FILE NAME

"Report.VCP.v00615.2009-01-01.Sediment_Chemistry_Data_Report.pdf"

NOTE

- Contains folded images. Images must be copied in their entirety.
- Images may contain color.
- Documents must be returned in the same arrangement in which they were received.

Please return electronic copies to Sally Dewes

NY Container Terminal: Berth 4
Staten Island, New York

SEDIMENT CHEMISTRY DATA REPORT
FIELD SAMPLING RESULTS FOR DREDGING

Client: New York Container Terminal

NYCT
NEW YORK CONTAINER TERMINAL

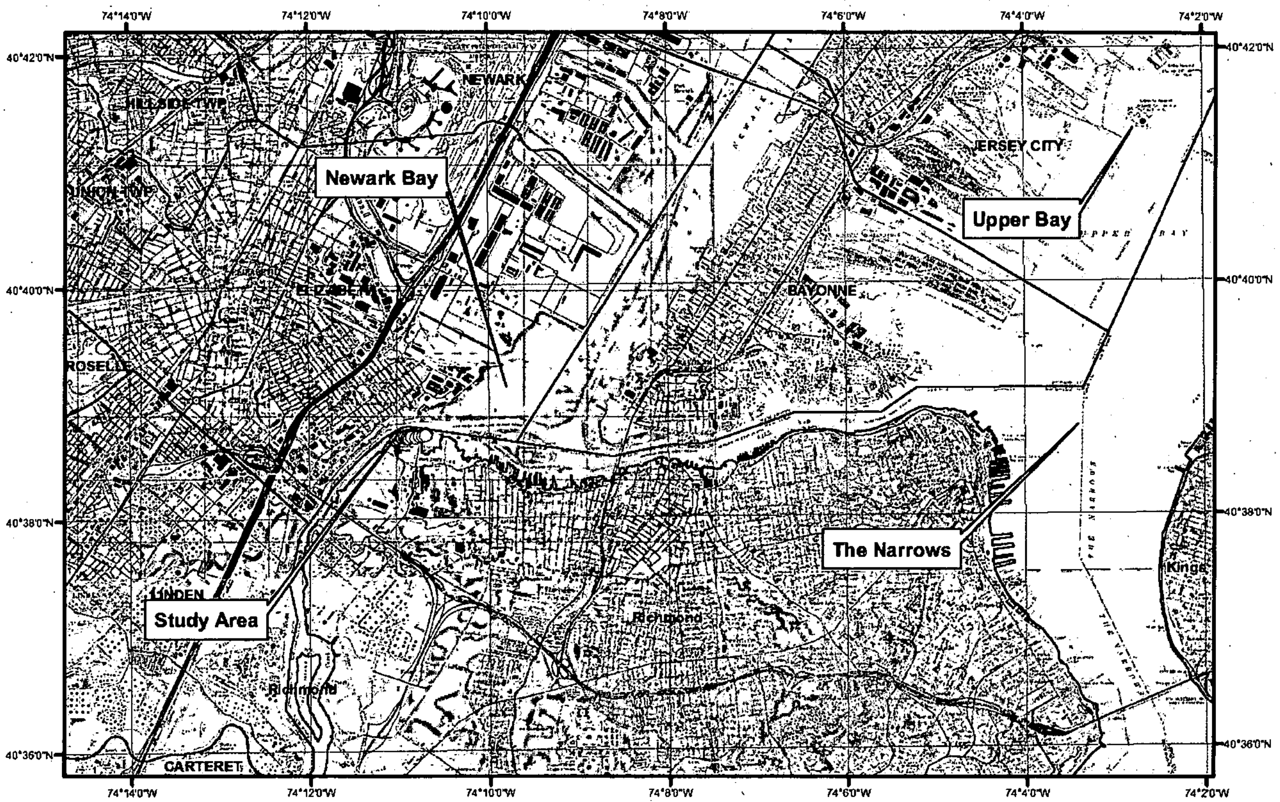
January 2009

AECOM

20 Exchange Place, NY, NY 10005
Project Number: 60004312.0019

and

89 Water Street, Woods Hole, MA 02543
Project Number: 10973-010



N

0 362.5 725 1,450 2,175 Meters

Legend

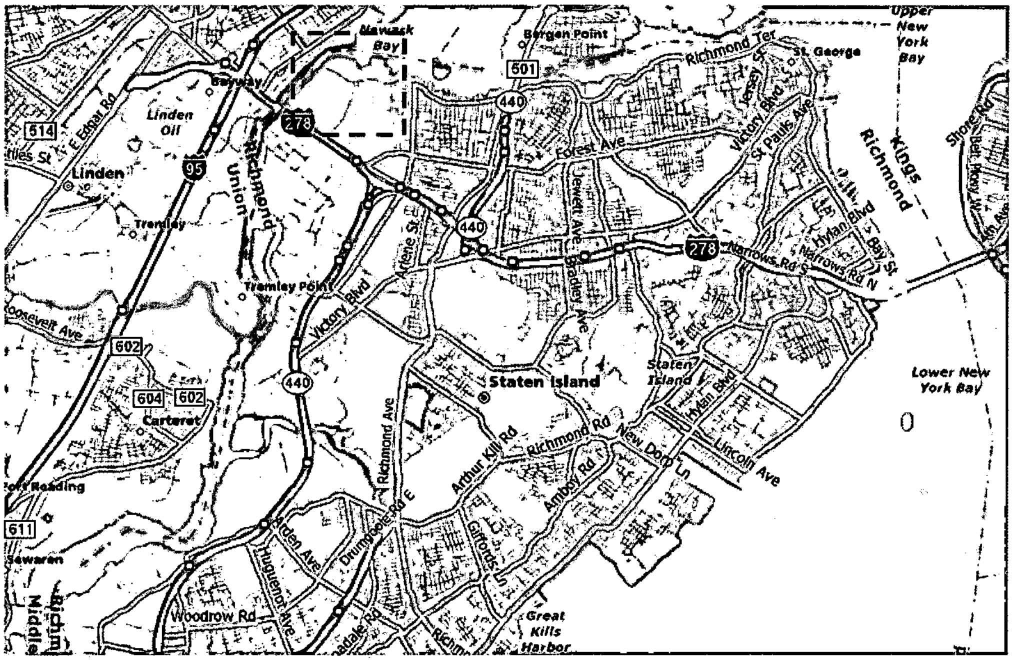
○ Stations

▭ Municipal Boundaries

Locus Map

Figure 1.

AECOM



Detail of Inset Shown Above

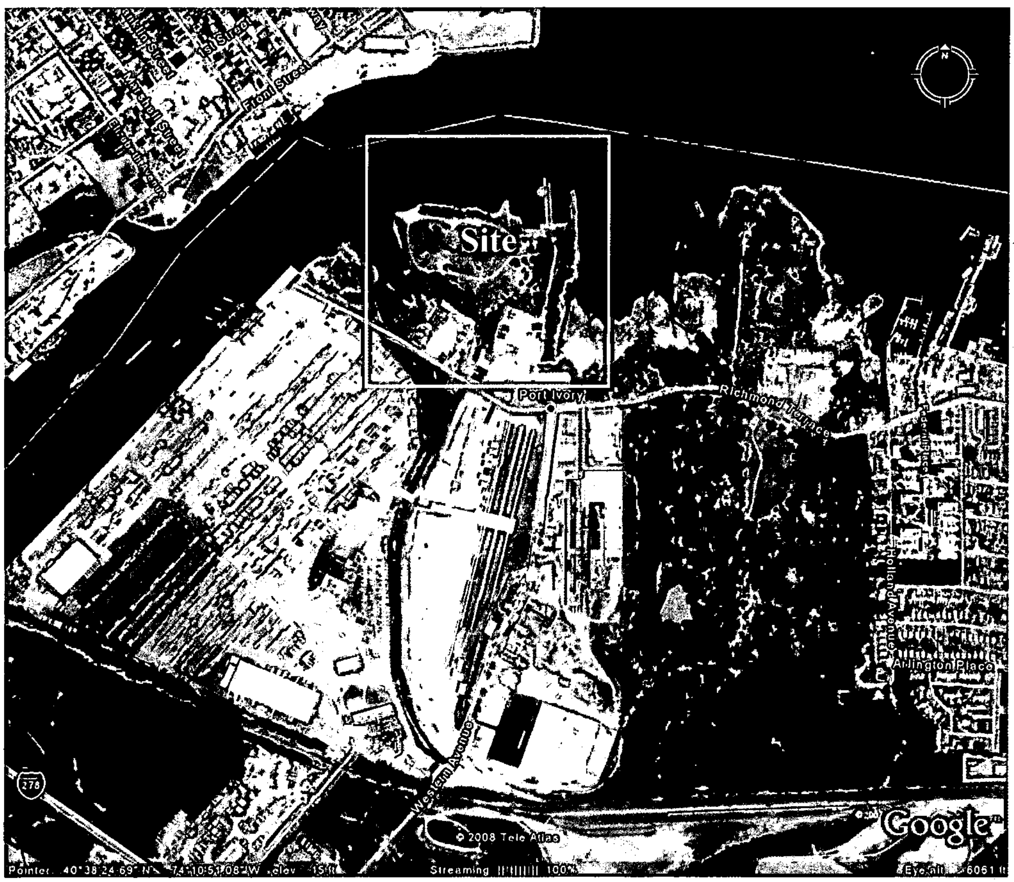
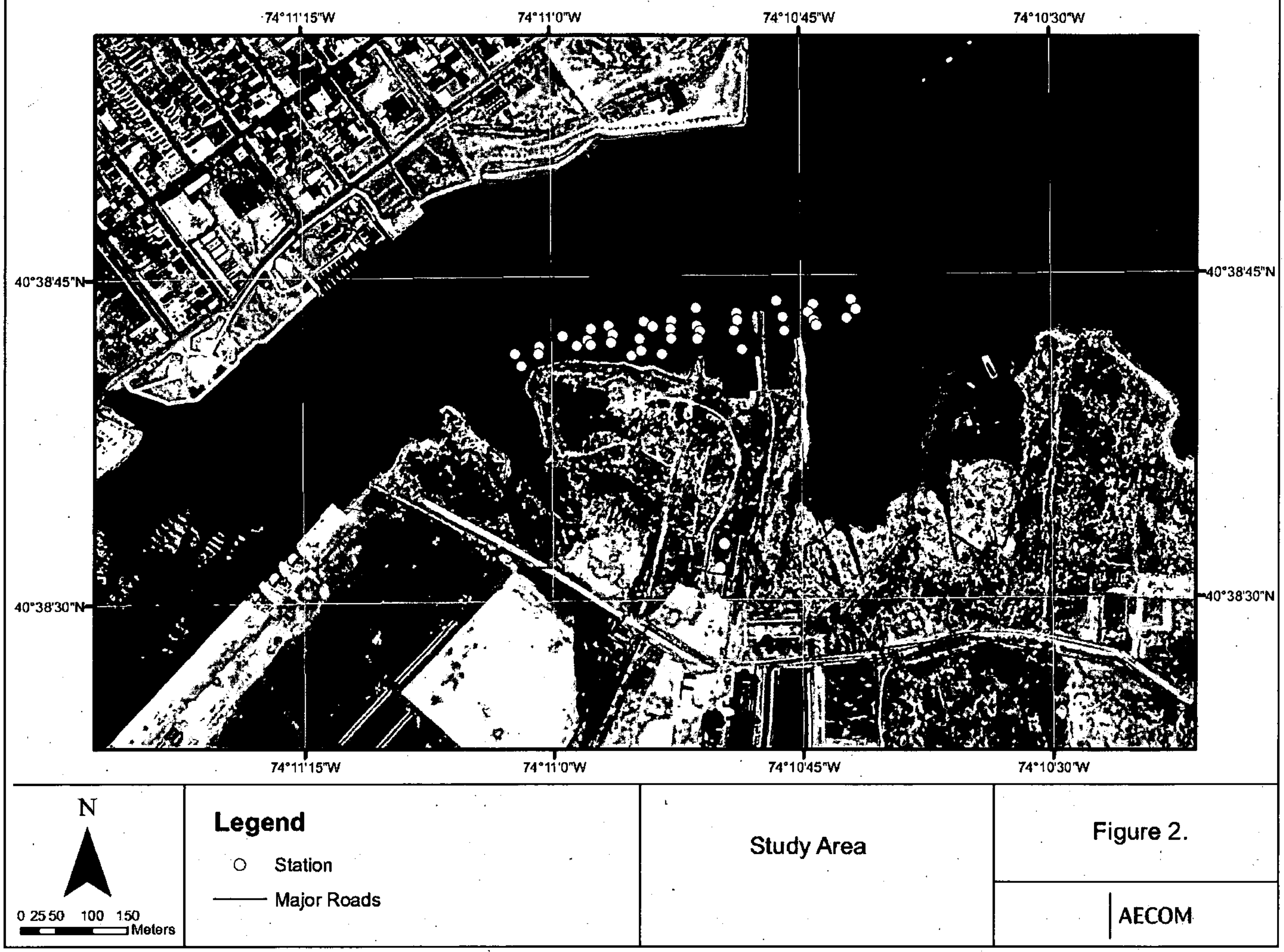


Figure 1 Site is located in North-western Staten Island as shown in the maps above.



Legend

○ Station

—— Major Roads

Study Area

Figure 2.

AECOM

Table 5. Metals Concentrations by Layer within Core

UPPER

Composite Number / Stations	(ppm)	ER-L	ER-M	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7
				1,2,3	4,5,6	7,9	10,11,12	10, 11, 12	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24	25,26,27	28,30	31,32,33	31,32,33	35,36
Amount (mg/kg)																			
Aluminum		NA	NA	10600	9460	8750	7550	7720	9620	8080	10800	10800	11200	10800	11100	11700	10700	9340	12700
Antimony		NA	NA	0.619	0.525	1.19	0.451	0.489	U	0.170	1.65	0.354	0.453	0.353	U	0.400	U	U	1.30
Arsenic	16	8.2	70	**19.0**	**21.3**	74.3	**13.8**	**15.8**	5.12	**19.7**	80.8	**20.6**	**22.1**	**20.6**	**13.0**	**19.9**	**8.66**	**8.53**	**49.8**
Barium	400	NA	NA	225	142	226	175	176	191	166	317	148	192	157	30.1	130	91.3	34.4	481
Beryllium	47	NA	NA	1.01	0.804	0.730	0.684	0.763	0.973	0.782	0.932	0.789	0.807	0.778	0.983	0.964	0.799	0.725	1.01
Cadmium	7.5	1.2	9.6	**2.72**	**2.10**	**4.76**	**2.50**	**2.96**	0.341	0.487	**8.25**	**2.40**	**2.77**	**2.49**	0.178	**3.05**	0.269	0.120	13.6
Calcium		NA	NA	6620	6840	72400	9050	8990	1520	9330	50600	3520	3700	3510	2280	6320	1780	1590	5940
Chromium	19/1500 *	81	370	**106**	**83.4**	**141**	**82.2**	**91.5**	27.4	39.2	**273**	**83.6**	**99.8**	**91.8**	34.8	**121**	29.4	25.8	**331**
Cobalt		NA	NA	12.2	10.2	9.79	9.36	9.85	11.5	8.85	12.3	10.5	10.9	10.6	10.3	10.7	9.78	8.33	13.3
Copper	270	34	270	**200**	**144**	325	**144**	**157**	16.9	**48.6**	486	**141**	**171**	**155**	16.0	**191**	15.8	12.7	612
Iron		NA	NA	28800	26900	24600	21000	21900	16000	20600	33700	36300	35600	34400	38100	37800	32300	29400	37000
Lead	450	47	218	**171**	**123**	278	**123**	**126**	17.9	41.4	330	**114**	**144**	**124**	13.4	**145**	12.2	10.3	380
Magnesium		NA	NA	7120	6030	7980	5890	5840	4730	4180	6920	6020	6180	5880	5580	6190	319	313	420
Manganese	2000	NA	NA	569	434	345	515	518	148	168	408	501	489	462	393	382	5760	5050	7760
Nickel	130	21	52	**37.8**	**30.3**	**44.8**	**28.3**	**30.5**	**21.6**	**22.6**	67.3	**32.6**	**35.3**	**34.0**	**25.0**	**37.4**	**23.2**	20.3	61.3
Potassium		NA	NA	2400	2050	1700	1740	1770	1450	1350	2050	2130	2030	1950	2310	2330	2200	2040	2600
Selenium	4	NA	NA	1.62	1.75	2.92	1.14	1.34	1.54	1.61	4.04	2.00	2.27	2.21	1.47	2.41	1.62	1.19	7.76
Silver	8.3	NA	NA	2.85	1.91	3.62	2.12	2.59	0.401	0.383	5.56	1.72	2.08	1.97	0.233	3.75	U	U	9.36
Sodium		NA	NA	8650	7560	7820	5460	5460	4160	3940	7530	6610	6420	6550	6820	7100	6370	5830	9790
Thallium		NA	NA	0.259	0.209	0.546	0.180	0.187	0.0770	0.199	0.554	0.199	0.206	0.191	0.190	0.294	0.202	U	0.470
Vanadium		NA	NA	37.8	32.6	30.6	25.7	28.6	41.9	45.1	52.5	35.7	37.4	34.9	43.1	45.6	33.6	30.0	54.7
Zinc	2480	150	410	**324**	**238**	508	**222**	**238**	73.1	**115**	663	**219**	**252**	**229**	73.0	**281**	70.6	57.4	757
Mercury	0.73	0.15	0.71	4.160	2.620	6.620	3.290	3.860	**0.194**	0.713	12.900	2.820	3.140	2.640	0.036	3.940	0.0479	0.0347	16.2
Percent Moisture (%)		-	-	59.00	56.10	54.90	46.90	48.20	42.80	39.70	56.00	50.50	50.50	50.80	53.00	55.20	51.90	44.70	59.70
Total Organic Carbon (%)*		-	-	2.05	2.25	2.30	1.25	1.30	4.30	1.75	2.85	2.50	2.70	2.85	3.50	2.00	3.20	2.65	3.35
*Average of 2 runs		-	-																

Dup.=Duplicate, Trip.=Triplicate, NA=Not Available, bold type indicates exceedence of ER-L, gray box indicates exceedence of ER-M

↑

TRACK 2 RESTRICTED COMMERCIAL-INDUSTRIAL & PROTECTION OF GROUNDWATER VALUES

* HEX Cr / TRI Cr

Table 5 Continued. Metals Concentrations by Layer within Composite

Composite Number	ER-L	ER-M	Upper					
Stations			CM-0.0-15.3 37,38,39	CO-0.0-11.2 29,34	Sta. 8-0.0-31.0 8	Sta. 20-0.0-15.2 20	Total Upper Average	Total Upper Standard Dev.
Amount (mg/kg)								
Aluminum	NA	NA	10600	7290	5090	14100	9900.00	2069.12
Antimony	NA	NA	U	2.55	U	3.16	0.73	0.85
Arsenic 16	8.2	70	**13.5**	7.52	6.34	133	**28.67**	**32.26**
Barium	NA	NA	34.5	49.4	22.9	1040	201.43	225.29
Beryllium	NA	NA	0.764	1.04	0.344	1.06	0.84	0.17
Cadmium	1.2	9.6	0.174	0.172	0.324	37.7	**4.37**	**8.50**
Calcium	NA	NA	2240	1590	10300	5950	10703.50	17957.66
Chromium	81	370	34.5	38.3	22.9	663	**120.98**	**150.85**
Cobalt	NA	NA	10.6	12.0	5.16	16.6	10.64	2.21
Copper	34	270	27.2	19.0	23.1	1220	**206.27**	287.87
Iron	NA	NA	34200	17000	16800	40100	29125.00	7960.29
Lead	47	218	**52.6**	11.0	25.6	580	**141.12**	**148.72**
Magnesium	NA	NA	5360	4260	3610	7250	5003.60	2269.39
Manganese	NA	NA	471	390	337	366	1273.30	2170.11
Nickel	21	52	**25.1**	**26.6**	15.6	136	**37.78**	**26.48**
Potassium	NA	NA	1970	1570	1020	2560	1961.00	407.61
Selenium	NA	NA	1.08	0.769	0.504	10.0	2.46	2.36
Silver	NA	NA	0.252	9.55	0.706	12.3	3.10	3.49
Sodium	NA	NA	5380	1320	2380	10300	6272.50	2212.18
Thallium	NA	NA	0.221	0.179	0.129	0.721	0.27	0.17
Vanadium	NA	NA	33.3	42.6	18.0	102	40.29	17.01
Zinc	150	410	92.0	65.2	53.0	1720	312.52	386.20
Mercury 0.73	0.15	0.71	**0.753**	38.300	**0.393**	46.900	**7.48**	**12.80**
Percent Moisture (%)			46.60	59.90	23.00	64.00	50.67	9.00
Total Organic Carbon (%)*			2.60	2.30	0.63	4.05	2.52	0.91

