	ND	0.012	ND	SED93-26-O	ND	0.009
Toluene	0 / 3	4 / 16	ND	0.041	ND	SED93-22-O	ND	0.018
Trichloroethene	0 / 3	1 / 16	ND	0.003	ND	SED93-22-O	ND	0.003
Xylenes	0 / 3	1 / 16	ND	0.02	ND	SED93-26-O	ND	0.013
Semivolatile Organic Compounds								
2-Methylnaphthalene	1 / 3	1 / 13	0.04	0.047	SED98-51	SED93-21-I	0.039	0.047
Acenaphthene	1 / 3	1 / 13	0.0755	0.062	SED98-51	SED93-21-I	0.076	0.062
Acenaphthylene	1 / 3	2 / 13	0.05	0.059	SED98-51	SED93-21-I	0.050	0.036
Anthracene	2 / 3	4 / 13	0.22	0.15	SED98-51	SED93-21-I	0.14	0.098
Benzo(a)anthracene	3 / 3	7 / 13	0.7	0.59	SED98-51	SED95-42	0.36	0.31
Benzo(a)pyrene	3 / 3	8 / 13	0.545	0.5	SED98-51	SED95-42	0.31	0.25
Benzo(b)fluoranthene	3 / 3	8 / 13	0.985	0.71	SED98-51	SED95-42	0.51	0.28
Benzo(g,h,i)perylene	2 / 3	4 / 13	0.185	0.21	SED98-51	SED95-42	0.15	0.13
Benzo(k)fluoranthene	3 / 3	7 / 13	0.2525	0.056	SED98-51	SED93-21-I	0.19	0.17
bis(2-Ethylhexyl)phthalate	3 / 3	13 / 13	2.7	18	SED98-51	SED95-43	1.33	1.75

TABLE 9-26

UPPER SIMMONS RESERVOIR SEDIMENT
TOXICITY TEST SAMPLE SET COMPARED TO
ALL PREVIOUS SAMPLES (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples
Butylbenzylphthalate	1 / 3	3 / 13	0.345	0.05	SED98-51	SED93-21-O	0.28	0.036
Carbazole	1 / 3	1 / 2	0.16	0.065	SED98-51	SED95-42	0.16	0.065
Chrysene	3 / 3	9 / 13	0.775	0.62	SED98-51	SED95-42	0.41	0.28
Di-n-butylphthalate	1 / 3	11 / 13	0.03	0.2	SED98-51	SED93-21-O	0.028	0.143
Di-n-octylphthalate	1 / 3	1 / 2	0.495	23.5	SED98-51	SED95-43	0.35	11.9
Dibenz(a,h)anthracene	2 / 3	1 / 2	0.357	0.065	SED98-51	SED95-42	0.2	0.065
Dibenzofuran	1 / 3	1 / 13	0.3215	0.039	SED98-51	SED93-21-I	0.27	0.039
Diethylphthalate	0 / 3	4 / 13	ND	0.92	ND	SED93-24-I	ND	0.3
Dimethylphthalate	0 / 3	1 / 13	ND	0.03	ND	SED93-27-I	ND	0.03
Fluoranthene	3 / 3	12 / 13	1.45	1.1	SED98-51	SED95-42	0.70	0.31
Fluorene	1 / 3	3 / 13	0.105	0.023	SED98-51	SED93-21-I	0.11	0.06
Indeno(1,2,3-c,d)pyrene	2 / 3	3 / 13	0.2	0.1	SED98-51	SED93-21-I	0.16	0.17
Naphthalene	1 / 3	1 / 13	0.051	0.036	SED98-51	SED93-21-I	0.051	0.036
Phenanthrene	3 / 3	8 / 13	0.975	0.51	SED98-51	SED93-21-I	0.43	0.24
Phenol	0 / 3	1 / 13	ND	0.026	ND	SED93-27-I	ND	0.026
Pyrene	3 / 3	12 / 13	1.65	1.2	SED98-51	SED95-42	0.73	0.26
Pesticides/PCBs								
4,4'-DDD	3 / 3	5 / 10	0.013	0.012	SED98-50	SED93-26-I	0.008	0.006
4,4'-DDE	2 / 3	3 / 10	0.012	0.0028	SED98-52	SED93-26-I	0.008	0.004
4,4'-DDT	3 / 3	3 / 10	0.047	0.0018	SED98-50	SED93-21-I	0.020	0.003
Aldrin	0 / 3	3 / 10	ND	0.0017	ND	SED95-06	ND	0.002
alpha-Chlordane	2 / 3	2 / 10	0.0057	0.0035	SED98-52	SED93-21-I	0.004	0.002
delta-BHC	3 / 3	0 / 6	0.0093	ND	SED98-52	ND	0.007	NCC
Endosulfan-sulfate	1 / 3	0 / 6	0.0026	ND	SED98-51	ND	0.002	NCC
Endosulfan I	1 / 3	0 / 6	0.01	ND	SED98-52	ND	0.003	NCC
gamma-Chlordane	2 / 3	2 / 10	0.0027	0.0022	SED98-52	SED93-21-I	0.002	0.002
Methoxychlor	1 / 3	0 / 6	0.01	ND	SED98-51	ND	0.009	NCC
PCB 1232	2 / 3	0 / 6	0.064	ND	SED98-52	ND	0.050	NCC