*Average of 2 runs

Dup.=Duplicate, Trip.=Triplicate, NA=Not Available, bold type indicates exceedence of ER-L, gray box indicates exceedence of ER-M U=Undetected

Table 5 Continued. Metals Concentrations by Layers in Composites

Composite Number / Stations	ER-L	ER-M	Lower CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0	Total Lower Ave.	Total Lower Stand. Dev.
			7,9	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**25,26,27**	**25,26,27**	**28,30**	**31,32,33**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**20**		
Amount (mg/kg)																		
Aluminum	NA	NA	2920	2470	3500	3090	6890	5350	3360	5640	2550	2730	3580	5680	5270	6680	4265.00	1578.35
Antimony	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	0.131	0.326	0.12	0.07
Arsenic	8.2	70	4.29	**11.3**	5.25	3.10	3.24	3.96	2.31	**47.1**	3.20	2.25	4.23	2.87	7.79	**18.2**	**8.51**	11.94
Barium	NA	NA	33.3	13.6	51.0	47.8	83.2	49.7	22.3	470	11.0	13.0	25.2	91.2	37.4	77.0	73.26	117.14
Beryllium	NA	NA	0.464	0.376	0.352	0.345	0.620	0.475	0.395	0.485	0.290	0.292	0.465	0.689	0.418	0.456	0.44	0.11
Cadmium	1.2	9.6	0.0817	0.0644	0.0400	0.0802	0.0650	0.102	0.0581	**12.1**	0.0620	0.0547	0.129	0.101	0.579	1.00	1.04	**3.20**
Calcium	NA	NA	665	272	842	720	793	1300	709	3310	419	340	780	634	6870	6080	1695.29	2161.73
Chromium	81	370	13.3	12.0	14.8	11.3	18.0	17.7	13.9	**233**	9.22	9.88	14.0	19.3	31.7	45.9	33.14	58.36
Cobalt	NA	NA	5.36	84.9	8.63	5.22	8.63	5.47	6.01	6.94	5.64	5.91	6.03	7.87	5.26	6.22	12.01	21.01
Copper	34	270	9.16	5.58	6.82	9.64	6.80	7.15	8.64	**404**	16.2	8.43	10.7	8.33	41.3	**85.8**	**44.90**	**105.61**
Iron	NA	NA	8400	9850	11900	8210	26000	16000	8760	9460	6780	6420	11700	11500	16400	19400	12198.57	5499.64
Lead	47	218	5.20	4.04	5.20	5.12	7.86	5.07	4.58	**205**	3.21	3.29	6.42	7.58	**53.6**	**162**	34.16	**65.12**
Magnesium	NA	NA	1740	1480	2520	1750	2780	2920	1920	2990	79.3	76.8	99.9	2530	3610	3950	2031.86	1264.05
Manganese	NA	NA	184	97.2	117	197	368	98.5	221	183	1450	1390	2120	145	322	289	512.98	643.10
Nickel	21	52	11.1	**25.2**	15.4	10.2	13.4	10.9	12.3	**47.2**	10.1	10.4	12.0	14.1	18.1	**22.6**	16.64	9.96
Potassium	NA	NA	499	580	859	542	926	1010	707	1090	433	517	676	930	1090	1310	797.79	270.75
Selenium	NA	NA	0.201	0.193	0.196	0.317	0.539	1.20	0.316	3.28	0.254	0.205	0.343	0.547	0.794	1.01	0.67	0.82
Silver	NA	NA	U	0.672	U	U	U	U	0.131	U	U	U	U	U	1.24	2.16	0.39	0.60
Sodium	NA	NA	809	980	1060	878	2210	4220	737	3760	626	653	1360	1900	2370	2470	1716.64	1164.28
Thallium	NA	NA	U	U	0.0776	0.182	0.0579	0.110	0.0864	0.226	U	U	U	0.0879	0.130	0.226	0.11	0.06
Vanadium	NA	NA	14.5	16.0	15.3	11.9	32.5	28.9	14.5	38.4	9.72	10.0	16.0	33.1	19.2	23.6	20.26	9.38
Zinc	150	410	30.0	41.3	35.3	29.1	38.2	34.0	32.1	**558**	24.6	25.0	37.3	44.9	77.9	146	82.41	140.51
Mercury	0.15	0.71	0.027	0.015	0.014	0.014	0.018	0.020	0.014	0.014	0.0138	0.0143	0.0880	0.016	0.740	2.830	0.27	0.76
Percent Moisture (%)			15.30	14.60	14.00	16.00	23.60	37.40	13.70	13.10	12.80	13.60	15.30	23.70	30.20	30.00	19.52	8.02
Total Organic Carbon (%)*			0.32	0.18	0.20	0.11	0.87	1.75	0.12	0.09	0.08	0.16	0.90	0.35	0.65	1.35	0.51	0.53

*Average of 2 runs

Dup.=Duplicate, Trip.=Triplicate, NA=Not Available, bold type indicates exceedence of ER-L, gray box indicates exceedence of ER-M U=Undetected

Table 6. Standard Deviation (±1) for Upper Layer and Lower Layer of Composites for Metals Concentrations (mg/kg)

Amount (mg/kg)	Average Upper Layer	Standard Deviation Upper Layer	Average Lower Layer	Standard Deviation Lower Layer
Aluminum	9900.0	2069.1	4265.0	2263.844
Antimony	0.7	0.8	0.1	0.259
Arsenic	28.7	32.3	8.5	14.261
Barium	201.4	225.3	73.3	128.152
Beryllium	0.8	0.2	0.4	0.193
Cadmium	4.4	8.5	1.0	3.820
Calcium	10703.5	17957.7	1695.3	5223.750
Chromium	121.0	150.9	33.1	68.535
Cobalt	10.6	2.2	12.0	4.666
Copper	206.3	287.9	44.9	127.197
Iron	29125.0	7960.3	12198.6	6554.834
Lead	141.1	148.7	34.2	73.307
Magnesium	5003.6	2269.4	2031.9	1542.828
Manganese	1273.3	2170.1	513.0	754.677
Nickel	37.8	26.5	16.6	11.695
Potassium	1961.0	407.6	797.8	452.848
Selenium	2.5	2.4	0.7	0.982
Silver	3.1	3.5	0.4	1.210
Sodium	6272.5	2212.2	1716.6	1639.540
Thallium	0.3	0.2	0.1	0.066
Vanadium	40.3	17.0	20.3	10.631
Zinc	312.5	386.2	82.4	168.526
Mercury	7.5	12.8	0.3	3.880
Percent Moisture (%)	50.7	9.0	19.5	12.603
Total Organic Carbon (%)*	2.5	0.9	0.5	0.733

Table 7. PCB Aroclor Concentrations by Layer within Composite

Composite Number	UPPER															
Stations	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7
	1,2,3	4,5,6	7,9	10,11,12	10, 11, 12	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24	25,26,27	28,30	31,32,33	31,32,33	35,36
Amount (ug/kg)																
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	294	210	374	176	332	U	12.8	846	183	191	139	U	273	U	U	797
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	579	409	481	286	535	22.6	U	863	208	220	151	U	451	U	U	696
Aroclor 1260	131	144	112	83.7	136	U	U	195	67.7	78.5	38.6	U	175	U	U	251
TOTAL (ppm)	1.0							1.9								1.7

Table 7 Continued. PCB Aroclor Concentrations by Layer within Composite.

Composite Number	UPPER			
Stations	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
	37,38,39	29,34	8	20
Amount (ug/kg)				
Aroclor 1016	U	U	U	U
Aroclor 1221	U	U	U	U
Aroclor 1232	U	U	U	U
Aroclor 1242	U	2760	30.5	2540
Aroclor 1248	U	U	U	U
Aroclor 1254	U	2080	41.6	1690
Aroclor 1260	U	680	15.5	530
TOTAL (ppm)		5.5		4.7

Table 7 Continued. PCB Aroclor Concentrations by Layer within Composite														
Composite Number LOWER														
Stations	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	20
Amount (ug/kg)														
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U	U	46.9	91.7
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	7.70	U	U	U	U	U	U	U	U	U	U	U	59.0	82.6
Aroclor 1260	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table 9. Volatile Organic Carbon Concentrations within Composites by Layer.

UPPER

Composite Number	(ppm)	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0
Stations		**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**
Amount (ug/kg)										
Chloromethane		U	U	U	U	U	U	U	U	U
Vinyl chloride		U	U	U	U	U	U	U	U	U
Bromomethane		U	U	U	U	U	U	U	U	U
Chloroethane		U	U	U	U	U	U	U	U	U
Trichlorofluoromethane		U	U	U	U	U	U	U	U	U
Acetone	50	167	94.6	120	34.2	54.1	73.8	8.96	1020	990
1,1-Dichloroethene		U	U	U	U	U	U	U	U	U
Carbon disulfide		4.63	4.36	8.40	2.46	3.43	8.89	4.35	10.7	U
Methylene chloride		U	U	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)		U	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene		U	U	U	U	U	U	U	U	U
1,1-Dichloroethane		U	U	U	U	U	U	U	U	U
Vinyl acetate		U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	120	27.9	23.7	32.9	11.0	19.6	12.7	U	25.2	U
cis-1,2-Dichloroethene		U	U	U	U	U	U	U	U	U
Chloroform		U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane		U	U	U	U	U	U	U	U	U
Carbon tetrachloride		U	U	U	U	U	U	U	U	U
Benzene	60	U	U	7.73	U	U	U	U	4.88	U
1,2-Dichloroethane		U	U	U	U	U	U	U	U	U
Trichloroethene		U	U	U	U	U	U	U	U	U
1,2-Dichloropropane		U	U	U	U	U	U	U	U	U
Bromodichloromethane		U	U	U	U	U	U	U	U	U
2-Chloroethylvinyl ether		U	U	U	U	U	4.78	U	U	U
Methyl isobutyl ketone (MIBK)		7.71	30.1	U	1.69	2.00	U	U	11.9	U
cis-1,3-Dichloropropene		U	U	U	U	U	U	U	U	U
Toluene		U	U	4.41	U	U	U	U	U	U
trans-1,3-Dichloropropene		U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane		U	U	U	U	U	U	U	U	U
2-Hexanone		U	U	U	U	U	U	U	U	U
Tetrachloroethene		U	U	U	U	U	U	U	U	U
Dibromochloromethane		U	U	U	U	U	U	U	U	U
Chlorobenzene		U	U	9.38	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane		U	U	U	U	U	U	U	U	U
Ethylbenzene	1000	U	U	54.5	U	U	U	U	6.67	U
p/m-Xylene	> 1600	1.78	3.64	137	U	U	U	U	U	U
o-Xylene		U	1.84	145	U	U	U	U	U	U
Styrene		U	U	U	U	U	U	U	U	U
Bromoform		U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 9 Continued. Volatile Organic Carbon Concentrations within Composites by Layer.
UPPER

Composite Number	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	**22,23,24**	**22,23,24**	**25,26,27**	**28,30**	**31,32,33**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**8**	**20**
Amount (ug/kg)	U	U									
Chloromethane	U	U	U	U	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U	U
Acetone	1000	U	988	793	1010	960	3220	620	3840	71.3	11300
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
Carbon disulfide	U	U	12.8	10.9	18.1	13.2	35.5	U	20.8	15.6	83.6
Methylene chloride	U	U	U	U	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	13.6	1.86	U	47.4	U	57.8	9.60	78.9
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
Chloroform	U	U	1.38	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	12.7	U	50.6	5.31	68.7
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	U	49.0	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U	26.5	U	34.5
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U	25.6
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	12.9	U	113	U	92.9
p/m-Xylene	U	U	U	U	U	U	U	U	342	1.99	219
o-Xylene	U	U	U	U	U	U	U	U	273	2.42	194
Styrene	U	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 9 Continued. Volatile Organic Carbon Concentrations within Composites by Layer.							
Composite Number	LOWER						
Stations	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13-0.0-15.2	CI-15.0-18.1	CI-18.1-23.1
	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27
Amount (ug/kg)							
Chloromethane	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Acetone	U	U	U	U	U	368	199
1,1-Dichloroethene	U	U	U	U	U	U	U
Carbon disulfide	2.78	13.3	15.4	1.88	U	12.1	2.29
Methylene chloride	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	2.14	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	0.97
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	42.4	396	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
p/m-Xylene	U	U	U	U	U	U	U
o-Xylene	0.83	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 9 Continued. Volatile Organic Carbon Concentrations within Composites by Layer.

Composite Number	LOWER						
Stations	CJ-15.3-21.6 28,30	CK13.2-20.5 31,32,33	CK-13.2-20.5 Dup. 31,32,33	CL-18.7-22.0 35,36	CM-15.3-20.5 37,38,39	CO-11.2-28.4 29,34	Sta. 20-15.2-27.0 20
Amount (ug/kg)							
Chloromethane	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Acetone	U	U	U	U	810	487	U
1,1-Dichloroethene	U	U	U	U	U	U	U
Carbon disulfide	U	U	U	U	U	2.24	U
Methylene chloride	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	1.72	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	10.3
1,2-Dichloroethane	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
p/m-Xylene	U	U	U	U	U	U	4.64
o-Xylene	U	U	U	U	U	U	10.8
Styrene	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 10 Continued. SVOCs by layer within Composites.

UPPER

Composite Number		CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup.	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.
Stations		1,2,3	4,5,6	7,9	10,11,12	10,11,13	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24
Amount ug/kg												
Di-n-butylphthalate		U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	500000	1470	1760	3920	753	920	U	607	4540	U	1710	1040
Pyrene	500000	1760	1960	4080	1090	1170	U	675	5610	U	1810	1020
Butylbenzylphthalate		U	U	U	U	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine		U	U	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	1000	766	986	2490	506	U	U	429	3120	U	J	J
Chrysene	1000	992	1280	3220	664	U	U	527	3990	U	842	J
bis(2-Ethylhexyl)phthalate		4380	3020	7210	6230	6870	329	U	15800	3820	6290	4920
Di-n-octylphthalate		U	U	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	1700	862	837	1370	513	U	U	U	1610	U	J	J
Benzo[k]fluoranthene	1700	888	870	1720	609	U	U	U	2300	U	J	J
Benzo[a]pyrene	1700	722	845	1610	452	U	U	U	1850	U	J	J
Indeno[1,2,3-cd]pyrene	5600	566	538	1010	363	U	U	U	1330	U	U	U
Dibenz[a,h]anthracene	560	435	U	634	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	500000	688	613	1140	438	U	U	U	1580	U	U	U
Anthracene	500000	J	U	1370	U	U	U	U	1390	U	J	U
Carbazole		U	U	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

NY Container Terminal: Berth 4
Staten Island, New York

SEDIMENT CHEMISTRY DATA REPORT
FIELD SAMPLING RESULTS FOR DREDGING

Client: New York Container Terminal

NYCT
NEW YORK CONTAINER TERMINAL

January 2009

AECOM

20 Exchange Place, NY, NY 10005
Project Number: 60004312.0019

and

89 Water Street, Woods Hole, MA 02543
Project Number: 10973-010

NY Container Terminal: Berth 4
Staten Island, New York

SEDIMENT CHEMISTRY DATA REPORT
FIELD SAMPLING RESULTS FOR DREDGING

AECOM Environment: Pamela Neubert, Ph.D.
Prepared By

AECOM Environment and AECOM Transportation Internal Staff
Reviewed By

Permit Application Number APP-NAN-2007-195

AECOM Environment
January 2009
Document No.: 10973-010 (1)

Contents

List of Appendices

List of Tables

List of Figures

LIST OF ACRONYMS AND ABBREVIATIONS

COI	Constituents of Interest
C.Y.	Cubic yards
DGPS	Differential Global Positioning System
DIUF	Deionized Ultrafiltered
FSP	Field Sampling Plan
GPS	Global Positioning System
HASP	Health and Safety Plan
IDW	Investigation-Derived Waste
MLW	Mean Low Water
NYCT	New York Container Terminal
NYSDEC	New York State Department of Environmental Conservation
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated biphenyl
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
RHSM	Regional Health and Safety Manager
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SSO	Site Safety Officer
USACE	U.S. Army Corps of Engineers
W/QAP	Work/Quality Assurance Plan

1.0 Introduction

The expansion of the New York Container Terminal (NYCT) into Parcel C is proposed as a new full service container and general cargo handling facility. This will provide one of the highest volume cargo capacities of any facility in the New York Harbor. Strategically located on Staten Island near the Goethals Bridge, the terminal occupies a 187-acre (58 hectares) tract of upland area (Figure 1). It is readily accessible to major truck routes, and has capability for on-dock rail service connecting to the North American intermodal rail network. NYCT is proposing to develop their Terminal C property to allow 14,500 TEU vessels to approach and berth at their facility. The length and width of the proposed berths are 1340 ft and 259 ft, respectively. The width will allow the berthing of a 22 wide container vessel with a width of 186 ft, plus a bunker barge moored outboard of the container vessel. Additional area to accommodate the approach and departure of vessels has also been included within the proposed dredging footprint. Dredging to allow container vessels to berth at Terminal C includes two scenarios depending upon project coordination with current U.S. Army Corps (USACE) New York Harbor Channel Deepening Program. Ideally, it is to the proposed project's benefit if the channel dredging by the Corps is completed before the berth dredging, which is the obligation of NYCT. If the proposed project dredging takes place after the Corps has finished their channel dredging, then the approximate cubic yardage of dredge material resulting from the NYCT proposed project will be as follows:

Channel Dredging Occurs Prior to Berth Slip Dredging (c.y.)			
	Soft Strata	Glacial Till	Rock
Volume (cubic yards) Post Survey Calculations	203,079	131,083	181,664
Channel Dredging Occurs After Berth Slip Dredging			
Volume (cubic yards) Post Survey Calculations	260,395	137,661	195,231

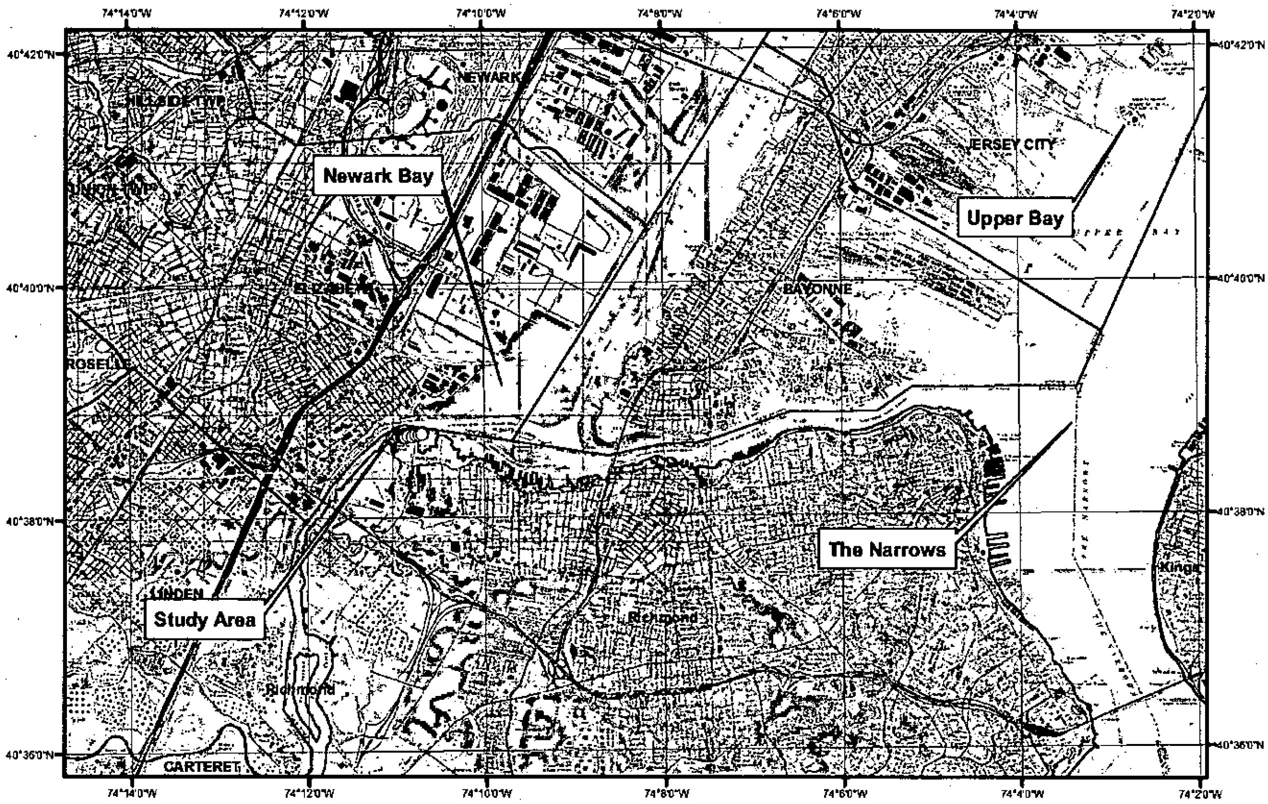
The objective of this field program was to characterize the vertical and horizontal extent of Constituents of Interest (COIs) within Holocene sediments of the NYCT proposed project site to better understand the environmental aspects of developing the basin (i.e., dredging). It is the intent of the proposed project to use as much material from the dredging excavation as possible for beneficial on-site construction purposes. The NYCT will seek permission to dispose of unused rock at a New York or New Jersey artificial reef site. The ~131,000 cubic yards of glacial till (unsorted red shale, clays, sands, gravel...etc.) have been pre-approved for either upland on-site use or offshore disposal at the Historical Area Remediation Site (HARS) within a Memorandum of Understanding (USACE, 2004) for pre-classified, clean Pleistocene material from the U.S. Army Corps of Engineers (USACE). The preferred method of disposal for the ~203,000 cubic yards of Holocene, soft strata that will be excavated as part of the proposed Project if channel dredging occurs prior to berth slip dredging will be to use as much of this material on-site as beneficial use and material that can not be beneficially used will be disposed at an upland facility.