TABLE 9-26

UPPER SIMMONS RESERVOIR SEDIMENT
TOXICITY TEST SAMPLE SET COMPARED TO
ALL PREVIOUS SAMPLES (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples	Toxicity Samples	All Previous Samples
PCB 1242	0 / 3	2 / 10	ND	0.06	ND	SED93-21-I	ND	0.039
PCB 1254	2 / 3	2 / 10	0.087	0.074	SED98-52	SED93-21-I	0.058	0.039
PCB 1260	0 / 3	1 / 10	ND	0.062	ND	SED93-26-I	ND	0.033
Metals								
Aluminum, total	3 / 3	19 / 19	21300	34400	SED98-50	SED93-30-I	12,490	16,371
Arsenic, total	3 / 3	8 / 10	13.8	6.7	SED98-50	SED95-43	8.13	2.71
Barium, total	3 / 3	19 / 19	145	222	SED98-50	SED93-27-I	96.8	95.5
Beryllium, total	3 / 3	10 / 10	29.8	22.5	SED98-50	SED93-26-O	12.6	11.7
Cadmium, total	3 / 3	10 / 10	4.7	2.6	SED98-50	SED93-23-O	2.44	1.59
Chromium, total	3 / 3	11 / 11	19.8	18.7	SED98-50	SED93-26-I	14.6	11.1
Cobalt, total	3 / 3	14 / 19	12.2	13.5	SED98-50	SED93-27-I	8.07	5.08
Copper, total	3 / 3	8 / 10	34	37	SED98-50	SED93-24-I	29	21
Cyanide, total	3 / 3	1 / 3	14.9	ND	SED98-50	ND	8.00	0.483
Iron, total	3 / 3	19 / 19	26900	56500	SED98-50	SED93-27-I	19,937	19,132
Lead, total	3 / 3	19 / 19	87.9	104	SED98-50	SED93-26-I	71.0	43.2
Manganese, total	3 / 3	19 / 19	1130	1340	SED98-50	SED93-27-I	753	579
Mercury, total	0 / 3	9 / 19	ND	0.3	ND	SED93-27-I	ND	0.17
Nickel, total	3 / 3	15 / 19	22.7	55.4	SED98-52	SED93-23-I	16.97	17
Selenium, total	0 / 3	7 / 10	ND	2.05	ND	SED93-26-O	ND	0.97
Vanadium, total	3 / 3	19 / 19	58.5	223	SED98-52	SED93-23-I	40	59
Zinc, total	3 / 3	19 / 19	351	483	SED98-50	SED93-27-I	231	184

Note:

1. NA = Not Analyzed; ND = Not Detected.

TABLE 9-27

LOWER SIMMONS RESERVOIR SEDIMENT
COMPARISONS OF CHEMICAL DATA BETWEEN SAMPLES COLLECTED FOR TOXICITY TESTS
AND PREVIOUSLY COLLECTED SAMPLES (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Samples
Volatile Organic Compounds								
Acetone	2 / 2	2 / 3	0.22	0.18	SED98-53	SED95-01	0.18	0.091
Chloromethane	2 / 2	0 / 3	0.004	ND	SED98-53	ND	0.0035	ND
Methyl ethyl Ketone	2 / 2	2 / 3	0.044	0.057	SED98-53	SED95-01	0.039	0.029
Semivolatile Organic Compounds								
4-Chloro-3-methylphenol	0 / 2	1 / 3	ND	0.057	ND	SED95-03	ND	0.057
Anthracene	1 / 2	0 / 3	0.068	ND	SED98-54	ND	0.264	ND
Benzo(a)anthracene	1 / 2	0 / 3	0.094	ND	SED98-54	ND	0.277	ND
Benzo(a)pyrene	1 / 2	0 / 3	0.115	ND	SED98-54	ND	0.288	ND
Benzo(b)fluoranthene	2 / 2	0 / 3	0.21	ND	SED98-54	ND	0.17	ND
Benzo(k)fluoranthene	1 / 2	0 / 3	0.098	ND	SED98-54	ND	0.279	ND
bis(2-Ethylhexyl)phthalate	1 / 2	1 / 3	0.35	0.38	SED98-54	SED95-03	0.405	0.352
Butylbenzylphthalate	0 / 2	1 / 3	ND	1.9	ND	SED95-02	ND	0.838
Chrysene	1 / 2	0 / 3	0.12	ND	SED98-54	ND	0.29	ND
Fluoranthene	2 / 2	1 / 3	0.165	0.08	SED98-54	SED95-02	0.1475	0.08
Phenanthrene	1 / 2	0 / 3	0.081	ND	SED98-54	ND	0.271	ND
Pyrene	2 / 2	3 / 3	0.20	0.094	SED98-54	SED95-02	0.2	0.078
Pesticides/PCBs								
4,4'-DDD	1 / 2	0 / 3	0.0083	ND	SED98-53	ND	0.005	ND
4,4'-DDE	2 / 2	0 / 3	0.013	ND	SED98-53	ND	0.009	ND
alpha-Chlordane	2 / 2	0 / 3	0.0043	ND	SED98-53	ND	0.004	ND
delta-BHC	2 / 2	0 / 3	0.0079	ND	SED98-53	ND	0.006	ND
Endosulfan I	1 / 2	0 / 3	0.0046	ND	SED98-53	ND	0.003	ND

TABLE 9-27

LOWER SIMMONS RESERVOIR SEDIMENT
COMPARISONS OF CHEMICAL DATA BETWEEN SAMPLES COLLECTED FOR TOXICITY TESTS
AND PREVIOUSLY COLLECTED SAMPLES (ppm)