2.0 Reports Reviewed from Prior Investigations

Several documents were reviewed prior to the start of the field program. These included several agency documents as well as reports prepared by DMJM Harris specifically for this project. Geotechnical borings were taken after the vibracore field survey. The resulting DMJM Harris geotechnical report was also reviewed.

These reports include the following and include drawings regarding the Channel Deepening of the Arthur Kill:

- Geotechnical Data Report, Upland Boring Program dated May, 2008, Prepared by DMJM Harris
- Parcel C Development Area, Marine Container Terminal, Stage 1 Report dated October 11, 2005, Prepared by the Port Authority of NY and NJ
- Site Investigation & Conceptual Remedial Workplan, Future Site 4, Parcel C dated September, 2005, Prepared by Hatch Mott MacDonald
- Geotechnical Reference Data for Port Ivory Parcel C dated May, 2005, Prepared by the Port Authority of NY and NJ
- New York Harbor, Arthur Kill Chanel, Navigation Improvement Project, Contract II, NY and NJ dated December, 2003, Prepared by the US Army Engineer District, Corp of Engineers, NY, NY
- Characterization of Sediment Stored in New Jersey Combined Disposal Facilities dated March 2007
- The Management and Regulation of Dredging Activites and Dredge Material in New Jersey Tidal Waters dated October 1997.
- Geotechnical Boring Report, NYCT Berth 4, DMJM Harris, September 2008
- USACE Memorandum for the Record Standards for Submission of Geotechnical Information Used for Determination of Pleistocene Glacial Till and/or Red Clay dated March 3, 2008.
- NYSDEC Dredged material Sampling Plan New York Container Terminal – Parcel C dated April 3, 2008
- ENSR Health and Safety Plan Specific for NYCT Field Program dated May 2008.
- Long, E. R., D. D. MacDonald, S. L. Smith, F. D. Calder, 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environmental Management 19: 81-87.



N

0362.525 1,450 2,175 Meters

Legend

○ Stations

▭ Municipal Boundaries

Locus Map

Figure 1.

AECOM

3.0 Materials and Methods

AECOM Environment (AECOM) developed the Field Sampling Plan (FSP) collaboratively with USACE, NYSDEC, and NJDEP. Once this plan was approved by these agencies it was implemented for this field program and while it was the goal to follow the plan as defined, sediment composition differed and agency approved modifications to the compositing scheme were required. Core sampling locations are shown within Figure 2. No more than three stations were composited for any given sample. Two cores were left as individual sample (i.e. not composited with any other core) because they had unique sedimentary properties from neighboring cores (Table 1).

The field survey collected sediment that was tested for physical and chemical data necessary to characterize Holocene material for environmental purposes and to assist with estimating dredge volumes and determine amounts of material slated for HARS and offshore disposal. To accomplish this objective, a bathymetric survey was performed by Ocean Surveys, Inc. (OSI) in May 2006 and these data were provided to ENSR, USACE, NYSDEC, and NJDEP to aid in the selection of sediment sampling locations. Prior to environmental assessment work, geotechnical borings were taken landward of the proposed project, which were also reviewed (AECOM, 2007). Since the underlying Pleistocene glacial till sediments have been pre-approved for ocean disposal (USACE-NY, 2004-Appendix A), it was only necessary to chemically characterize the overlying Holocene, soft strata sediments for chemical and physical parameters.

For the vibracoring assessment effort, sediment cores were collected to depths of at least 2.5 ft below the upper boundary of the Pleistocene glacial till sediments (or to refusal) to ensure the entire Holocene layer was sampled. Refusal was determined at two minutes of vibracoring with no advance further into the sediment. Alpine Ocean Seismic Survey, Inc. (Alpine) provided a 40 foot vibracore, personnel, DGPS and support equipment to conduct the marine sampling for this field survey. At all core sites, the Alpine CoreLog system was used to monitor and record on the barge, the rate and depth of penetration of the Vibracore. These data were available to the AECOM personnel on the barge upon completion of each core. The location of each core was determined by DGPS equipment, interfaced to a computer equipped with Hypack Max 6.2b navigation software. The proposed core locations were entered into the computer and used to generate a target to which the tug boat operator moved the coring barge. The final location was then taken when the Vibracore was placed on the sea floor. All work was conducted from a 30x90 foot spud barge. The barge had a container on it as a work space. Adequate space outside the container was made available for cutting and sampling of the cores and a tent was set up to protect the cores from inclement weather. A total of 39 cores were taken as planned within the approved NYSDEC Dredged Material Sampling Plan (Appendix B). The sampling plan allowed for compositing of up to three nearest neighboring cores, keeping any observed sediment layering greater than the USACE recommended 2 feet distinct for homogenization purposes. The sampling scheme was modified in the field to best characterize the project footprint, any changes made to the compositing scheme were agency approved. Table 1 shows both the originally planned compositing scheme and actual compositing scheme that took place in the field.

Legend	Study Area	Figure 2.
○ Station —— Major Roads		AECOM

Table 1. NYCT Coring Scheme	
Proposed Coring Scheme	**Actual Coring Scheme**
Composite A =sample cores 1, 2 and 3	Composite A =sample cores 1, 2 and 3
Composite B =sample cores 4, 5 and 6	Composite B =sample cores 4, 5 and 6
Composite C =sample cores 7, 8 and 9	Composite C =sample cores 7 and 9
Composite D =sample cores 10, 11 and 12	Composite D =sample cores 10, 11 and 12
Composite E =sample cores 13, 14 and 15	Composite E =sample cores 13, 14 and 15
Composite F =sample cores 16, 17 and 18	Composite F =sample cores 16, 17 and 18
Composite G =sample cores 19, 20 and 21	Composite G =sample cores 19 and 21
Composite H =sample cores 22, 23 and 24	Composite H =sample cores 22, 23 and 24
Composite I =sample cores 25, 26 and 27	Composite I =sample cores 25, 26 and 27
Composite J =sample cores 28, 29 and 30	Composite J =sample cores 28 and 30
Composite K =sample cores 31, 32 and 33	Composite K =sample cores 31, 32 and 33
Composite L =sample cores 34 and 35	Composite L =sample cores 35 and 36
Composite M =sample cores 36 and 37	Composite M =sample cores 37, 38, and 39
Composite N =sample cores 38 and 39	Composite O=29 and 34
	Station 8=Not composited, individual sample
	Station 20=Not composited, individual sample

The chemical composition of the soft strata (Holocene material) was determined for numerous COIs. A list of the COIs tested from each composited sample is presented in Table 2. Raw sediment, amended sediment, and SPLP tests were performed on each of the cores except for dioxin furan compounds from those samples that showed little to no presence of these constituents within the lower layers of the cores (Table 3).

Table 2. Constituents Tested within Raw, SPLP, and Amended Sediment Samples	
Dioxins/Furans	
2,3,7,8-TCDD	Total PeCDFs
1,2,3,7,8-PeCDD	Total HxCDFs
1,2,3,4,7,8-HxCDD	Total HpCDFs
1,2,3,6,7,8-HxCDD	13C12-2,3,7,8-TCDD
1,2,3,7,8,9-HxCDD	13C12-1,2,3,7,8-PeCDD
1,2,3,4,6,7,8-HpCDD	13C12-1,2,3,4,7,8-HxCDD
OCDD	13C12-1,2,3,6,7,8-HxCDD
2,3,7,8-TCDF	13C12-1,2,3,4,6,7,8-HpCDD
1,2,3,7,8-PeCDF	13C12-OCDD
2,3,4,7,8-PeCDF	13C12-2,3,7,8-TCDF
1,2,3,4,7,8-HxCDF	13C12-1,2,3,7,8-PeCDF
1,2,3,6,7,8-HxCDF	13C12-2,3,4,7,8-PeCDF
2,3,4,6,7,8-HxCDF	13C12-1,2,3,4,7,8-HxCDF
1,2,3,7,8,9-HxCDF	13C12-1,2,3,6,7,8-HxCDF
1,2,3,4,6,7,8-HpCDF	13C12-2,3,4,6,7,8-HxCDF
1,2,3,4,7,8,9-HpCDF	13C12-1,2,3,7,8,9-HxCDF
OCDF	13C12-1,2,3,4,6,7,8-HpCDF
Total TCDDs	13C12-1,2,3,4,7,8,9-HpCDF
Total PeCDDs	37Cl4-2,3,7,8-TCDD
Total HxCDDs	TEQ (ND=0)
Total HpCDDs	TEQ (ND=1/2)
Total TCDFs	

Table 2 Continued. Constituents Tested within Raw, SPLP, and Amended Sediment Samples

Metals	Pesticides	PCBs
Aluminum	4,4'-DDD	Aroclor 1016
Barium	4,4'-DDE	Aroclor 1221
Beryllium	4,4'-DDT	Aroclor 1232
Cadmium	Aldrin	Aroclor 1242
Calcium	alpha-BHC	Aroclor 1248
Chromium	alpha-Chlordane	Aroclor 1254
Cobalt	beta-BHC	Aroclor 1260
Copper	delta-BHC	
Magnesium	Dieldrin	
Manganese	Endosulfan I	
Nickel	Endosulfan II	
Selenium	Endosulfan sulfate	
Sodium	Endrin	
Zinc	Endrin aldehyde	
Arsenic	Endrin ketone	
Lead	gamma-BHC	
Potassium	gamma-Chlordane	
Thallium	Heptachlor	
Vanadium	Heptachlor epoxide (B)	
Iron	Methoxychlor	
Antimony	Toxaphene	
Silver	Technical Chlordane	
Mercury	Mirex	
	Cyanide	

Table 2 Continued. Constituents Tested within Raw, SPLP, and Amended Sediment Samples

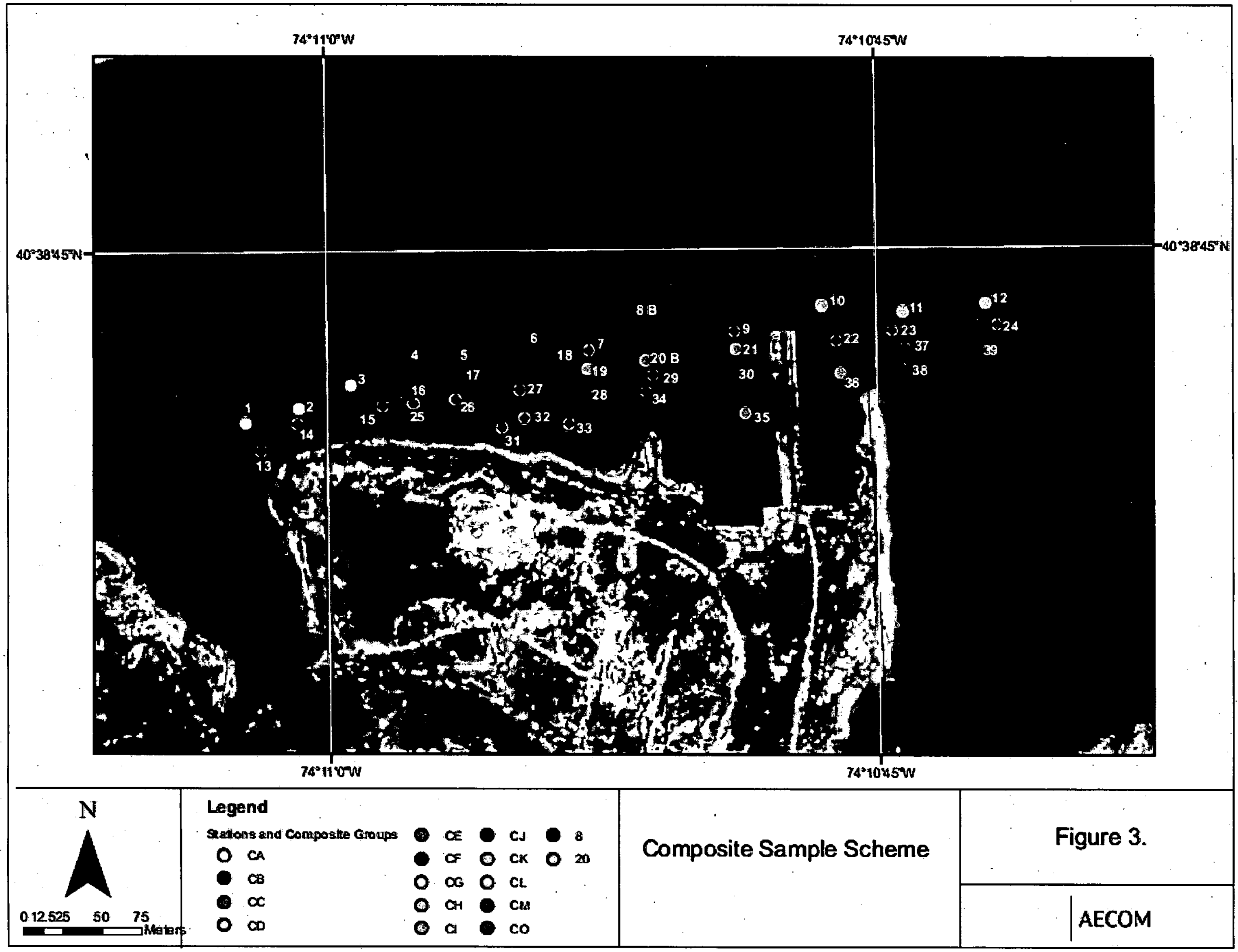
VOCs		SVOCs		
Chloromethane	cis-1,3-Dichloropropene	bis(2-Chloroethyl)ether	Hexachlorocyclopentadiene	Phenanthrene
Vinyl chloride	Toluene	Phenol	2,4,6-Trichlorophenol	Anthracene
Bromomethane	trans-1,3-Dichloropropene	2-Chlorophenol	2,4,5-Trichlorophenol	Carbazole
Chloroethane	1,1,2-Trichloroethane	1,3-Dichlorobenzene	2-Chloronaphthalene	Di-n-butylphthalate
Trichlorofluoromethane	2-Hexanone	1,4-Dichlorobenzene	2-Nitroaniline	Fluoranthene
Acetone	Tetrachloroethene	1,2-Dichlorobenzene	Acenaphthylene	Pyrene
1,1-Dichloroethene	Dibromochloromethane	bis(2-chloroisopropyl)ether	Dimethylphthalate	Butylbenzylphthalate
Carbon disulfide	Chlorobenzene	2-Methylphenol	2,6-Dinitrotoluene	3,3'-Dichlorobenzidine
Methylene chloride	1,1,2,2-Tetrachloroethane	Hexachloroethane	Acenaphthene	Benz[a]anthracene
Methyl tert-butyl ether (MTBE)	Ethylbenzene	n-Nitroso-di-n-propylamine	3-Nitroaniline	Chrysene
trans-1,2-Dichloroethene	p/m-Xylene	4-Methylphenol	2,4-Dinitrophenol	bis(2-Ethylhexyl)phthalate
1,1-Dichloroethane	o-Xylene	Nitrobenzene	Dibenzofuran	Di-n-octylphthalate
Vinyl acetate	Styrene	Isophorone	2,4-Dinitrotoluene	Benzo[b]fluoranthene
2-Butanone (MEK)	Bromoform	2-Nitrophenol	4-Nitrophenol	Benzo[k]fluoranthene
cis-1,2-Dichloroethene		2,4-Dimethylphenol	Fluorene	Benzo[a]pyrene
Chloroform		bis(2-Chloroethoxy)methane	4-Chlorophenyl-phenylether	Indeno[1,2,3-cd]pyrene
1,1,1-Trichloroethane		2,4-Dichlorophenol	Diethylphthalate	Dibenz[a,h]anthracene
Carbon tetrachloride		1,2,4-Trichlorobenzene	4-Nitroaniline	Benzo[g,h,i]perylene
Benzene		Naphthalene	4,6-Dinitro-2-methylphenol	
1,2-Dichloroethane		4-Chloroaniline	n-Nitrosodiphenylamine	
Trichloroethene		Hexachlorobutadiene	4-Bromophenyl-phenylether	
1,2-Dichloropropane		4-Chloro-3-methylphenol	Hexachlorobenzene	
Bromodichloromethane		2-Methylnaphthalene	Pentachlorophenol	
2-Chloroethylvinyl ether				
Methyl isobutyl ketone (MIBK)				

Sediment was extracted from each core layer using inert sampling gear that was pre-cleaned and decontaminated between each sample from within individual cores. Decontamination included washing with a mixture of alconox and site water, rinsing with DIUF water, and then a final rinse with methanol. Once sampling implements were decontaminated, they were wrapped within clean aluminum foil to prevent contact with outside surfaces and cross-contamination. Saw blades used to cut the core liners were also cleaned and decontaminated before use. Any material from the core liners that may have been in contact with the sediment were removed previous to extracting sediment for homogenization and eventual analysis. Sediment for homogenization was placed in clean, decontaminated stainless steel bowls with lids. The samples were homogenized within the barge container to prevent possible influence boat exhaust. Once a sediment sample was thoroughly homogenized, it was distributed into several laboratory provided, clean containers. Samples were held on ice within coolers until ready for shipment. Shipment was through Federal Express priority overnight.

4.0 Results

Raw, amended, and SPLP tests were performed on the samples to determine the extent and location of contaminated within the propose Project area. Most of the cores were not homogeneous regarding sediment stratification and layers identified greater than 2-ft were treated as individual samples. Table 3 lists number of layers within each of the 39 cores taken. Of the fourteen composites and two solitary samples, eleven had two layers and one had three layers. Figure 3 shows the locations of individual cores in relation to the proposed project footprint, existing pier structure, and color codes composites. For consistency, the area west of the existing pier is considered "creek side" and the area east of the pier structure is considered "marsh side" for reference. Marsh side samples showed thin peat layers (less than 2-feet) that were not observed within the creek side or around the pier samples.

In general, individual cores contained three distinct layers greater than 2 feet except cores closest to the navigation channel which only had two layers or the two solitary cores that were unique in their consistency and were likely fill material associated with the burial of the Colonial pipeline (Station 8 and 20). The first layer at the greatest depth was red Pleistocene gravel, sands, and clay, the second layer (middle layer) was gray sand, Holocene but not recent, and less impacted by COIs, the third layer is comprised of black silt, recent Holocene, and had the greatest number and concentrations of COIs. The Holocene material (both black silt and gray sand) was tested for COIs because the Pleistocene material was pre-approved for open ocean disposal. Total organic carbon (TOC) and percent moisture was measured from the composites and solitary core samples within raw sample, only. Amended and SPLP samples were bound with 8% Portland cement and percent moisture or TOC were not measured from these samples.



Composite Sample Scheme

Figure 3.

AECOM

4.1 Raw Sediment Results

4.1.1 Dioxins and Furans

Table 4 presents results of dioxins and furans tested from each composite or solitary core sample. The black silt, upper Holocene layer within all composites as well as within Station 8 and Station 20 showed the presence of dioxins and furans in greater concentrations as compared to the lower, gray sand layer beneath the black silt. The composites with the greatest concentrations and numbers of dioxin/furan congeners were largely found near the existing pier structure and were as follows: CA, CB, CC upper, CE upper, CF upper, Station 8, CG, Station 20 upper, CJ, upper, CO upper, CL upper, CD, and CH upper. The lower layer of CE, CF, Station 20, CJ, CO, CL and CH low concentrations of dioxin/furans and had a limited number of congers present (Table 4). Composites CI all three layers, CK both layers on the creek side as well as CM both layers on the marsh side and all lower layers associated with composites, were the least impacted by dioxin/furans had low concentrations with few congeners (Table 4).

Table 3. Number of Layers per Each Core

Composite	Cores in Composite	Number of Layers
CA	1,2,3	1
CB	4,5,6	1
CC	7,9	2
CD	10,11,12	1
CE	13,14,15	2
CF	16,17,18	2
CG	19,21	2
CH	22,23,24	2
CI	25,26,27	3
CJ	28,30	2
CK	31,32,33	2
CL	35,36	2
CM	37,38,39	2
CO	29,34	2
Sta. 8-0	8	1
Sta. 20	20	2

Table 4. Raw Sediment Dioxins and Furans by Composite Layer.

	UPPER															
Composite Number	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	1,2,3	4,5,6	7,9	10,11,12	13,14,15	16,17,18	19,21	22,23,24	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	8	20
Amount (pg/g)																
2,3,7,8-TCDD	33.6	23.5	74.1	134	1.15	ND	215	15.4	ND	16.1	ND	30	ND	43.5	2	478
1,2,3,7,8-PeCDD	ND	ND	5.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	30.2	ND	ND
1,2,3,4,7,8,-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	23.5	ND	ND
1,2,3,6,7,8-HxCDD	17.9	12.1	26.7	20.5	ND	ND	ND	9.31	ND	12.2	ND	18.2	ND	142	ND	153
1,2,3,7,8,9-HxCDD	10.7	7.21	14.9	11.7	ND	ND	ND	5.75	ND	7.68	ND	11.2	ND	71.2	ND	82.3
1,2,3,4,6,7,8-HpCDD	361	251	332	337	27.8	24.4	797	156	7.45	267	10.4	286	13.8	2550	34.2	2680
OCDD	4010	3010	4670	3490	536	537	9250	1880	159	3400	257	2780	614	28400	501	39300
2,3,7,8-TCDF	18.5	11.7	19.4	ND	ND	1.57	65.5	6.7	ND	8.71	ND	16.7	ND	132	ND	251
1,2,3,7,8-PeCDF	8.34		16.2	12.3	ND	ND	ND	ND	ND	6.03	ND	12.4	ND	101	ND	116
2,3,4,7,8-PeCDF	17.4	13.2	27.6	20.1	ND	ND	ND	9.66	ND	9.9	ND	19	ND	148	ND	182
1,2,3,4,7,8-HxCDF	34.7	27.4	52.8	40.4	ND	ND	103	18.6	ND	22.1	ND	39.3	ND	303	5.03	358
1,2,3,6,7,8-HxCDF	14.2	10.1	22.1	17	ND	ND	ND	8.53	ND	9.19	ND	17	ND	125	ND	154
2,3,4,6,7,8-HxCDF	13	9.48	19.5	15.9	ND	ND	ND	7.45	ND	8.73	ND	15.1	ND	121	ND	137
1,2,3,7,8,9-HxCDF	ND	ND	8.99	6.68	ND	ND	ND	ND	ND	ND	ND	6.8	ND	66.6	ND	65.5
1,2,3,4,6,7,8,-HpCDF	175	139	264	208	6.9	5.73	481	93.1	ND	122	ND	198	ND	1360	33.6	1720
1,2,3,4,7,8,9,-HpCDF	10.1	8.54	22.5	14.8	ND	ND	ND	7.79	ND	7.97	ND	14.8	ND	137	ND	146
OCDF	267	227	511	346	10	15.7	953	147	ND	230	ND	312	ND	2650	39.6	3300
Total TCDDs	99.3	79.9	167	206	3.52	1.64	419	38.9	ND	53.5	ND	70.2	ND	588	6.48	943
Total PeCDDs	27.4	12.6	30.7	20.7	ND	ND	82.4	ND	ND	20.2	ND	32.7	ND	314	ND	253
Total HxCDDs	237	139	232	183	15.8	20.4	417	87.1	7.57	133	10.5	179	15.1	1280	33.1	1360
Total HpCDDS	1190	709	747	775	75.1	75.5	1780	383	26.2	663	37.4	639	51.6	5480	83.6	5540
Total TCDFs	329	245	306	314	7.25	7.25	1310	138	ND	163	ND	224	ND	1730	46.1	2590
Total PeCDFs	179	132	330	240	ND	ND	500	93.7	ND	130	ND	243	ND	1790	6.35	2170
Total HxCDFs	196	146	283	226	ND	ND	576	86.1	ND	126	ND	238	ND	1760	31	1960
Total HpCDFs	316	246	498	374	6.9	5.73	921	153	ND	247	ND	341	ND	2610	61.7	3200
WHO-2005 TEQ (ND=0)	56.7	40.2	112	158	1.66	0.624	248	27.1	0.122	31.2	0.181	54.4	0.322	661	3.34	714
WHO-2005 TEQ (ND=1/2)	59.7	43.3	112	161	6.81	6.22	296	30.2	5.8	34.2	5.86	57.2	6	661	8.24	742

ND=Not Detected ½ TEQ calculated by taking ½ detection limit value.

Table 4 Continued. Raw Sediment Dioxins and Furans by Composite Layer.

	Lower												
Composite Number	**CC-2.7-5.1**	**CE-7.4-11.5**	**CF-3.7-6.1**	**CG-14.2-20.7**	**CH-13.0-15.2**	**CI-15.0-18.1**	**CI-18.1-23.1**	**CJ-15.3-21.6**	**CK13.2-20.5**	**CL-18.7-22.0**	**CM-15.3-20.5**	**CO-11.2-28.4**	**Sta. 20-15.2-27.0**
Stations	**7,9**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**25,26,27**	**25,26,27**	**28,30**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**20**
Amount (pg/g)													
2,3,7,8-TCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.17
1,2,3,7,8-PeCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8,-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.79	ND	17.2	23.2
OCDD	51.3	19.9	11.1	51.7	52.1	122	18.1	20.3	14.7	167	33.2	321	325
2,3,7,8-TCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.23	1.72
1,2,3,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8,-HpCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	8.94	18.3
1,2,3,4,7,8,9,-HpCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.4	25.2
Total TCDDs	1.4	1.33	1.11	1.8	2.52	ND	0.999	1.41	1.71	1.12	1.79	2.7	2.17
Total PeCDDs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDDs	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.42	ND	17	14.4
Total HpCDDS	ND	ND	ND	5.67	4.96	16.2	ND	ND	ND	18.8	4.95	50.3	60.8
Total TCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.8	28.5
Total PeCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.2
Total HpCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.9	31.5
WHO-2005 TEQ (ND=0)	0.0154	0.00597	0.00333	0.0155	0.0156	0.0366	0.00543	0.00609	0.00441	0.118	0.00996	0.484	2.86
WHO-2005 TEQ (ND=1/2)	5.72	5.71	5.7	5.72	5:72	5.74	5.71	5.71	5.71	5.79	5.71	6.08	7.96

ND=Not Detected ½ TEQ calculated by taking ½ detection limit value.

4.1.2 Metals

Analysis on sediment samples was performed on the following metals based on the agency approve field sampling plan protocol: Aluminum (Al), Antimony (An), Aresenic (Ar), Barium (Ba), Beryllium (Be), Cadmium (Cd), Calcium (Ca), Chromium (Cr), Cobalt (Co), Copper (Cu), Iron (Fe), Lead (Pb), Magnesium (Mg), Manganese (Mn), Nickel (Ni), Potassium (K), Selenium (Se), Silver (Ag), Sodium (Na), Thallium (Tl), Vanadium (V), Zinc (Zn) and total Mercury (Hg). Metals concentrations were randomly distributed throughout the proposed project location i.e. there was no difference in metals concentration when marsh area was compared to the creek area or the area near the existing pier (Table 5). There was a trend that the black, silty upper layer of composites including solitary Station 8 had higher concentrations of metals when compared to the deeper gray, clay layer, however, when averages were compare with ± 1 standard deviation only Al, Be, Fe, K, and Na showed significant differences suggesting that the upper layer had higher concentrations of these COIs when compared to the lower layers (Tables 5 and 6).

Of the twenty-three metals, a subset of eight that are typically considered for risk analysis and have effects range low (ER-L) and effects range median (ER-M) screening values (Long et al. 1995) were compared to the raw sediment chemistry results. These screening values were included within Table 5 as sediment quality guidelines to assist with understanding possible risks to marine organisms and humans. ER-L and ER-M screening values were developed as guidelines from a series of exposure studies conducted in the 1990s by the NOAA Status and Trends program. Study endpoints in which adverse effects were measured at the 10th (low) and 50th (median) percentiles indicate ER-L and ER-M, respectively. Exceedences of ER-L values suggest acute toxicity may be possible while exceedences of ER-M values suggest chronic toxicity is possible. Within the upper composite layer (black silty sediment) only CE, CO, and Station 8 did not exceed ER-L or ER-M for Arsenic. Three composites (CC, CG, and Station 20) exceeded ER-M for Arsenic and the remaining composites exceeded ER-L for this COI. The average value and standard deviation for all upper layers of composites exceeded ER-L but did not exceed ER-M. Composites E, F, I, K, M, O, and Station 8 for upper layers within composites did not exceed either ER-L or ER-M values for Cadmium. Only Composite CL and Station 20 exceeded the ER-M value for Cadmium, the remaining upper layers for composites, the average and standard deviation exceeded the ER-L value (Table 5). For Chromium, only Station 20 exceeded the ER-M value while composites CA, CB, CC, CD, CG, CH, CJ, CL, the average and standard deviation exceeded the ER-L value. Remaining composites did not exceed either ER-M or ER-L values for Chromium. Composites CE, CI, CK, CM, CO and Station 8 did not exceed either ER-L or ER-M values for Copper. Composites CC, CG, CL and Station 20 exceeded the ER-M value for Copper while the remaining stations exceeded ER-L values (Table 5). The average for Copper within upper layers of all composites exceeded the ER-L value while the standard deviation exceeded the ER-M value suggesting there is a high variance among stations for this COI. Lead was observed to exceed ER-M value for CC, CG, CL and Station 20. The average, standard deviation, and composites CA, CB, CD, CH, CJ and CM for this COI exceeded ER-L value. Remaining composites did not exceed either of these screening values for Lead (Table 5). Nickel exceeded either ER-L or ER-M for all composites except Station 8 which was below both of these screening values. The average and standard deviation for Nickel exceeded ER-L value (Table 5). However, composites CE and CF had 21.6 and 22.6 mg/kg respectively, very close to the ER-L value of 21 mg/kg. For Zinc, the ER-M value was exceeded within composites CC, CG, CL and Station 20 as well as the average and standard deviation suggesting there was high variation among stations for this COI. Composites CA, CB, CD, CF, CH, and CJ exceeded the ER-L value. Remaining composites did not exceed either screening value for Zinc. Mercury, in general was high among the stations. Only stations CI and CK did not exceed either screening value. Composites CE and CM along with Station 8 exceeded the ER-L value for Mercury by only a small amount. The remaining stations exceeded the ER-M value for this COI as did the average and standard deviation.

When the results from lower layers of sediment cores were compared to metals ER-L and ER-M values, there were very few samples that had screening level exceedences. Only Station 20 had ER-M exceedences within the lower layer. This suggests that Station 20 had the most metals exposure risk among all the stations. While there may not be statistical differences when upper layer concentrations of COIs were compared to lower layers, there are clear differences with regard to health risk where the upper layers of the composites are more likely to cause acute or chronic metals exposure issues when compared to the relatively metals uncontaminated lower layers.

Percent moisture was measured for each layer within the composites. The general trend was that the upper layers had considerable amounts of moisture when compared to the more compact, gray sand layer that was deeper within the composites. Total organic carbon followed this same trend (Table 5).

4.1.3 PCBs

Composites were analyzed for six PCB Aroclors. These Aroclors are as follows: Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, and Aroclor 1260. Results are show in Table 7. In general, PCB concentrations were largely reported at or below the detection limit. The area around the existing pier structure had higher concentrations of PCBs when compared to the marsh or creek side of the proposed project. Aroclor 1016, Aroclor 1221, Aroclor 1232 and Aroclor 1248 were at or below the detection limit for all stations and all layers suggesting these PCBs are not in high enough concentrations to present marine organism or human risk issues. The upper layer of Station 20 had the highest concentrations of detectable Aroclors among all stations. A trend of decreased concentrations of PCBs within lower layers of composites and individual stations was also observed (Table 7) and nearly all of the PCB concentrations within the lower layers of the composites were below detection levels. Because most of the PCBs were at or below detection limits, averages and standard deviations were not calculated.

Table 5. Metals Concentrations by Layer within Core

Composite Number (UPPER)

TRACK 2; R/C-I; EPGV

Stations		ER-L	ER-M	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7
Composite Number				**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10, 11, 12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**22,23,24**	**22,23,24**	**25,26,27**	**28,30**	**31,32,33**	**31,32,33**	**35,36**
Amount (mg/kg)																			
Aluminum		NA	NA	10600	9460	8750	7550	7720	9620	8080	10800	10800	11200	10800	11100	11700	10700	9340	12700
Antimony		NA	NA	0.619	0.525	1.19	0.451	0.489	U	0.170	1.65	0.354	0.453	0.353	U	0.400	U	U	1.30
Arsenic	16	8.2	70	**19.0**	**21.3**	**74.3**	**13.8**	**15.8**	5.12	**19.7**	**80.8**	**20.6**	**22.1**	**20.6**	**13.0**	**19.9**	**8.66**	**8.53**	**49.8**
Barium	400	NA	NA	225	142	226	175	176	191	166	317	148	192	157	30.1	130	91.3	34.4	481
Beryllium	47	NA	NA	1.01	0.804	0.730	0.684	0.763	0.973	0.782	0.932	0.789	0.807	0.778	0.983	0.964	0.799	0.725	1.01
Cadmium	7.5	1.2	9.6	**2.72**	**2.10**	**4.76**	**2.50**	**2.96**	0.341	0.487	**8.25**	**2.40**	**2.77**	**2.49**	0.178	**3.05**	0.269	0.120	**13.6**
Calcium		NA	NA	6620	6840	72400	9050	8990	1520	9330	50600	3520	3700	3510	2280	6320	1780	1590	5940
Chromium	19/1500	81	370	**106**	**83.4**	**141**	**82.2**	**91.5**	27.4	39.2	**273**	**83.6**	**99.8**	**91.8**	34.8	**121**	29.4	25.8	**331**
Cobalt		NA	NA	12.2	10.2	9.79	9.36	9.85	11.5	8.85	12.3	10.5	10.9	10.6	10.3	10.7	9.78	8.33	13.3
Copper	270	34	270	**200**	**144**	**325**	**144**	**157**	16.9	**48.6**	**486**	**141**	**171**	**155**	16.0	**191**	15.8	12.7	**612**
Iron		NA	NA	28800	26900	24600	21000	21900	16000	20600	33700	36300	35600	34400	38100	37800	32300	29400	37000
Lead	450	47	218	**171**	**123**	**278**	**123**	**126**	17.9	41.4	**330**	**114**	**144**	**124**	13.4	**145**	12.2	10.3	**380**
Magnesium		NA	NA	7120	6030	7980	5890	5840	4730	4180	6920	6020	6180	5880	5580	6190	319	313	420
Manganese	2000	NA	NA	569	434	345	515	518	148	168	408	501	489	462	393	382	5760	5050	7760
Nickel	130	21	52	**37.8**	**30.3**	**44.8**	**28.3**	**30.5**	**21.6**	**22.6**	**67.3**	**32.6**	**35.3**	**34.0**	**25.0**	**37.4**	**23.2**	20.3	**61.3**
Potassium		NA	NA	2400	2050	1700	1740	1770	1450	1350	2050	2130	2030	1950	2310	2330	2200	2040	2600
Selenium	4	NA	NA	1.62	1.75	2.92	1.14	1.34	1.54	1.61	4.04	2.00	2.27	2.21	1.47	2.41	1.62	1.19	7.76
Silver	8.3	NA	NA	2.85	1.91	3.62	2.12	2.59	0.401	0.383	5.56	1.72	2.08	1.97	0.233	3.75	U	U	9.36
Sodium		NA	NA	8650	7560	7820	5460	5460	4160	3940	7530	6610	6420	6550	6820	7100	6370	5830	9790
Thallium		NA	NA	0.259	0.209	0.546	0.180	0.187	0.0770	0.199	0.554	0.199	0.206	0.191	0.190	0.294	0.202	U	0.470
Variadium		NA	NA	37.8	32.6	30.6	25.7	28.6	41.9	45.1	52.5	35.7	37.4	34.9	43.1	45.6	33.6	30.0	54.7
Zinc	2480	150	410	**324**	**238**	**508**	**222**	**238**	73.1	**115**	**663**	**219**	**252**	**229**	73.0	**281**	70.6	57.4	**757**
Mercury	.73	0.15	0.71	**4.160**	**2.620**	**6.620**	**3.290**	**3.860**	**0.194**	**0.713**	**12.900**	**2.820**	**3.140**	**2.640**	0.036	**3.940**	0.0479	0.0347	**16.2**
Percent Moisture (%)		-	-	59.00	56.10	54.90	46.90	48.20	42.80	39.70	56.00	50.50	50.50	50.80	53.00	55.20	51.90	44.70	59.70
Total Organic Carbon (%)*		-	-	2.05	2.25	2.30	1.25	1.30	4.30	1.75	2.85	2.50	2.70	2.85	3.50	2.00	3.20	2.65	3.35
*Average of 2 runs		-	-																

Dup.=Duplicate, Trip.=Triplicate, NA=Not Available, bold type indicates exceedence of ER-L, gray box indicates exceedence of ER-M

Hex Cr?

Table 5 Continued. Metals Concentrations by Layer within Composite

Composite Number	ER-L	ER-M	Upper					
Stations			**CM-0.0-15.3 37,38,39**	**CO-0.0-11.2 29,34**	**Sta. 8-0.0-31.0 8**	**Sta. 20-0.0-15.2 20**	**Total Upper Average**	**Total Upper Standard Dev.**
Amount (mg/kg)								
Aluminum	NA	NA	10600	7290	5090	14100	9900.00	2069.12
Antimony	NA	NA	U	2.55	U	3.16	0.73	0.85
Arsenic	8.2	70	**13.5**	7.52	6.34	133	**28.67**	**32.26**
Barium	NA	NA	34.5	49.4	22.9	1040	201.43	225.29
Beryllium	NA	NA	0.764	1.04	0.344	1.06	0.84	0.17
Cadmium	1.2	9.6	0.174	0.172	0.324	37.7	**4.37**	**8.50**
Calcium	NA	NA	2240	1590	10300	5950	10703.50	17957.66
Chromium	81	370	34.5	38.3	22.9	663	**120.98**	**150.85**
Cobalt	NA	NA	10.6	12.0	5.16	16.6	10.64	2.21
Copper	34	270	27.2	19.0	23.1	1220	**206.27**	287.87
Iron	NA	NA	34200	17000	16800	40100	29125.00	7960.29
Lead	47	218	**52.6**	11.0	25.6	580	**141.12**	**148.72**
Magnesium	NA	NA	5360	4260	3610	7250	5003.60	2269.39
Manganese	NA	NA	471	390	337	366	1273.30	2170.11
Nickel	21	52	**25.1**	**26.6**	15.6	136	**37.78**	**26.48**
Potassium	NA	NA	1970	1570	1020	2560	1961.00	407.61
Selenium	NA	NA	1.08	0.769	0.504	10.0	2.46	2.36
Silver	NA	NA	0.252	9.55	0.706	12.3	3.10	3.49
Sodium	NA	NA	5380	1320	2380	10300	6272.50	2212.18
Thallium	NA	NA	0.221	0.179	0.129	0.721	0.27	0.17
Vanadium	NA	NA	33.3	42.6	18.0	102	40.29	17.01
Zinc	150	410	92.0	65.2	53.0	1720	312.52	386.20
Mercury	0.15	0.71	**0.753**	38.300	**0.393**	46.900	7.48	**12.80**
Percent Moisture (%)			46.60	59.90	23.00	64.00	50.67	9.00
Total Organic Carbon (%)*			2.60	2.30	0.63	4.05	2.52	0.91

*Average of 2 runs

Dup.=Duplicate, Trip.=Triplicate, NA=Not Available, bold type indicates exceedence of ER-L, gray box indicates exceedence of ER-M U=Undetected