Constituent	Frequency of Detection		Maximum Detected		Location of Maximum Detected Concentration		Average Concentrations	
	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Samples	Toxicity Samples	Draft RA Samples
Metals								
Aluminum, total	2 / 2	3 / 3	17000	22400	SED98-53	SED95-01	12170	11627
Antimony, total	0 / 0	1 / 3	ND	1.3	ND	SED95-02	NA	0.71
Arsenic, total	2 / 2	3 / 3	10.9	16.3	SED98-53	SED95-01	9.5	9.87
Barium, total	2 / 2	3 / 3	225	287	SED98-53	SED95-01	205	151
Beryllium, total	2 / 2	3 / 3	18	11.4	SED98-53	SED95-01	13	7.23
Cadmium, total	2 / 2	3 / 3	5.9	4	SED98-53	SED95-01	4.85	2.67
Chromium, total	2 / 2	2 / 3	17	32.9	SED98-53	SED95-02	14.7	21.8
Cobalt, total	2 / 2	3 / 3	16.8	22.6	SED98-53	SED95-01	14.1	13.4
Copper, total	2 / 2	2 / 3	31.6	37.2	SED98-53	SED95-01	25.6	19.7
Cyanide, total	2 / 2	1 / 3	12.1	ND	SED98-53	ND	10.1	1.68
Iron, total	2 / 2	3 / 3	33500	34800	SED98-54	SED95-01	31000	20443
Lead, total	2 / 2	3 / 3	88.3	93	SED98-53	SED95-01	60.2	62.7
Manganese, total	2 / 2	3 / 3	12100	13900	SED98-54	SED95-02	8430	8416
Mercury, total	0 / 2	3 / 3	ND	0.37	ND	SED95-01	ND	0.23
Nickel, total	2 / 2	2 / 3	35.4	20.3	SED98-53	SED95-01	24.2	11
Selenium, total	1 / 2	0 / 3	5	ND	SED98-54	ND	4	ND
Thallium, total	1 / 2	2 / 3	5.9	26.4	SED98-54	SED95-02	4	14
Vanadium, total	2 / 2	2 / 3	80.3	70	SED98-53	SED95-01	52	33
Zinc, total	2 / 2	3 / 3	438	411	SED98-53	SED95-01	325	231

Note:

1. NA = Not Analyzed; ND = Not Detected.

TABLE 9-28

GREAT BLUE HERON FOOD WEB ASSESSMENT
SUMMARY OF TOXICITY QUOTIENTS AND TOTAL HAZARD QUOTIENTS
Central Landfill - OU2 Remedial Investigation
Johnston, Rhode Island

Contaminant	Entire CLF Drainage Area		Upper Shannons Reservoir		Upper Shannons Reservoir North Basin		Lower Simmons Reservoir		Sedimentation Ponds 2 & 3 and Stream Channels		Sedimentation Pond 4	
	LOEL TQ	NOEL TQ	LOEL TQ	NOEL TQ	LOEL TQ	NOEL TQ	LOEL TQ	NOEL TQ	LOEL TQ	NOEL TQ	LOEL TQ	NOEL TQ
Benzo(a)anthracene									1.3	12.7		
Benzo(a)pyrene		1.9							3.1	30.8		
Butylbenzylphthalate		1.9		3.6		2.8					1.4	14.4
DDE						1.2						
DDT	3.7	34.2					6.5	60.2				
Total DDTR	3.8	35.2				2.7	6.6	61.3				
Beryllium		1.3		1.6				1.2				
Mercury (assumed methyl)		4.7							4.0	42.7		
Thallium	7.4	73.6				6.7	12.8	128.5				
Hazard Quotient (organic)	4.3	40.6		4.7		7.8	6.6	61.5	4.5	44.9	1.4	14.4
Hazard Quotient (inorganic)	8.1	81.7		3.9		8.5	13.3	131.9	4.2	44.8		
Total Hazard Quotient (organic + inorganic)	12.4	122.3		8.6	1.6	16.4	19.8	193.4	8.7	89.7	1.5	14.5

Notes:

1. The LOEL and NOEL Toxicity Quotients (TQ) are the Estimated Daily Dose for the contaminant divided by the LOEL and NOEL benchmark, resepectively.
2. The Total Hazard Quotient (HQ) for organics is the sum of the individual toxicity quotients for organic COCs; Total Hazard Quotient for inorganics is the sum of the individual toxicity quotients for inorganic COCs; and the Total Hazard Quotient is the sum of the Total Hazard Quotient for organics and the Total Hazard Quotient for inorganics.
3. Only exceedances (Toxicity Quotients or Hazard Quotients that are greater than one) are presented in this table; The Hazard Quotients may be greater than the TQs less than 1 are included in the HQs.
4. The Total Hazard Quotient (HQ) for organics do not include the individual toxicity quotient for Total DDTR.
5. Total DDTR is the sum of DDE, DDD, and DDT.