Table 5 Continued. Metals Concentrations by Layers in Composites

Composite Number			Lower															
Stations	ER-L	ER-M	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0	Total Lower	Total Lower Stand. Dev.
			7,9	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**25,26,27**	**25,26,27**	**28,30**	**31,32,33**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**20**	**Ave.**	**Dev.**
Amount (mg/kg)																		
Aluminum	NA	NA	2920	2470	3500	3090	6890	5350	3360	5640	2550	2730	3580	5680	5270	6680	4265.00	1578.35
Antimony	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	0.131	0.326	0.12	0.07
Arsenic	8.2	70	4.29	**11.3**	5.25	3.10	3.24	3.96	2.31	**47.1**	3.20	2.25	4.23	2.87	7.79	**18.2**	**8.51**	**11.94**
Barium	NA	NA	33.3	13.6	51.0	47.8	83.2	49.7	22.3	470	11.0	13.0	25.2	91.2	37.4	77.0	73.26	117.14
Beryllium	NA	NA	0.464	0.376	0.352	0.345	0.620	0.475	0.395	0.485	0.290	0.292	0.465	0.689	0.418	0.456	0.44	0.11
Cadmium	1.2	9.6	0.0817	0.0644	0.0400	0.0802	0.0650	0.102	0.0581	12.1	0.0620	0.0547	0.129	0.101	0.579	1.00	1.04	**3.20**
Calcium	NA	NA	665	272	842	720	793	1300	709	3310	419	340	780	634	6870	6080	1695.29	2161.73
Chromium	81	370	13.3	12.0	14.8	11.3	18.0	17.7	13.9	**233**	9.22	9.88	14.0	19.3	31.7	45.9	33.14	58.36
Cobalt	NA	NA	5.36	84.9	8.63	5.22	8.63	5.47	6.01	6.94	5.64	5.91	6.03	7.87	5.26	6.22	12.01	21.01
Copper	34	270	9.16	5.58	6.82	9.64	6.80	7.15	8.64	404	16.2	8.43	10.7	8.33	41.3	**85.8**	**44.90**	**105.61**
Iron	NA	NA	8400	9850	11900	8210	26000	16000	8760	9460	6780	6420	11700	11500	16400	19400	12198.57	5499.64
Lead	47	218	5.20	4.04	5.20	5.12	7.86	5.07	4.58	**205**	3.21	3.29	6.42	7.58	**53.6**	**162**	34.16	**65.12**
Magnesium	NA	NA	1740	1480	2520	1750	2780	2920	1920	2990	79.3	76.8	99.9	2530	3610	3950	2031.86	1264.05
Manganese	NA	NA	184	97.2	117	197	368	98.5	221	183	1450	1390	2120	145	322	289	512.98	643.10
Nickel	21	52	11.1	**25.2**	15.4	10.2	13.4	10.9	12.3	**47.2**	10.1	10.4	12.0	14.1	18.1	**22.6**	16.64	9.96
Potassium	NA	NA	499	580	859	542	926	1010	707	1090	433	517	676	930	1090	1310	797.79	270.75
Selenium	NA	NA	0.201	0.193	0.196	0.317	0.539	1.20	0.316	3.28	0.254	0.205	0.343	0.547	0.794	1.01	0.67	0.82
Silver	NA	NA	U	0.672	U	U	U	U	0.131	U	U	U	U	U	1.24	2.16	0.39	0.60
Sodium	NA	NA	809	980	1060	878	2210	4220	737	3760	626	653	1360	1900	2370	2470	1716.64	1164.28
Thallium	NA	NA	U	U	0.0776	0.182	0.0579	0.110	0.0864	0.226	U	U	U	0.0879	0.130	0.226	0.11	0.06
Vanadium	NA	NA	14.5	16.0	15.3	11.9	32.5	28.9	14.5	38.4	9.72	10.0	16.0	33.1	19.2	23.6	20.26	9.38
Zinc	150	410	30.0	41.3	35.3	29.1	38.2	34.0	32.1	558	24.6	25.0	37.3	44.9	77.9	146	82.41	140.51
Mercury	0.15	0.71	0.027	0.015	0.014	0.014	0.018	0.020	0.014	0.014	0.0138	0.0143	0.0880	0.016	0.740	2.830	0.27	0.76
Percent Moisture (%)			15.30	14.60	14.00	16.00	23.60	37.40	13.70	13.10	12.80	13.60	15.30	23.70	30.20	30.00	19.52	8.02
Total Organic Carbon (%)*			0.32	0.18	0.20	0.11	0.87	1.75	0.12	0.09	0.08	0.16	0.90	0.35	0.65	1.35	0.51	0.53

*Average of 2 runs

Dup.=Duplicate, Trip.=Triplicate, NA=Not Available, bold type indicates exceedence of ER-L, gray box indicates exceedence of ER-M U=Undetected

Table 6. Standard Deviation (±1) for Upper Layer and Lower Layer of Composites for Metals Concentrations (mg/kg)	Average Upper Layer	Standard Deviation Upper Layer	Average Lower Layer	Standard Deviation Lower Layer
Amount (mg/kg)				
Aluminum	9900.0	2069.1	4265.0	2263.844
Antimony	0.7	0.8	0.1	0.259
Arsenic	28.7	32.3	8.5	14.261
Barium	201.4	225.3	73.3	128.152
Beryllium	0.8	0.2	0.4	0.193
Cadmium	4.4	8.5	1.0	3.820
Calcium	10703.5	17957.7	1695.3	5223.750
Chromium	121.0	150.9	33.1	68.535
Cobalt	10.6	2.2	12.0	4.666
Copper	206.3	287.9	44.9	127.197
Iron	29125.0	7960.3	12198.6	6554.834
Lead	141.1	148.7	34.2	73.307
Magnesium	5003.6	2269.4	2031.9	1542.828
Manganese	1273.3	2170.1	513.0	754.677
Nickel	37.8	26.5	16.6	11.695
Potassium	1961.0	407.6	797.8	452.848
Selenium	2.5	2.4	0.7	0.982
Silver	3.1	3.5	0.4	1.210
Sodium	6272.5	2212.2	1716.6	1639.540
Thallium	0.3	0.2	0.1	0.066
Vanadium	40.3	17.0	20.3	10.631
Zinc	312.5	386.2	82.4	168.526
Mercury	7.5	12.8	0.3	3.880
Percent Moisture (%)	50.7	9.0	19.5	12.603
Total Organic Carbon (%)*	2.5	0.9	0.5	0.733

TOTAL PCB's
SCG
1 ppm

Table 7. PCB Aroclor Concentrations by Layer within Composite

Composite Number	UPPER															
Stations	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7
	1,2,3	4,5,6	7,9	10,11,12	10, 11, 12	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24	25,26,27	28,30	31,32,33	31,32,33	35,36
Amount (ug/kg)																
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	294	210	374	176	332	U	12.8	846	183	191	139	U	273	U	U	797
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	579	409	481	286	535	22.6	U	863	208	220	151	U	451	U	U	696
Aroclor 1260	131	144	112	83.7	136	U	U	195	67.7	78.5	38.6	U	175	U	U	251

[1.0] [1.9] [1.7]

TOTAL PCB's
1-5 ppm
in 5 samples

Table 7 Continued. PCB Aroclor Concentrations by Layer within Composite.

Composite Number	UPPER			
Stations	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
	37,38,39	29,34	8	20
Amount (ug/kg)				
Aroclor 1016	U	U	U	U
Aroclor 1221	U	U	U	U
Aroclor 1232	U	U	U	U
Aroclor 1242	U	2760	30.5	2540
Aroclor 1248	U	U	U	U
Aroclor 1254	U	2080	41.6	1690
Aroclor 1260	U	680	15.5	530

[5.5] [4.7]

Table 7 Continued. PCB Aroclor Concentrations by Layer within Composite														
Composite Number	LOWER													
Stations	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	20
Amount (ug/kg)														
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U	U	46.9	91.7
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	7.70	U	U	U	U	U	U	U	U	U	U	U	59.0	82.6
Aroclor 1260	U	U	U	U	U	U	U	U	U	U	U	U	U	U

4.1.4 Pesticides

Twenty-three pesticides and cyanide were tested from the sediment samples. The general trend was that pesticides and cyanide, excluding DDD, DDT, and DDE, were undetected. Station 20, had the highest concentrations of detected pesticides among the stations sampled. Composite CO had the only concentration of cyanide above detection limits (6.7 mg/kg). Similar to PCBs, Dioxins/Furans, and Metals, concentrations of pesticides were found at higher concentrations within upper black, silty layers when compared to the deeper gray sand layers (Table 8).

4.1.5 Volatile Organic Compounds

Station 20 had the highest concentrations of VOC COIs among all stations and composites tested. The upper layer from the composites had concentrations of acetone, carbon disulfide, 2-butanone (MEK), methyl isobutyl ketone (MIBK), toluene, cholorbenzene, ethylbenzene, p/m-xylene, 0-xylene, and C-1,2-dicholorethene present above the detection limit. Few VOCs were detected within the lower layer of the composites and solitary core samples (Table 9). The upper layer from composites and solitary stations had higher concentrations of VOC COIs when compared to the lower layer sampled, a trend observed with other COIs tested from these sediment samples.

4.1.6 Semi-Volatile Organic Carbon

Semi-volatile organic compounds were detected for several PAHs, naphthalene, and 2-metanapthalene. Concentrations of SVOCs were higher in the upper layers of the composites when compared to results from the lower composite layers similar to what was observed for the other constituents (Table 10). Station 20 and Composite CO had the highest concentrations of SVOCs. Within the lower layers, only Station 20 and Composite CO had more than one SVOC COI detected.

Table 8. Pesticides by Layer within Composites.	UPPER								
Composite Number	**CA-0.0-2.0**	**CB-0.0-3.0**	**CC-0.0-2.7**	**CD-0.0-1.9**	**CD-0.0-1.9 Dup**	**CE-0.0-7.4**	**CF-0.0-3.7**	**CG-0.0-14.2**	**CH-0.0-13.0**
Stations	**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**
Amount (ug/kg)									
4,4'-DDD	159	133	49.5	104	92.0	9.22	2.13	78.2	75.5
4,4'-DDE	167	179	79.3	120	114	9.90	2.75	169	85.7
4,4'-DDT	98.2	368	U	40.6	37.0	2.86	1.25	70.1	21.5
Aldrin	U	U	U	U	U	U	U	18.0	U
alpha-BHC	U	U	U	U	U	U	U	4.22	U
alpha-Chlordane	7.59	U	U	U	U	U	U	7.86	U
beta-BHC	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	U	U	U
Endosulfan I	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	U
gamma-Chlordane	14.4	12.2	7.00	9.41	9.52	U	U	14.7	7.74
Heptachlor	U	U	U	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U
Amount (mg/kg)									
Cyanide	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

IW

Table 8 Continued. Pesticides by Layer within Composites.

Composite Number	UPPER CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	22,23,24	22,23,24	25,26,27	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	8	20
Amount (ug/kg)											
4,4'-DDD	39.5	40.4	2.71	63.5	U	U	94.2	U	44.1	1.81	98.9
4,4'-DDE	52.9	63.7	U	86.4	U	U	241	U	239	3.48	453
4,4'-DDT	192	U	U	46.7	U	U	U	U	U	U	4.94
Aldrin	U	U	U	U	U	U	U	U	U	U	37.1
alpha-BHC	U	U	U	U	U	U	U	U	U	U	8.29
alpha-Chlordane	U	U	U	U	U	U	7.01	U	15.0	U	23.6
beta-BHC	U	U	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	21.5	U	41.7	U	82.4
Endosulfan I	U	U	U	U	U	U	U	U	U	U	U
Endosulfan II	3.95	4.23	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	U	U	9.58
gamma-Chlordane	4.78	5.94	U	U	U	U	25.1	U	23.4	U	46.9
Heptachlor	U	U	U	U	U	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	U	U	U
Methoxychlor	U	U	15.8	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U	U	13.2
Amount (mg/kg)											
Cyanide	U	U	U	U	U	U	U	U	6.7	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 8 Continued. Pesticides by Layer within Composites.

Composite Number	LOWER													
Stations	**CC-2.7-5.1**	**CE-7.4-11.5**	**CF-3.7-6.1**	**CG-14.2-20.7**	**CH-13.0-15.2**	**CI-15.0-18.1**	**CI-18.1-23.1**	**CJ-15.3-21.6**	**CK13.2-20.5**	**CK-13.2-20.5 Dup.**	**CL-18.7-22.0**	**CM-15.3-20.5**	**CO-11.2-28.4**	**Sta. 20-15.2-27.0**
	7,9	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**25,26,27**	**25,26,27**	**28,30**	**31,32,33**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**20**
Amount (ug/kg)														
4,4'-DDD	1.29	U	U	U	U	U	U	U	U	U	U	U	44.1	U
4,4'-DDE	1.38	U	U	U	U	U	U	U	U	U	1.03	U	239	U
4,4'-DDT	3.83	U	U	U	U	U	U	U	U	U	U	U	U	U
Aldrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
alpha-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
alpha-Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	15.0	U
beta-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	U	U	U	U	U	U	41.7	U
Endosulfan I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
gamma-Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	23.4	U
Heptachlor	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Amount (mg/kg)														
Cyanide	U	U	U	U	U	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 9. Volatile Organic Carbon Concentrations within Composites by Layer.

UPPER

Composite Number		CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0
Stations		1,2,3	4,5,6	7,9	10,11,12	10,11,12	13,14,15	16,17,18	19,21	22,23,24
Amount (ug/kg)										
Chloromethane		U	U	U	U	U	U	U	U	U
Vinyl chloride		U	U	U	U	U	U	U	U	U
Bromomethane		U	U	U	U	U	U	U	U	U
Chloroethane		U	U	U	U	U	U	U	U	U
Trichlorofluoromethane		U	U	U	U	U	U	U	U	U
Acetone	50	167	94.6	120	34.2	54.1	73.8	8.96	1020	990
1,1-Dichloroethene		U	U	U	U	U	U	U	U	U
Carbon disulfide		4.63	4.36	8.40	2.46	3.43	8.89	4.35	10.7	U
Methylene chloride		U	U	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)		U	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene		U	U	U	U	U	U	U	U	U
1,1-Dichloroethane		U	U	U	U	U	U	U	U	U
Vinyl acetate		U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	120	27.9	23.7	32.9	11.0	19.6	12.7	U	25.2	U
cis-1,2-Dichloroethene		U	U	U	U	U	U	U	U	U
Chloroform		U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane		U	U	U	U	U	U	U	U	U
Carbon tetrachloride		U	U	U	U	U	U	U	U	U
Benzene	60	U	U	7.73	U	U	U	U	4.88	U
1,2-Dichloroethane		U	U	U	U	U	U	U	U	U
Trichloroethene		U	U	U	U	U	U	U	U	U
1,2-Dichloropropane		U	U	U	U	U	U	U	U	U
Bromodichloromethane		U	U	U	U	U	U	U	U	U
2-Chloroethylvinyl ether		U	U	U	U	U	4.78	U	U	U
Methyl isobutyl ketone (MIBK)		7.71	30.1	U	1.69	2.00	U	U	11.9	U
cis-1,3-Dichloropropene		U	U	U	U	U	U	U	U	U
Toluene		U	U	4.41	U	U	U	U	U	U
trans-1,3-Dichloropropene		U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane		U	U	U	U	U	U	U	U	U
2-Hexanone		U	U	U	U	U	U	U	U	U
Tetrachloroethene		U	U	U	U	U	U	U	U	U
Dibromochloromethane		U	U	U	U	U	U	U	U	U
Chlorobenzene		U	U	9.38	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane		U	U	U	U	U	U	U	U	U
Ethylbenzene	1000	U	U	54.5	U	U	U	U	6.67	U
p/m-Xylene	(T) 1600	1.78	3.64	137	U	U	U	U	U	U
o-Xylene		U	1.84	145	U	U	U	U	U	U
Styrene		U	U	U	U	U	U	U	U	U
Bromoform		U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 9 Continued. Volatile Organic Carbon Concentrations within Composites by Layer.

UPPER

Composite Number	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	22,23,24	22,23,24	25,26,27	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	8	20
Amount (ug/kg)	U	U									
Chloromethane	U	U	U	U	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U	U
Acetone	1000	U	988	793	1010	960	3220	620	3840	71.3	11300
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
Carbon disulfide	U	U	12.8	10.9	18.1	13.2	35.5	U	20.8	15.6	83.6
Methylene chloride	U	U	U	U	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	13.6	1.86	U	47.4	U	57.8	9.60	78.9
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
Chloroform	U	U	1.38	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	12.7	U	50.6	5.31	68.7
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	U	49.0	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U	26.5	U	34.5
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U	25.6
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	12.9	U	113	U	92.9
p/m-Xylene	U	U	U	U	U	U	U	U	342	1.99	219
o-Xylene	U	U	U	U	U	U	U	U	273	2.42	194
Styrene	U	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 9 Continued. Volatile Organic Carbon Concentrations within Composites by Layer.							
Composite Number	LOWER						
Stations	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13-0.0-15.2	CI-15.0-18.1	CI-18.1-23.1
	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27
Amount (ug/kg)							
Chloromethane	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Acetone	U	U	U	U	U	368	199
1,1-Dichloroethene	U	U	U	U	U	U	U
Carbon disulfide	2.78	13.3	15.4	1.88	U	12.1	2.29
Methylene chloride	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	2.14	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	0.97
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	42.4	396	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
p/m-Xylene	U	U	U	U	U	U	U
o-Xylene	0.83	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
U=Undetected Dup.=Duplicate, Trip.=Triplicate							

Table 9 Continued. Volatile Organic Carbon Concentrations within Composites by Layer.

Composite Number	LOWER						
Stations	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	20
Amount (ug/kg)							
Chloromethane	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Acetone	U	U	U	U	810	487	U
1,1-Dichloroethene	U	U	U	U	U	U	U
Carbon disulfide	U	U	U	U	U	2.24	U
Methylene chloride	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	1.72	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U
Benzene	U	U	U	U	U	U	10.3
1,2-Dichloroethane	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
p/m-Xylene	U	U	U	U	U	U	4.64
o-Xylene	U	U	U	U	U	U	10.8
Styrene	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 10. SVOCs by layer within Composites.

UPPER

Composite Number	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup.	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.
Stations	1,2,3	4,5,6	7,9	10,11,12	10,11,13	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24
Amount ug/kg											
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
Naphthalene 12000	J	U	1200	U	U	U	U	1360	U	J	U
4-Chloroaniline	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U	U	U
2-Methylnaphthalene	J	U	1420	U	U	U	U	1030	U	J	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U	837	U	U	U
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U
n-Nitrosodiphenylamine	U	U	U	U	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene 500000	810	895	3090	U	U	U	583	4460	J	1350	J

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 10 Continued. SVOCs by layer within Composites.

UPPER

Composite Number		CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup.	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.
Stations		1,2,3	4,5,6	7,9	10,11,12	10,11,13	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24
Amount ug/kg												
Di-n-butylphthalate		U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	500000	1470	1760	3920	753	920	U	607	4540	U	1710	1040
Pyrene	500000	1760	1960	4080	1090	1170	U	675	5610	U	1810	1020
Butylbenzylphthalate		U	U	U	U	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine		U	U	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	1000	766	986	2490	506	U	U	429	3120	U	J	J
Chrysene	1000	992	1280	3220	664	U	U	527	3990	U	842	J
bis(2-Ethylhexyl)phthalate		4380	3020	7210	6230	6870	329	U	15800	3820	6290	4920
Di-n-octylphthalate		U	U	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	1700	862	837	1370	513	U	U	U	1610	U	J	J
Benzo[k]fluoranthene	1700	888	870	1720	609	U	U	U	2300	U	J	J
Benzo[a]pyrene	1000	722	845	1610	452	U	U	U	1850	U	J	J
Indeno[1,2,3-cd]pyrene	560	566	538	1010	363	U	U	U	1330	U	U	U
Dibenz[a,h]anthracene	560	435	U	634	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	500000	688	613	1140	438	U	U	U	1580	U	U	U
Anthracene	500000	J	U	1370	U	U	U	U	1390	U	J	U
Carbazole		U	U	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 10 Continued. SVOCs by layer within Composites.

Composite Number		CI-0.0-15.0 (UPPER)	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations		25,26,27	28,30	31,32,33	31, 32, 33	35,36	37,38,39	29,34	8	20
Amount ug/kg										
bis(2-Chloroethyl)ether		U	U	U	U	U	U	U	U	U
Phenol		U	U	U	U	U	U	U	U	U
2-Chlorophenol		U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene		U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	1800	U	U	U	U	U	U	1680	U	U
1,2-Dichlorobenzene	1100	U	U	U	U	U	U	380	U	U
bis(2-chloroisopropyl)ether		U	U	U	U	U	U	U	U	U
2-Methylphenol		U	U	U	U	U	U	U	U	U
Hexachloroethane		U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine		U	U	U	U	U	U	U	U	U
4-Methylphenol		U	U	U	U	U	U	U	U	U
Nitrobenzene		U	U	U	U	U	U	U	U	U
Isophorone		U	U	U	U	U	U	U	U	U
2-Nitrophenol		U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol		U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane		U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol		U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene		U	U	U	U	U	U	U	U	U
Naphthalene	12500	U	U	U	U	U	U	1760	271	2110
4-Chloroaniline		U	U	U	U	U	U	U	U	U
Hexachlorobutadiene		U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol		U	U	U	U	U	U	U	U	U
2-Methylnaphthalene		U	U	U	U	U	U	2550	299	2960
Hexachlorocyclopentadiene		U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol		U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol		U	U	U	U	U	U	U	U	U
2-Chloronaphthalene		U	U	U	U	U	U	U	U	U
2-Nitroaniline		U	U	U	U	U	U	U	U	U
Acenaphthylene		U	U	U	U	U	U	778	U	U
Dimethylphthalate		U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene		U	U	U	U	U	U	U	U	U
Acenaphthene	98000	U	U	U	U	U	U	902	233	U
3-Nitroaniline		U	U	U	U	U	U	U	313	U
2,4-Dinitrophenol		U	U	U	U	U	U	U	U	U
Dibenzofuran		U	U	U	U	U	U	750	U	U
2,4-Dinitrotoluene		U	U	U	U	U	U	U	U	U
4-Nitrophenol		U	U	U	U	U	U	U	U	U
Fluorene	386000	U	U	U	U	U	U	1480	U	2150
4-Chlorophenyl-phenylether		U	U	U	U	U	U	U	U	U
Diethylphthalate		U	U	U	U	U	U	U	U	U
4-Nitroaniline		U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol		U	U	U	U	U	U	U	U	U
n-Nitrosodiphenylamine		U	U	U	U	U	U	6540	U	7960
4-Bromophenyl-phenylether		U	U	U	U	U	U	4010	523	4060
Hexachlorobenzene		U	U	U	U	U	U	712	U	U
Pentachlorophenol	800	U	U	U	U	7450	U	7170	U	U
Phenanthrene	500000	U	U	U	U	2870	461	7260	1250	6700

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 10 Continued. SVOCs by layer within Composites.

UPPER

Composite Number	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	25,26,27	28,30	31,32,33	31, 32, 33	35,36	37,38,39	29,34	8	20
Amount ug/kg									
Anthracene	U	U	U	U	U	447	U	1620	9980
Carbazole	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	U	599	U	U	U	U	U	U	U
Chrysene	U	728	U	U	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	11600	U	U	49100	U	U	U	U
Di-n-octylphthalate	U	U	U	U	1860	U	U	U	U
Benzo[b]fluoranthene	U	574	U	U	U	U	2010	373	U
Benzo[k]fluoranthene	U	526	U	U	U	U	1460	527	U
Benzo[a]pyrene	U	550	U	413	U	U	1970	593	2030
Indeno[1,2,3-cd]pyrene	U	U	U	U	U	U	1060	275	U
Dibenz[a,h]anthracene	U	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	U	421	U	U	U	U	1270	317	U
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U
Fluoranthene	U	1170	U	U	U	U	2850	868	3000
Pyrene	U	1160	U	U	U	U	3420	957	4340
Butylbenzylphthalate	U	U	U	U	U	U	38000	U	44800
3,3'-Dichlorobenzidine	U	U	U	U	U	U	1340	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 10 Continued. SVOCs by layer within Composites.
LOWER

Composite Number	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CJ-15.3-21.6	CK13.2-20.5	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
Stations	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	20
Amount ug/kg												
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U	U	U	390	1220
4-Chloroaniline	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U	U	U	U	384	1080
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U	U	U	U	426
Dimethylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U	U	363	1190
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U	U	U	U	U	758
n-Nitrosodiphenylamine	U	U	U	U	U	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	U	U	U	U	1560	4980
Anthracene	U	U	U	U	U	U	U	U	U	U	684	1880
Carbazole	U	U	U	U	U	U	U	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	U	U	U	U	U	U	U	U	U	U	1790	5010
Pyrene	U	U	U	U	U	U	U	U	U	U	2080	5880

Table 10 Continued. SVOCs by layer within Composites.
LOWER

Composite Number	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CJ-15.3-21.6	CK13.2-20.5	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
Stations	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	20
Amount ug/kg												
Butylbenzylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	U	U	U	U	U	U	U	U	U	U	1000	3370
Chrysene	U	U	U	U	U	U	U	U	U	U	1120	3610
bis(2-Ethylhexyl)phthalate	U	U	U	239	U	U	U	U	329	U	316	815
Di-n-octylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	U	U	U	U	U	U	U	U	U	U	558	1640
Benzo[k]fluoranthene	U	U	U	U	U	U	U	U	U	U	563	2110
Benzo[a]pyrene	U	U	U	U	U	U	U	U	U	U	864	2200
Indeno[1,2,3-cd]pyrene	U	U	U	U	U	U	U	U	U	U	374	1250
Dibenz[a,h]anthracene	U	U	U	U	U	U	U	U	U	U	U	472
Benzo[g,h,i]perylene	U	U	U	U	U	U	U	U	U	U	469	1430

4.2 Amended Sediment Samples

Raw sediment samples were amended with 8% Portland cement and then subsequently tested for the same raw sediment constituents of interest. Results of these tests are presented in Tables 11-17. In general, binding the sediment with cement reduced the concentration of detected COIs, in some instances, by orders of magnitude or rendered the constituents undetectable.

4.2.1 Dioxins and Furans

It was also determined that many of the gray sand layers had no or few Dioxin and Furan congeners present and, therefore, these samples were not analyzed for Dioxin and Furan constituents (Steve Zahn, Personal Communication). The only lower layer clay samples that were analyzed because they showed presence of Dioxin and Furan compounds were CL, CO, and Station 20 (Table 4). Binding the sediment with 8% Portland cement greatly reduced the concentrations of dioxins and furans detected within the sediment. Station 20 had the greatest number of congeners as well as the highest concentrations of dioxin/furan constituents among all the composites tested. In particular, OCDD, 2,3,7,8-TCDF, and 1,2,3,4,6,7,8-HpCDD had higher concentrations than other congeners in the amended sediment samples but were lower than concentrations detected within the raw sediment samples (Table 11).

Table 11. SPLP Dioxin Furan Concentrations by Layer.

	UPPER															
Composite Number	**CA-0.0-2.0**	**CB-0.0-3.0**	**CC-0.0-2.7**	**CD-0.0-1.9**	**CE-0.0-7.4**	**CF-0.0-3.7**	**CG-0.0-14.2**	**CH-0.0-13.0**	**CI-0.0-15.0**	**CJ-0.0-15.3**	**CK-0.0-13.2**	**CL-0.0-18.7**	**CM-0.0-15.3**	**CO-0.0-11.2**	**Sta. 8-0.0-31.0**	**Sta. 20-0.0-15.2**
Stations	**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**25,26,27**	**28,30**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**8**	**20**
Amount (pg/g)																
1,2,3,4,6,7,8-HpCDD	66.8	231	465	360	22.2	21.2	910	269	27.6	377	32.5	2440	29.7	2180	42.8	2540
1,2,3,4,6,7,8-HpCDF	36.2	89.7	173	161	ND	ND	265	114	ND	156	ND	859	ND	623	ND	1640
1,2,3,4,7,8,9-HpCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	70.3	ND	60.1	ND	107
1,2,3,4,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDF	6.73	ND	ND	29.5	ND	ND	54.3	ND	ND	30.1	ND	174	ND	132	ND	321
1,2,3,6,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	91.2	ND	92.9	ND	150
1,2,3,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	70	ND	59.6	ND	118
1,2,3,7,8,9-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	43.2	ND	39.7	ND	59.9
1,2,3,7,8,9-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	32.8	ND	30.1	ND	ND
1,2,3,7,8-PeCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	49.7	ND	49.3	ND	85.3
2,3,4,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	64.1	ND	57.2	ND	102
2,3,4,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	78.8	ND	74.8	ND	138
2,3,7,8-TCDD	6.3	15.9	43.6	27.4	ND	ND	76.6	15.8	ND	22.5	ND	143	ND	352	ND	331
2,3,7,8-TCDF	2.84	6.31	15.5	10.8	ND	1.49	25.4	7.93	ND	10.1	ND	64.5	ND	71.8	ND	96.9
OCDD	801	2820	6530	4080	612	574	11000	3730	716	4190	825	26600	1030	39400	376	60600
OCDF	73.1	175	391	305	ND	16.2	562	211	ND	270	ND	1710	ND	1360	ND	3380
Total HpCDDs	159	747	1370	1200	64	66.3	2700	772	103	1500	125	6910	118	5910	209	7060
Total HpCDFs	59.1	159	291	280	ND	ND	468	192	ND	269	ND	1540	ND	1260	24.4	2710
Total HxCDDs	24.2	118	250	224	8.28	17.2	526	163	34.5	416	41.8	1400	33	1220	24.9	2210
Total HxCDFs	25.4	95.5	177	168	ND	ND	297	115	ND	156	ND	992	ND	762	6.45	1620
Total PeCDDs	ND	8.08	24.6	25.1	ND	ND	41	15.7	ND	49.1	ND	238	ND	186	ND	243
Total PeCDFs	29.2	92.9	195	197	ND	ND	301	126	ND	189	ND	919	ND	1090	ND	1660
Total TCDDs	14.9	36.2	94.1	51.6	ND	2.18	164	49.4	1.34	47.6	2.58	430	1.15	464	ND	638
Total TCDFs	47.9	131	284	245	2.24	7.64	590	158	ND	231	1.1	1210	ND	1680	18.5	3080
WHO-2005 TEQ (ND=0)	8.55	20.6	53.6	38	0.406	0.538	99.8	21.6	0.491	33.2	0.573	264	0.606	465	0.541	522
WHO-2005 TEQ (ND=½)	13.4	46.1	105	62.2	6.08	6.16	148	47.1	6.17	57.4	6.25	278	6.28	479	28.9	552

ND=Not Detected ½ TEQ calculated by taking ½ detection limit value.

Table 11 Continued. SPLP Dioxin Furan Concentrations by Layer.

Lower

	CL-18.7-22.0	CO-11.2-28.4	Sta. 20-15.2-27.0
	35,36	29,34	20
Amount (pg/g)			
1,2,3,4,6,7,8-HpCDD	30.8	53.8	74.9
1,2,3,4,6,7,8-HpCDF	5.72	ND	27.7
1,2,3,4,7,8,9-HpCDF	ND	ND	ND
1,2,3,4,7,8-HxCDD	ND	ND	ND
1,2,3,4,7,8-HxCDF	ND	ND	ND
1,2,3,6,7,8-HxCDD	ND	ND	ND
1,2,3,6,7,8-HxCDF	ND	ND	ND
1,2,3,7,8,9-HxCDD	ND	ND	ND
1,2,3,7,8,9-HxCDF	ND	ND	ND
1,2,3,7,8-PeCDD	ND	ND	ND
1,2,3,7,8-PeCDF	ND	ND	ND
2,3,4,6,7,8-HxCDF	ND	ND	ND
2,3,4,7,8-PeCDF	ND	ND	ND
2,3,7,8-TCDD	1.2	ND	ND
2,3,7,8-TCDF	ND	ND	ND
OCDD	249	479	547
OCDF	11.3	ND	ND
Total HpCDDs	87.2	304	423
Total HpCDFs	5.72	38.4	44.8
Total HxCDDs	21.5	58.2	85.7
Total HxCDFs	ND	15.8	16.7
Total PeCDDs	ND	ND	4.77
Total PeCDFs	ND	12.9	17.7
Total TCDDs	3.64	4.08	6.89
Total TCDFs	3.5	22	22.8
WHO-2005 TEQ (ND=0)	1.64	0.682	1.19
WHO-2005 TEQ (ND=½)	6.79	29.1	29.4

ND=Not Detected ½ TEQ calculated by taking ½ detection limit value.

4.2.2 Metals

Metals concentrations were reduced through the process of amending the sediment with 8% Portland cement. The amended sediment had only three individual metals concentrations that exceeded ER-M screening values as compared twelve individual metals concentrations that exceeded ER-M screening values from the raw sediment. Additionally, there were fewer amended sediment samples that exceeded ER-L values when compared to raw sediment. Mercury continued to show high concentrations with exceedences of ER-M values at nearly all stations for both raw and amended sediment samples. Station 20 had the highest concentrations of metals when compared to the other composites, as was observed with the raw sediment results (Tables 5 and 12). Average calculations of metals from all stations had few exceedences and the standard deviation was smaller suggesting that there was less variance among amended samples when compared to raw samples. Except for mercury, none of the metals averages or standard deviations from amended samples exceeded ER-M values (Table 13).

4.2.3 PCBs

PCB concentrations were not affected by amending with Portland cement. Congeners detected and concentrations were nearly equal when the results from the raw samples were compared with the amended sediment sample results (Tables 5 and 14). However, of the seven congeners analyzed, only three were consistently detected from composites and solitary samples, with Station 20 having the highest concentration of PCBs (Aroclor 1242, Aroclor 1254, and Aroclor 1260). The remaining four congeners (Aroclor 1016, Aroclor 1221, Aroclor 1232, and Aroclor 1248) were undetectable within the raw sediment as well as within amended sediment samples.

Table 12. Metals, Percent Moisture, and Total Organic Carbon Amended Sediment Results by Layer.

UPPER

Composite Number			**CA-0.0-2.0**	**CB-0.0-3.0**	**CC-0.0-2.7**	**CD-0.0-1.9**	**CD-0.0-1.9 Dup.**	**CE-0.0-7.4**	**CF-0.0-3.7**	**CG-0.0-14.2**	**CH-0.0-13.0**	**CH-0.0-13.0 Dup.**	**CH-0.0-13.0 Trip.**	**CI-0.0-15.0**	**CJ-0.0-15.3**
Stations			**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**22,23,24**	**22,23,24**	**25,26,27**	**28,30**
Amount (mg/kg)	**ER-L**	**ER-M**													
Aluminum	NA	NA	11900	10300	9860	9490	10200	9510	10600	12200	12000	11800	11600	11700	13000
Antimony	NA	NA	0.464	0.459	0.620	0.438	0.422	U	0.264	1.46	0.321	0.349	0.344	U	0.510
Arsenic	8.2	70	**17.5**	**20.0**	**35.0**	**14.3**	**15.3**	6.38	**24.7**	**63.0**	**20.0**	**19.8**	**22.4**	**10.9**	**17.0**
Barium	NA	NA	200	141	166	173	177	187	189	256	167	159	173	39.7	127
Beryllium	NA	NA	1.08	0.868	0.833	0.850	0.845	0.883	0.958	0.892	0.902	0.862	0.916	0.926	0.959
Cadmium	1.2	9.6	**1.89**	**1.73**	**2.66**	**1.98**	**2.16**	0.336	0.528	**5.90**	**2.08**	**2.11**	**2.27**	0.191	**2.27**
Calcium	NA	NA	78000	69600	128000	72000	81800	54500	60500	95300	59600	58200	61400	64000	69200
Chromium	81	370	**104**	**89.4**	**101**	**86.2**	**95.8**	38.5	53.7	**207**	**97.5**	**94.4**	**95.2**	43.8	**105**
Cobalt	NA	NA	10.5	9.18	8.10	8.74	9.10	8.03	9.54	10.6	9.86	9.85	9.87	9.06	9.68
Copper	34	270	**142**	**113**	**147**	**122**	**132**	17.7	**60.4**	365	**124**	**125**	**133**	13.6	**137**
Iron	NA	NA	27400	24200	19100	21100	22200	16100	20800	29100	29000	29700	30600	31800	32300
Lead	47	218	**128**	**106**	**126**	**97.5**	**110**	14.5	**54.6**	292	**111**	**109**	**118**	11.4	**113**
Magnesium	NA	NA	9100	7680	8420	7760	8330	5910	5840	7970	7800	7400	7610	6890	7910
Manganese	NA	NA	554	431	349	503	535	204	250	427	497	484	495	382	437
Nickel	21	52	**40.4**	**34.8**	**39.4**	**33.5**	**36.2**	**23.1**	**31.1**	**56.8**	**38.0**	**37.1**	**38.6**	**27.9**	**37.4**
Potassium	NA	NA	3220	2840	2990	2740	3140	2150	2400	2880	2850	2950	3120	3070	3250
Selenium	NA	NA	1.67	1.58	1.81	1.34	1.54	1.45	1.64	3.28	2.00	2.10	2.15	1.46	1.91
Silver	NA	NA	2.03	1.67	2.31	1.96	2.00	0.307	0.483	4.38	1.77	1.66	1.76	0.287	3.01
Sodium	NA	NA	7030	6200	4370	5600	5580	4260	3840	6540	5740	5530	5960	5990	6200
Thallium	NA	NA	0.196	0.163	0.248	0.147	0.151	0.0680	0.191	0.486	0.154	0.150	0.161	0.100	0.179
Vanadium	NA	NA	77.9	65.9	80.0	62.4	70.0	64.1	63.2	73.0	73.6	67.2	72.0	67.7	74.0
Zinc	150	410	**275**	**214**	**283**	**211**	**225**	75.7	136	512	**214**	**216**	**228**	81.6	**236**
Mercury	0.15	0.71	2.850	2.420	3.930	2.980	3.180	0.098	0.905	7.440	2.090	2.250	2.200	0.026	2.650

Dup.=Duplicate, Trip.=Triplicate U=Undetected NA=Not applicable

Table 12 Continued. Metals, Percent Moisture, and Total Organic Carbon Amended Sediment Results by Layer.

Amount (mg/kg)	ER-L	ER-M	UPPER CK-0.0-13.2 31,32,33	CK-0.0-13.2 Dup. 31,32,33	CL-0.0-18.7 35,36	CM-0.0-15.3 37,38,39	CO-0.0-11.2 29,34	Sta. 8-0.0-31.0 8	Sta. 20-0.0-15.2 20	Total Upper Average	Total Upper Standard Dev.
Aluminum	NA	NA	11200	8630	12800	11600	12200	6550	15000	11107.00	1807.88
Antimony	NA	NA	U	U	1.19	U	1.57	0.134	2.74	0.75	0.70
Arsenic	8.2	70	**10.6**	7.93	**50.2**	**12.3**	**64.9**	7.02	**101**	**28.11**	**25.43**
Barium	NA	NA	61.8	46.0	497	57.7	687	33.2	817	217.72	209.58
Beryllium	NA	NA	0.900	0.675	1.05	0.825	0.875	0.443	1.16	0.89	0.15
Cadmium	1.2	9.6	0.150	0.135	**11.7**	0.136	**16.9**	0.300	**27.9**	**4.28**	**6.79**
Calcium	NA	NA	112000	45800	75400	98200	85800	48100	66100	74175.00	21113.57
Chromium	81	370	50.1	29.3	**316**	53.6	**331**	30.8	**542**	**137.06**	**133.42**
Cobalt	NA	NA	8.23	7.26	11.3	8.13	10.5	5.08	14.4	9.35	1.83
Copper	34	270	12.9	10.3	**545**	17.5	**555**	24.0	**970**	**185.02**	**235.00**
Iron	NA	NA	26500	24500	32700	26700	25400	15200	32900	25865.00	5405.77
Lead	47	218	9.90	8.38	**344**	27.3	**288**	27.3	**478**	**129.04**	**123.33**
Magnesium	NA	NA	8310	5940	8460	7860	7830	4990	8740	7537.50	1086.07
Manganese	NA	NA	383	255	416	461	388	369	414	411.70	94.25
Nickel	21	52	**33.7**	**21.6**	**59.1**	**31.9**	**74.3**	19.2	**110**	**40.78**	20.36
Potassium	NA	NA	2730	2280	3320	2890	3780	1800	3760	2908.00	488.15
Selenium	NA	NA	1.36	1.09	4.63	1.14	5.09	0.503	8.57	2.32	1.85
Silver	NA	NA	U	U	7.88	0.251	5.16	0.584	10.5	2.67	2.76
Sodium	NA	NA	4290	4790	8280	3820	5410	2390	8420	5512.00	1472.95
Thallium	NA	NA	U	U	0.309	0.0750	0.269	0.0680	0.440	0.20	0.12
Vanadium	NA	NA	91.5	45.6	82.6	92.0	99.8	38.9	111	73.62	16.78
Zinc	150	410	89.3	61.5	**674**	93.4	**817**	67.5	**1420**	**304.09**	**316.92**
Mercury	0.15	0.71	0.042	0.041	**16.600**	**0.331**	**23.800**	**0.960**	**35.200**	**5.04**	**8.86**

Dup.=Duplicate, Trip.=Triplicate U=Undetected NA=Not Applicable

Table 12 Continued. Metals, Percent Moisture, and Total Organic Carbon Amended Sediment Results by Layer.