TABLE 9-29

AMERICAN ROBIN FOOD WEB ASSESSMENT
SUMMARY OF TOXICITY QUOTIENTS AND TOTAL HAZARD QUOTIENTS
Central Landfill - OU2
Johnston, Rhode Island

Contaminant	Based on Average Concentrations		Based on Maximum Concentrations	
	NOAEL TQ	LOAEL TQ	NOAEL TQ	LOAEL TQ
Semivolatile Organic Compounds				
bis(2-Ethylhexyl)phthalate			1.9	
Pesticides/PCBs				
4,4'-DDE			1.9	
4,4'-DDT	2.3		12	1.2
Total DDTR	3.0		14	1.5
Metals				
Chromium, total	1.8		3.5	
Lead, total	10.1	1.0	22	2.2
Zinc, total	19.3	2.1	220	24
Hazard Quotient	39.3	4.43	279	30.8

Notes:

1. The LOEL and NOEL Toxicity Quotients (TQ) are the Estimated Daily Dose for the contaminant divided by the LOEL and NOEL benchmark, resepectively.
2. The LOEL or NOEL Hazard Quotient (HQ) is the sum of the individual LOEL or NOEL Toxicity Quotients for all of the COCs analyzed in the food web.
3. Only exceedances (Toxicity Quotients or Hazard Quotients that are greater than one) are presented in this table; The Hazard Quotients may be greater than the TQs less than 1 are included in the HQs.

TABLE 9-30

MEADOW VOLE FOOD WEB ASSESSMENT
SUMMARY OF TOXICITY QUOTIENTS AND TOTAL HAZARD QUOTIENTS
Central Landfill - OU2
Johnston, Rhode Island

Contaminant	Based on Average Concentrations		Based on Maximum Concentrations	
	NOAEL TQ	LOAEL TQ	NOAEL TQ	LOAEL TQ
Vanadium, total			1.01	
Hazard Quotient	0.88	0.14	2.19	0.53

Notes:

1. The LOEL and NOEL Toxicity Quotients (TQ) are the Estimated Daily Dose for the contaminant divided by the LOEL and NOEL benchmark, resepectively.
2. The LOEL or NOEL Hazard Quotient (HQ) is the sum of the individual LOEL or NOEL Toxicity Quotients for all of the COCs analyzed in the food web.
3. Only exceedances (Toxicity Quotients or Hazard Quotients that are greater than one) are presented in this table; The Hazard Quotients may be greater than the TQs less than 1 are included in the HQs.

TABLE 9-31

SHORT-TAILED SHREW FOOD WEB ASSESSMENT
SUMMARY OF TOXICITY QUOTIENTS AND TOTAL HAZARD QUOTIENTS
Central Landfill - OU2
Johnston, Rhode Island

Contaminant	Based on Average Concentrations		Based on Maximum Concentrations	
	NOAEL TQ	LOAEL TQ	NOAEL TQ	LOAEL TQ
Metals				
Chromium, total			1.2	
Lead, total	1.5		3.2	
Selenium, total			1.1	
Vanadium, total	5.4		9	
Zinc, total	2.2	1.1	25	12.6
Hazard Quotient	10.5	2.32	41	15

Notes:

1. The LOEL and NOEL Toxicity Quotients (TQ) are the Estimated Daily Dose for the contaminant divided by the LOEL and NOEL benchmark, resepectively.
2. The LOEL or NOEL Hazard Quotient (HQ) is the sum of the individual LOEL or NOEL Toxicity Quotients for all of the COCs analyzed in the food web.
3. Only exceedances (Toxicity Quotients or Hazard Quotients that are greater than one) are presented in this table; The Hazard Quotients may be greater than the TQs less than 1 are included in the HQs.