LOWER

			CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK-13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0	Total Lower	Total Lower
			7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	20		
Amount (mg/kg)	**ER-L**	**ER-M**															**Average**	**Standard Dev.**
Aluminum	NA	NA	4080	4320	4960	4940	7770	8100	4360	4380	5130	6550	6090	7260	7530	7210	5905.71	1465.15
Antimony	NA	NA	U	U	U	0.102	U	U	0.0993	0.0890	U	U	U	U	0.158	0.260	0.14	0.07
Arsenic	8.2	70	4.78	6.86	4.56	3.63	5.89	4.76	3.53	5.80	3.84	6.26	6.01	4.32	7.98	**8.92**	5.51	1.62
Barium	NA	NA	41.5	25.6	53.9	62.7	80.9	53.8	28.6	30.4	32.3	41.1	46.8	105	50.9	54.8	50.59	21.67
Beryllium	NA	NA	0.473	0.556	0.446	0.434	0.732	0.569	0.429	0.523	0.502	0.615	0.560	0.729	0.513	0.477	0.54	0.10
Cadmium	1.2	9.6	0.0636	0.0622	0.0479	0.125	0.0860	0.108	0.0587	0.0721	0.0739	0.102	0.157	0.127	0.459	0.512	0.15	0.15
Calcium	NA	NA	30500	32900	28400	39000	48700	54700	30900	27000	62400	88300	63400	39600	59100	63600	47750.00	18151.23
Chromium	81	370	18.2	21.5	19.0	22.9	32.0	30.7	19.8	20.7	27.6	35.7	35.5	30.0	38.4	37.6	27.83	7.38
Cobalt	NA	NA	5.23	21.4	9.15	6.01	7.16	5.79	6.61	6.05	6.10	8.87	6.55	7.39	5.72	5.07	7.65	4.14
Copper	34	270	8.30	6.86	7.50	8.68	8.08	7.90	7.59	6.89	7.93	11.5	14.8	9.19	35.1	**36.3**	12.62	10.00
Iron	NA	NA	8660	11600	9640	8830	19100	16000	8850	9310	9220	12800	13100	13100	16600	15300	12293.57	3420.91
Lead	47	218	4.72	5.00	4.96	5.74	7.45	5.46	4.89	4.28	4.22	5.96	7.20	7.43	39.4	54.2	11.49	15.28
Magnesium	NA	NA	3010	3380	3810	3490	4490	5050	3110	3110	4280	5520	4560	4160	5570	5500	4217.14	935.22
Manganese	NA	NA	242	181	144	206	344	181	165	173	183	206	185	196	374	321	221.50	71.98
Nickel	21	52	14.1	20.9	17.7	15.4	19.3	18.6	15.6	15.3	19.8	**28.1**	**21.7**	19.4	**27.1**	**22.6**	19.69	4.21
Potassium	NA	NA	1110	1260	1590	1390	1540	2150	1410	1210	1740	2150	2170	1620	2060	2110	1679.29	384.84
Selenium	NA	NA	U	0.255	0.261	0.262	0.534	0.825	0.287	0.271	0.402	0.466	0.462	0.564	0.681	0.632	0.45	0.19
Silver	NA	NA	U	0.327	U	0.0877	0.0958	0.166	0.129	U	U	U	U	0.203	0.924	0.896	0.35	0.35
Sodium	NA	NA	805	1130	1020	1030	1980	3640	751	626	859	1240	1620	1790	2230	1980	1478.64	810.51
Thallium	NA	NA	U	U	0.107	0.0376	0.0438	U	0.0371	0.0602	U	U	U	0.0563	0.0902	0.0828	0.06	0.03
Vanadium	NA	NA	30.0	33.0	26.2	34.6	63.4	52.1	29.2	28.1	48.2	60.6	51.1	53.9	48.2	47.4	43.29	12.71
Zinc	150	410	36.4	51.7	44.9	42.0	53.1	54.1	39.4	37.8	48.5	64.6	62.5	58.5	90.7	91.3	55.39	17.46
Mercury	0.15	0.71	U	U	U	0.028	0.016	U	U	U	U	U	**0.183**	0.016	**0.603**	**0.801**	**0.27**	**0.34**
Percent Moisture (%)			12.20	16.00	11.40	13.10	21.70	33.00	11.00	9.20	9.60	7.90	13.00	19.50	22.00	21.30	15.78	6.95
Total Organic Carbon (%)*			0.12	0.10	0.10	0.20	0.70	2.10	0.10	0.10	0.20	0.20	0.48	0.40	0.60	0.30	0.41	0.53

*Average of 2 runs Dup.=Duplicate, Trip.=Triplicate U=Undetected

Table 13. Standard Deviation (±1) for Upper Layer and Lower Layer of Composites for Amended Sediment Metals Concentrations (mg/kg)

Amount (mg/kg)	Average Upper Layer	Standard Dev. Upper Layer	Average Lower Layer	Standard Dev. Lower Layer
Aluminum	11107.0	1807.88	5905.71	1465.147
Antimony	0.8	0.70211	0.14166	0.071435
Arsenic	27.0	24.5031	5.51	1.623155
Barium	217.72	209.576	50.5929	21.66555
Beryllium	0.8851	0.14589	0.53986	0.097278
Cadmium	4.2	6.99792	0.14674	0.147162
Calcium	74175	21113.6	47750	18151.23
Chromium	128.215	128.728	27.8286	7.383602
Cobalt	9.3505	1.83007	7.65	4.139394
Copper	188.32	243.818	12.6157	10.00178
Iron	25865	5405.77	12293.6	3420.914
Lead	128.694	126.65	11.4936	15.27521
Magnesium	7537.5	1086.07	4217.14	935.2205
Manganese	411.7	94.2545	221.5	71.98264
Nickel	41.205	20.7588	19.6857	4.212227
Potassium	2908	488.15	1679.29	384.8369
Selenium	2.31565	1.85283	0.454	0.186494
Silver	2.66678	2.75565	0.35356	0.351679
Sodium	5512	1472.95	1478.64	810.5078
Thallium	0.1975	0.11681	0.06438	0.026159
Vanadium	73.62	16.7766	43.2857	12.70886
Zinc	306.5	330.404	55.3929	17.46295
Mercury	5.49966	9.18535	0.27453	0.342867

Table 14. Amended Sediment PCB Aroclor Concentrations by Layer within Composite

Composite Number	UPPER															
Stations	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7
	1,2,3	4,5,6	7,9	10,11,12	10, 11, 12	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24	25,26,27	28,30	31,32,33	31,32,33	35,36
Amount (ug/kg)																
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	230	150	231	173	189	11.0	U	453	119	107	124	6.34	159	U	U	786
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	462	270	312	283	356	20.0	U	469	119	154	165	U	245	U	U	799
Aroclor 1260	106	66.6	121	90.7	97.3	U	U	181	119	60.5	58.8	U	80.5	U	U	280

Table 14. Amended Sediment PCB Aroclor Concentrations by Layer within Composite

Composite Number	UPPER			
Stations	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
	37,38,39	29,34	8	20
Amount (ug/kg)				
Aroclor 1016	U	U	U	U
Aroclor 1221	U	U	U	U
Aroclor 1232	U	U	U	U
Aroclor 1242	U	1910	U	2680
Aroclor 1248	U	U	U	U
Aroclor 1254	U	1130	36.4	1790
Aroclor 1260	U	305	U	565
U=Undetected				

Table 14. Amended Sediment PCB Aroclor Concentrations by Layer within Composite														
Composite Number	Lower													
Stations	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	20
Amount (ug/kg)														
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	11.8	U	29.9	65.6
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	U	U	U	U	U	U	U	U	U	U	6.84	U	32.8	56.6
Aroclor 1260	U	U	U	U	U	U	U	U	U	U	U	U	U	U

4.2.4 Pesticides

While few pesticides were detected, those that had detectable concentrations were reduced when compared to raw sediment results for most composites. In particular, Station 20, the sample with the greatest number of congeners and highest concentrations of pesticides in raw sediment showed reduced levels of constituents. Lower layers of composited cores and solitary samples had undetected concentrations of all pesticide congeners once the sediment was amended. DDD and DDE were the two pesticide congeners that were found with low concentrations consistently among the composited cores and two solitary samples. Table 15 presents the results of amended sediment pesticide results.

Table 15. Amended Sediment Pesticide Results by Layer.

Composite Number	UPPER CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0
Stations	1,2,3	4,5,6	7,9	10,11,12	10,11,12	13,14,15	16,17,18	19,21	22,23,24
Amount (ug/kg)									
4,4'-DDD	94.7	87.3	42.4	131	86.1	11.7	U	39.4	57.4
4,4'-DDE	125	154	64.6	181	103	5.50	U	93.0	69.9
4,4'-DDT	78.1	U	21.8	1460	93.3	4.13	U	U	U
Aldrin	U	U	U	U	U	U	U	U	U
alpha-BHC	U	U	U	U	U	U	U	U	U
alpha-Chlordane	4.83	3.34	U	U	U	U	U	U	U
beta-BHC	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	U	U	U
Endosulfan I	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	U
gamma-Chlordane	9.96	9.53	7.35	10.0	8.30	U	U	U	7.14
Heptachlor	8.78	U	5.37	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	6.58	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U
Mirex	2.92	U	U	U	U	U	U	U	U
Amount (mg/kg)									
Cyanide	U	U	0.12	U	U	U	U	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 15 Continued. Amended Sediment Pesticide Results by Layer.

Composite Number Stations	UPPER CH-0.0-13.0 Dup. 22,23,24	CH-0.0-13.0 Trip. 22,23,24	CI-0.0-15.0 25,26,27	CJ-0.0-15.3 28,30	CK-0.0-13.2 31,32,33	CK-0.0-13.2 Dup. 31,32,33	CL-0.0-18.7 35,36	CM-0.0-15.3 37,38,39	CO-0.0-11.2 29,34	Sta. 8-0.0-31.0 8	Sta. 20-0.0-15.2 20
Amount (ug/kg)											
4,4'-DDD	48.9	51.6	1.90	42.3	U	U	165	U	46.9	U	78.0
4,4'-DDE	76.7	85.4	U	56.7	5.24	U	640	U	113	U	279
4,4'-DDT	U	U	U	U	22.4	U	122	U	101	U	U
Aldrin	U	U	U	U	U	U	U	U	U	U	43.9
alpha-BHC	U	U	U	U	U	U	U	U	U	U	U
alpha-Chlordane	U	U	U	U	U	U	8.76	U	9.67	U	20.1
beta-BHC	U	U	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	U	U	U	U	35.9
Endosulfan I	U	U	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	U	U	U
gamma-Chlordane	7.56	7.87	U	6.07	U	U	40.8	U	12.0	U	28.1
Heptachlor	U	U	U	U	U	U	U	U	6.01	U	42.1
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	15.3	U	14.8
Methoxychlor	U	U	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U	U	U
Amount (mg/kg)											
Cyanide	U	U	U	U	U	U	U	U	0.52	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 15 Continued. Amended Sediment Pesticide Results by Layer.

Stations	CC-2.7-5.1 7,9	CE-7.4-11.5 13,14,15	CF-3.7-6.1 16,17,18	CG-14.2-20.7 19,21	CH-13.0-15.2 22,23,24	CI-15.0-18.1 25,26,27	CI-18.1-23.1 25,26,27	CJ-15.3-21.6 28,30	CK13.2-20.5 31,32,33	CK-13.2-20.5 Dup. 31,32,33	CL-18.7-22.0 35,36	CM-15.3-20.5 37,38,39	CO-11.2-28.4 29,34	Sta. 20-15.2-27.0 20
Amount (ug/kg)														
4,4'-DDD	U	U	U	U	U	U	U	U	U	U	0.957	U	U	U
4,4'-DDE	U	U	U	U	U	U	U	U	U	U	2.16	U	1.70	4.12
4,4'-DDT	U	U	U	U	U	U	U	U	U	U	U	U	U	4.35
Aldrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
alpha-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
alpha-Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	U	U
beta-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
gamma-Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Heptachlor	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U	U	1.63	U	U	U
Amount (mg/kg)														
Cyanide	U	U	U	U	U	U	U	U	U	U	U	U	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

4.2.5 Volatile Organic Carbon

Station 20 had the greatet number of VOC congeners among all stations and composites tested but did not have the highest concentrations of VOCs when compared to other composites and stations. Similar to raw sediment results, the upper layer from the composites had concentrations of acetone, carbon disulfide, 2-butanone (MEK), and methylene chloride consistently detected from samples and in higher concentration than lower layer sediment samples. Few VOCs were detected within the lower layer of the composites and solitary core samples (Table 17). The process of amending the sediment increased and decreased concentrations of VOCs randomly and these changes are not likely to be significantly different due to high variance among sample results.

4.2.6 Semi-Volatile Organic Carbon

The process of amending the samples with cement had no affect to the concentrations of SVOCs within the sediment tested. Congeners detected within the raw sediment samples were consistently identified within the amended samples with similar concentrations. Station 20 had the highest concentrations of SVOCs among all composites and solitary cores sampled. In general, the lower layers tested had fewer congeners and lower concentration detected when compared to the upper sediment layers (Table 17).

Table 16. Amended Sediment Volatile Organic Carbons by Layer

Composite Number	UPPER CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0
Stations	**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**
Amount (ug/kg)									
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	63.0	51.8	12.4	24.4	14.4	20.8	33.4	24.1	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U	8.07	
2-Hexanone	5.32	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	U	U	U	U	U	U	U
Acetone	459	855	209	250	212	159	3100	1400	990
Benzene	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U
Carbon disulfide	82.2	66.5	51.4	99.6	32.1	16.9	21.5	83.3	U
Carbon tetrachloride	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	4.98	U	U	U	U	8.61	U
Methyl isobutyl ketone (MIBK)	6.28	9.14	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U	U	U
Methylene chloride	15.1	15.6	18.1	18.9	10.7	8.79	12.4	U	U
o-Xylene	U	U	14.5	U	U	U	U	19.3	U
p/m-Xylene	U	U	11.6	U	6.36	6.64	U	20.7	U
Styrene	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	4.70	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 16 Continued. Amended Sediment Volatile Organic Carbons by Layer

Composite Number	UPPER CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	22,23,24	22,23,24	25,26,27	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	8	20
Amount (ug/kg)											
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	25.8	U	11.1	8.86	U	U	U	5.26	32.0
2-Chloroethylvinyl ether	U	U	U	U	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	U	U	U	U	U	U	U	U	U
Acetone	1000	U	1120	BE	838	1550	10200	U	U	147	1490
Benzene	U	U	U	U	U	U	U	U	U	U	
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U	U
Carbon disulfide	U	U	27.2	U	17.0	19.2	U	U	U	28.8	132
Carbon tetrachloride	U	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U	17.0
Chloroethane	U	U	U	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U	U	U	U	U
Methylene chloride	U	U	13.1	U	4.95	8.3	U	U	U	10.2	22.9
o-Xylene	U	U	U	U	U	U	U	U	U	U	148
p/m-Xylene	U	U	U	U	U	U	U	U	U	U	206
Styrene	U	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U	U	U	U	52.9
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U	U	U	U	U
Vinyl chloride	U	140	U	U	U	U	U	U	U	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 16 Continued. Amended Sediment Volatile Organic Carbons by Layer

Composite Number	LOWER						
Stations	CC-2.7-5.1 7,9	CE-7.4-11.5 13,14,15	CF-3.7-6.1 16,17,18	CG-14.2-20.7 19,21	CH-13.0-15.2 22,23,24	CI-15.0-18.1 25,26,27	CI-18.1-23.1 25,26,27
Amount (ug/kg)							
1,1,1-Trichloroethane	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
2-Butanone (MEK)	U	1.27	2.89	3.82	U	24.8	2.40
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	U	U	U	U	U
Acetone	63.6	31.7	64.0	240	330	1210	621
Benzene	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Carbon disulfide	U	5.48	11.1	12.3	U	8.01	10.3
Carbon tetrachloride	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	243	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
Methylene chloride	U	U	9.76	9.52	U	12.1	8.13
o-Xylene	U	U	U	U	U	U	U
p/m-Xylene	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 16 Continued. Amended Sediment Volatile Organic Carbons by Layer							
Composite Number							
Stations	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	20
Amount (ug/kg)							
1,1,1-Trichloroethane	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	U	U	U	8.99
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
2-Hexanone	107	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	U	U	U	U	U
Acetone	U	703	1010	1940	330	1600	601
Benzene	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Carbon disulfide	U	6.37	3.29	12.1	U	U	38.4
Carbon tetrachloride	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
Methylene chloride	U	6.03	32.1	9.71	U	11.0	12.4
o-Xylene	U	U	U	U	U	74.8	3.16
p/m-Xylene	U	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Toluene	U	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 17. Amended Sediment Semi-volatile Orgainc Carbon Results by Layer.

UPPER

Composite Number	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup.	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.
Stations	1,2,3	4,5,6	7,9	10,11,12	10,11,13	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24
Amount ug/kg											
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	J	U	1200	U	U	U	U	1360	U	J	U
4-Chloroaniline	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U	U	U
2-Methylnaphthalene	J	U	1420	U	U	U	U	1030	U	J	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U	837	U	U	U
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U
n-Nitrosodiphenylamine	U	U	U	U	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 17 Continued. Amended Sediment Semi-volatile Orgainc Carbon Results by Layer.

	UPPER										
Composite Number	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup.	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.
Stations	1,2,3	4,5,6	7,9	10,11,12	10,11,13	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24
Amount ug/kg											
Phenanthrene	810	895	3090	U	U	U	583	4460	J	1350	J
Anthracene	J	U	1370	U	U	U	U	1390	U	J	U
Carbazole	U	U	U	U	U	U	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	1470	1760	3920	753	920	U	607	4540	U	1710	1040
Pyrene	1760	1960	4080	1090	1170	U	675	5610	U	1810	1020
Butylbenzylphthalate	U	U	U	U	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	766	986	2490	506	U	U	429	3120	U	J	J
Chrysene	992	1280	3220	664	U	U	527	3990	U	842	J
bis(2-Ethylhexyl)phthalate	4380	3020	7210	6230	6870	329	U	15800	3820	6290	4920
Di-n-octylphthalate	U	U	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	862	837	1370	513	U	U	U	1610	U	J	J
Benzo[k]fluoranthene	888	870	1720	609	U	U	U	2300	U	J	J
Benzo[a]pyrene	722	845	1610	452	U	U	U	1850	U	J	J
Indeno[1,2,3-cd]pyrene	566	538	1010	363	U	U	U	1330	U	U	U
Dibenz[a,h]anthracene	435	U	634	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	688	613	1140	438	U	U	U	1580	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 17 Continued. Amended Sediment Semi-volatile Orgainc Carbon Results by Layer.

	UPPER								
Composite Number	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	25,26,27	28,30	31,32,33	31, 32, 33	35,36	37,38,39	29,34	8	20
Amount ug/kg									
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	1680	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	380	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	1760	271	2110
4-Chloroaniline	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	2550	299	2960
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	778	U	U
Dimethylphthalate	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	902	233	U
3-Nitroaniline	U	U	U	U	U	U	U	313	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	750	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	1480	U	2150
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U
n-Nitrosodiphenylamine	U	U	U	U	U	U	6540	U	7960
4-Bromophenyl-phenylether	U	U	U	U	U	U	4010	523	4060
Hexachlorobenzene	U	U	U	U	U	U	712	U	U
Pentachlorophenol	U	U	U	U	7450	U	7170	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 17 Continued. Amended Sediment Semi-volatile Orgainc Carbon Results by Layer.

	UPPER								
Composite Number	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	25,26,27	28,30	31,32,33	31, 32, 33	35,36	37,38,39	29,34	8	20
Amount ug/kg									
Phenanthrene	U	U	U	U	2870	461	7260	1250	6700
Anthracene	U	U	U	U	U	447	U	1620	9980
Carbazole	U	U	U	U	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U
Fluoranthene	U	1170	U	U	U	U	2850	868	3000
Pyrene	U	1160	U	U	U	U	3420	957	4340
Butylbenzylphthalate	U	U	U	U	U	U	38000	U	44800
3,3'-Dichlorobenzidine	U	U	U	U	U	U	1340	U	U
Benz[a]anthracene	U	599	U	U	U	U	U	U	U
Chrysene	U	728	U	U	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	11600	U	U	49100	U	U	U	U
Di-n-octylphthalate	U	U	U	U	1860	U	U	U	U
Benzo[b]fluoranthene	U	574	U	U	U	U	2010	373	U
Benzo[k]fluoranthene	U	526	U	U	U	U	1460	527	U
Benzo[a]pyrene	U	550	U	413	U	U	1970	593	2030
Indeno[1,2,3-cd]pyrene	U	U	U	U	U	U	1060	275	U
Dibenz[a,h]anthracene	U	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	U	421	U	U	U	U	1270	317	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 17 Continued. Amended Sediment Semi-volatile Orgainc Carbon Results by Layer.

	LOWER											
Composite Number	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CJ-15.3-21.6	CK13.2-20.5	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
Stations	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	20
Amount ug/kg												
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U	U	U	390	1220
4-Chloroaniline	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
-Methylnaphthalene	U	U	U	U	U	U	U	U	U	U	384	1080
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U	U	U	U	426
Dimethylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U	U	363	1190
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U	U	U	U	U	758
n-Nitrosodiphenylamine	U	U	U	U	U	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	U	U	U	U	1560	4980
Anthracene	U	U	U	U	U	U	U	U	U	U	684	1880
Carbazole	U	U	U	U	U	U	U	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U	U	U	U

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

Table 17 Continued. Amended Sediment Semi-volatile Orgainc Carbon Results by Layer.

LOWER

Composite Number	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CJ-15.3-21.6	CK-13.2-20.5	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
Stations	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	20
Amount ug/kg												
Diethylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	U	U	U	U	U	U	U	U	U	U	1790	5010
Pyrene	U	U	U	U	U	U	U	U	U	U	2080	5880
Butylbenzylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	U	U	U	U	U	U	U	U	U	U	1000	3370
Chrysene	U	U	U	U	U	U	U	U	U	U	1120	3610
bis(2-Ethylhexyl)phthalate	U	U	U	239	U	U	U	U	329	U	316	815
Di-n-octylphthalate	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	U	U	U	U	U	U	U	U	U	U	558	1640
Benzo[k]fluoranthene	U	U	U	U	U	U	U	U	U	U	563	2110
Benzo[a]pyrene	U	U	U	U	U	U	U	U	U	U	864	2200
Indeno[1,2,3-cd]pyrene	U	U	U	U	U	U	U	U	U	U	374	1250
Dibenz[a,h]anthracene	U	U	U	U	U	U	U	U	U	U	U	472
Benzo[g,h,i]perylene	U	U	U	U	U	U	U	U	U	U	469	1430

U=Undetected, Dup.=Duplicate, Trip.=Triplicate

4.3 SPLP Sediment Samples

Synthetic Precipitation Leaching Procedure (SPLP) testing was performed on sediment samples that were amended with 8% Portland cement to demonstrate the leaching potential of COIs and to determine suitability for upland disposal. The SPLP results showed that many of the constituents that were present within raw or amended sediment samples were no longer detected and not available as a biological risk factor.

4.3.1 Dioxins and Furans

The only dioxin/furan congener detected from SPLP sample analyses was Total TCDFs for Station 20, which consistently had the highest concentrations of all constituents among all samples. Results of SPLP testing suggested that there is minimal risk of Total TCDF and no risk of other dioxin and furan congers leaching into the environment (Table 18).

4.3.2 Metals

Metals concetrations were further reduced through the SPLP process where only 3 individual metals had exceedences above ER-M screening values. Fewer metals exceeded ER-L values when compared to raw or amended sediment results (Table 19). The standard deviation associated with the mean of SPLP individual metals showed less variance (Table 20).

4.3.3 PCBs

Aroclors were undetected from SPLP samples (Table 21). This suggests there is no leaching risk for the seven congeners tested.

4.3.4 Pesticides

Detection of pesticides was reduced for SPLP samples when compared to the raw and amended sediment results. In particular, DDD, DDE, and DDT were either undetected or were detected at low concentrations suggesting low risk of leaching. Furthermore, none of the lower layers showed detection for any pesticides except Station 20 that had a value of 0.00488 for DDD (Table 22).

4.3.5 Semi-Volatile Organic Carbons

SPLP results showed fewer SVOCs and much lower concentrations of these constituents, when detected, as compared to the raw and amended sediment results (Table 23). Station 20 had the greatest number of SVOCs as compared to the other composites and solitary station. This is consistent with raw and amended sediment sample results. Overall, the reduction in concentrations and number of detected SVOCs through the SPLP process suggests that there is little to no risk for leaching contamination into the environment.

4.3.6 Volatile Organic Carbons

Volatile organic compounds were detected but with fewer constituents and lower concentrations when compared to raw or amended sediment samples. Acetone was the only constituent that was detected among nearly all the samples (Table 24). Station 20 had the greatest number of VOCs indentified within the sediment, consistent with the raw and amended sediment results. SPLP results suggest there is minimal to no risk for the majority of VOCs tested for within sediment samples.

Table 18. SPLP Dioxin Furan Concentrations by Layer.

UPPER

Composite Number	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	1,2,3	4,5,6	7,9	10,11,12	13,14,15	16,17,18	19,21	22,23,24	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	8	20
Amount (pg/g)																
1,2,3,4,6,7,8-HpCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8-HpCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8,9-HpCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,4,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8,9-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6,7,8-HxCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,7,8-TCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,7,8-TCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OCDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
OCDF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HpCDDs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HpCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDDs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total HxCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PeCDDs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PeCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TCDDs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TCDFs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0492
WHO-2005 TEQ (ND=0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00125
WHO-2005 TEQ (ND=½)	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.057	0.0578

ND=Not Detected ½ TEQ calculated by taking ½ detection limit value.

Table 18 Continued. SPLP Dioxin Furan Concentrations by Layer.
Lower

	CL-18.7-22.0 35,36	CO-11.2-28.4 29,34	Sta. 20-15.2-27.0 20
Amount (pg/g)			
1,2,3,4,6,7,8-HpCDD	ND	ND	ND
1,2,3,4,6,7,8-HpCDF	ND	ND	ND
1,2,3,4,7,8,9-HpCDF	ND	ND	ND
1,2,3,4,7,8-HxCDD	ND	ND	ND
1,2,3,4,7,8-HxCDF	ND	ND	ND
1,2,3,6,7,8-HxCDD	ND	ND	ND
1,2,3,6,7,8-HxCDF	ND	ND	ND
1,2,3,7,8,9-HxCDD	ND	ND	ND
1,2,3,7,8,9-HxCDF	ND	ND	ND
1,2,3,7,8-PeCDD	ND	ND	ND
1,2,3,7,8-PeCDF	ND	ND	ND
2,3,4,6,7,8-HxCDF	ND	ND	ND
2,3,4,7,8-PeCDF	ND	ND	ND
2,3,7,8-TCDD	ND	ND	ND
2,3,7,8-TCDF	ND	ND	ND
OCDD	ND	ND	ND
OCDF	ND	ND	ND
Total HpCDDs	ND	ND	ND
Total HpCDFs	ND	ND	ND
Total HxCDDs	ND	ND	ND
Total HxCDFs	ND	ND	ND
Total PeCDDs	ND	ND	ND
Total PeCDFs	ND	ND	ND
Total TCDDs	ND	ND	ND
Total TCDFs	ND	ND	ND
WHO-2005 TEQ (ND=0)	0	0	0
WHO-2005 TEQ (ND=½)	0.057	0.057	0.057

ND=Not Detected ½ TEQ calculated by taking ½ detection limit value.

Table 19. SPLP Metals Concentrations by Layer

			UPPER												
Composite Number			**CA-0.0-2.0**	**CB-0.0-3.0**	**CC-0.0-2.7**	**CD-0.0-1.9**	**CD-0.0-1.9 Dup.**	**CE-0.0-7.4**	**CF-0.0-3.7**	**CG-0.0-14.2**	**CH-0.0-13.0**	**CH-0.0-13.0 Dup.**	**CH-0.0-13.0 Trip.**	**CI-0.0-15.0**	**CJ-0.0-15.3**
Stations			**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**22,23,24**	**22,23,24**	**25,26,27**	**28,30**
Amount (ug/kg)	**ER-L**	**ER-M**													
Aluminum	NA	NA	560	U	U	U	U	650	666	1410	622	685	725	636	916
Antimony	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U
Arsenic	8.2	70	3.83	7.14	**8.33**	3.74	3.26	U	5.05	**11.9**	5.01	6.04	5.53	U	4.15
Barium	NA	NA	31.2	27.2	156	46.1	82.5	56.2	48.1	61.4	39.5	30.2	51.9	12.7	24.1
Beryllium	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U
Cadmium	1.2	9.6	U	U	U	U	U	U	U	U	U	U	U	U	U
Calcium	NA	NA	326000	331000	512000	362000	398000	298000	228000	209000	243000	219000	273000	187000	207000
Chromium	81	370	54.9	**83.1**	**133**	**94.5**	**112**	**106**	69.2	45.9	41.9	41.8	44.3	42.8	42.8
Cobalt	NA	NA	U	U	2.50	U	U	U	U	2.88	1.28	1.11	1.43	1.53	1.66
Copper	34	270	**153**	**109**	**90.5**	**77.6**	**69.9**	**14.4**	**49.9**	**105**	**93.3**	**93.8**	**101**	**14.1**	**112**
Iron	NA	NA	1520	1600	2960	1970	2430	1370	1520	1330	1740	1500	1930	1110	1400
Lead	47	218	U	U	U	U	U	U	U	U	U	U	U	U	U
Magnesium	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U
Manganese	NA	NA	3.38	U	U	U	U	U	U	U	U	U	U	U	U
Nickel	21	52	20.0	12.6	**28.1**	13.9	17.7	7.58	19.9	**53.1**	**25.2**	**23.0**	**27.1**	16.8	**23.5**
Potassium	NA	NA	42600	42100	62400	44700	41800	41200	41900	42600	40600	36300	43900	38300	39600
Selenium	NA	NA	U	U	U	U	U	U	U	U	6.17	6.91	7.22	U	8.42
Silver	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U
Sodium	NA	NA	200000	188000	158000	167000	156000	143000	147000	180000	155000	157000	166000	176000	179000
Thallium	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U
Vanadium	NA	NA	U	38.8	U	U	U	73.9	35.9	U	U	33.6	U	41.1	31.6
Zinc	150	410	U	U	U	U	U	U	U	U	U	U	U	U	U
Mercury	0.15	0.71	U	U	U	U	U	U	U	U	U	U	U	U	U

Dup.=Duplicate, Trip.=Triplicate U=Undetected NA=Not applicable, data undetected Bold face type=exceeds ER-L, Gray highlight=exceeds ER-M

Table 19 Continued. SPLP Metals Concentrations by Layer

			UPPER								
Amount (ug/kg)	**ER-L**	**ER-M**	**CK-0.0-13.2 31,32,33**	**CK-0.0-13.2 Dup. 31,32,33**	**CL-0.0-18.7 35,36**	**CM-0.0-15.3 37,38,39**	**CO-0.0-11.2 29,34**	**Sta. 8-0.0-31.0 8**	**Sta. 20-0.0-15.2 20**	**Total Upper Layer Average**	**Total Upper Layer Standard Dev.**
Aluminum	NA	NA	U	572	1160	U	U	U	4900	1125.17	1216.70
Antimony	NA	NA	U	U	U	U	U	U	5.80	5.80	0.00
Arsenic	8.2	70	U	2.95	**9.88**	2.68	**10.6**	U	**36.4**	7.91	8.11
Barium	NA	NA	45.9	24.2	81.4	59.7	373	48.3	70.9	68.53	78.00
Beryllium	NA	NA	U	U	U	U	U	U	U	NA	NA
Cadmium	1.2	9.6	U	U	U	U	U	U	U	NA	NA
Calcium	NA	NA	392000	235000	241000	429000	424000	340000	116000	298500.00	99750.48
Chromium	81	370	**107**	62.2	41.4	69.0	28.4	**120**	39.5	68.99	32.22
Cobalt	NA	NA	1.89	1.36	2.17	1.92	3.30	U	2.79	1.99	0.69
Copper	34	270	14.6	12.9	48.3	18.9	86.2	17.2	41.7	**66.17**	**42.01**
Iron	NA	NA	2560	1710	1760	3070	2720	2120	798	1855.90	616.06
Lead	47	218	U	U	U	U	12.9	U	U	12.90	0.00
Magnesium	NA	NA	U	U	U	U	U	U	U	NA	NA
Manganese	NA	NA	U	U	U	U	U	U	U	3.38	0.00
Nickel	21	52	**25.4**	18.6	**45.6**	28.9	**88.3**	12.5	**73.0**	**29.04**	20.75
Potassium	NA	NA	66600	40100	40500	64500	75400	45000	38800	46445.00	11095.97
Selenium	NA	NA	U	6.73	9.70	U	6.76	U	U	7.42	1.22
Silver	NA	NA	U	U	U	U	U	U	U	NA	NA
Sodium	NA	NA	163000	163000	194000	142000	175000	114000	235000	167900.00	25354.12
Thallium	NA	NA	U	U	U	U	U	U	U	NA	NA
Vanadium	NA	NA	U	28.7	U	U	U	U	64.2	43.48	16.46
Zinc	150	410	U	U	U	U	U	U	U	NA	NA
Mercury	0.15	0.71	U	U	U	U	U	U	U	NA	NA

Dup.=Duplicate, Trip.=Triplicate U=Undetected NA=Not applicable, data undetected Bold face type=exceeds ER-L, Gray highlight=exceeds ER-M

Table 19 Continued. SPLP Metals Concentrations by Layer

Amount (ug/kg)	ER-L	ER-M	LOWER CC-2.7-5.1 7,9	CE-7.4-11.5 13,14,15	CF-3.7-6.1 16,17,18	CG-14.2-20.7 19,21	CH-13.0-15.2 22,23,24	CI-15.0-18.1 25,26,27	CI-18.1-23.1 25,26,27	CJ-15.3-21.6 28,30	CK-13.2-20.5 31,32,33	CK-13.2-20.5 Dup. 31,32,33	CL-18.7-22.0 35,36	CM-15.3-20.5 37,38,39	CO-11.2-28.4 29,34	Sta. 20-15.2-27.0 20	Total Lower Layer Ave.	Total Lower Layer Standard Dev.
Aluminum	NA	NA	U	693	949	744	1040	543	563	1200	622	694	U	1030	535	799	784.33	221.50
Antimony	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Arsenic	8.2	70	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Barium	NA	NA	106	63.0	224	325	51.6	37.5	213	77.6	192	69.0	201	172	57.4	52.9	131.57	88.50
Beryllium	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Cadmium	1.2	9.6	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Calcium	NA	NA	359000	315000	350000	374000	232000	292000	413000	234000	467000	312000	478000	333000	330000	296000	341785.71	73783.65
Chromium	81	370	**216**	**115**	**120**	75.7	70.8	58.9	54.4	43.3	**127**	**126**	**181**	**88.2**	58.1	72.8	**100.51**	50.46
Cobalt	NA	NA	U	U	U	U	U	1.64	1.17	U	1.90	U	1.35	U	U	U	1.52	0.32
Copper	34	270	2.73	U	U	2.98	4.64	11.5	U	2.67	U	U	5.28	2.91	29.9	**40.9**	11.50	14.10
Iron	NA	NA	2270	1750	2200	2470	1630	1760	2790	1530	3490	2120	3440	2530	2060	1900	2281.43	615.79
Lead	47	218	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Magnesium	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Manganese	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Nickel	21	52	11.1	8.21	10.7	13.4	10.8	18.6	15.4	12.4	19.0	12.0	**21.5**	14.6	20.1	18.2	14.72	4.14
Potassium	NA	NA	41700	30400	35000	40700	33800	41600	38600	20600	62000	33900	62900	43000	38600	39600	40171.43	11080.78
Selenium	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Silver	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Sodium	NA	NA	42800	45000	52300	59400	72600	128000	45000	28000	41100	27000	61500	70300	90800	87500	60807.14	27543.77
Thallium	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Vanadium	NA	NA	U	U	U	U	26.0	U	U	U	U	U	U	U	U	U	26.00	0.00
Zinc	150	410	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Mercury	0.15	0.71	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA

Dup.=Duplicate, Trip.=Triplicate U=Undetected NA=Not applicable, data undetected Bold face type=exceeds ER-L, Gray highlight=exceeds ER-M

Table 20. Standard Deviation (±1) for Upper Layer and Lower Layer of Composites for SPLP Sediment Metals Concentrations (mg/kg).

Amount (mg/kg)	Average Upper Layer	Standard Dev. Upper Layer	Average Lower Layer	Standard Dev. Lower Layer
Aluminum	1125.17	1216.70	784.33	221.50
Antimony	5.80	0.00	NA	NA
Arsenic	7.91	8.11	NA	NA
Barium	68.53	78.00	131.57	88.50
Beryllium	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA
Calcium	298500.00	99750.48	341785.71	73783.65
Chromium	68.99	32.22	100.51	50.46
Cobalt	1.99	0.69	1.52	0.32
Copper	66.17	42.01	11.50	14.10
Iron	1855.90	616.06	2281.43	615.79
Lead	12.90	0.00	NA	NA
Magnesium	NA	NA	NA	NA
Manganese	3.38	0.00	NA	NA
Nickel	29.04	20.75	14.72	4.14
Potassium	46445.00	11095.97	40171.43	11080.78
Selenium	7.42	1.22	NA	NA
Silver	NA	NA	NA	NA
Sodium	167900.00	25354.12	60807.14	27543.77
Thallium	NA	NA	NA	NA
Vanadium	43.48	16.46	26.00	0.00
Zinc	NA	NA	NA	NA
Mercury	NA	NA	NA	NA

Table 21. SPLP PCB Concentrations by Layer.

Composite Number	UPPER															
	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup.	CL-0.0-18.7
Stations	1,2,3	4,5,6	7,9	10,11,12	10, 11, 12	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24	25,26,27	28, 30	31,32,33	31,32,33	35, 36
Amount (ug/kg)																
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1260	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U

U=Undetected

Table 21 Continued. SPLP PCB Concentrations by Layer.

Composite Number	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	37,38,39	29,34	8	20
Amount (ug/kg)	U	U	U	U
Aroclor 1016	U	U	U	U
Aroclor 1221	U	U	U	U
Aroclor 1232	U	U	U	U
Aroclor 1242	U	U	U	U
Aroclor 1248	U	U	U	U
Aroclor 1254	U	U	U	U
Aroclor 1260				

U=Undetected

Table 21 Continued. SPLP PCB Concentrations by Layer.														
Composite Number	LOWER													
Stations	**CC-2.7-5.1**	**CE-7.4-11.5**	**CF-3.7-6.1**	**CG-14.2-20.7**	**CH-13.0-15.2**	**CI-15.0-18.1**	**CI-18.1-23.1**	**CJ-15.3-21.6**	**CK13.2-20.5**	**CK-13.2-20.5 Dup.**	**CL-18.7-22.0**	**CM-15.3-20.5**	**CO-11.2-28.4**	**Sta. 20-15.2-27.0**
	7,9	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**	**25,26,27**	**25,26,27**	**28,30**	**31,32,33**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**20**
Amount (ug/kg)														
Aroclor 1016	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1221	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1232	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1242	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1248	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1254	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aroclor 1260	U	U	U	U	U	U	U	U	U	U	U	U	U	U
U=Undetected														

Table 22. SPLP Pesticides by Layer.

Composite Number	UPPER CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0
Stations	**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**
Amount (ug/kg)									
4,4'-DDD	0.0169	U	U	U	U	U	U	U	U
4,4'-DDE	U	U	U	U	U	U	U	U	U
4,4'-DDT	U	U	U	U	U	U	U	U	U
Aldrin	U	U	U	U	U	U	U	U	U
alpha-BHC	U	U	0.0118	U	U	U	U	U	U
alpha-Chlordane	U	U	U	U	U	U	U	U	U
beta-BHC	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	U	U	U
Endosulfan I	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	0.00720
gamma-Chlordane	U	U	U	U	U	U	U	U	U
Heptachlor	U	U	U	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U
Amount (mg/kg)									
Cyanide	U	U	U	U	U	U	U	U	U

Table 22 Continued. SPLP Pesticides by Layer.

Composite Number Stations	UPPER CH-0.0-13.0 Dup. 22,23,24	CH-0.0-13.0 Trip. 22,23,24	CI-0.0- 15.0 25,26,27	CJ-0.0- 15.3 28,30	CK-0.0- 13.2 31,32,33	CK-0.0-13.2 Dup. 31,32,33	CL-0.0- 18.7 35,36	CM-0.0- 15.3 37,38,39	CO-0.0- 11.2 29,34	Sta. 8-0.0- 31.0 8	Sta. 20-0.0-15.2 20
Amount (ug/kg)											
4,4'-DDD	U	U	U	U	U	U	U	U	0.00616	U	U
4,4'-DDE	U	U	U	U	U	U	U	U	U	U	U
4,4'-DDT	U	U	U	U	U	U	U	U	U	U	U
Aldrin	U	U	U	U	U	U	U	U	0.00592	U	U
alpha-BHC	U	U	U	U	U	U	U	U	U	U	U
alpha-Chlordane	U	U	U	U	U	U	U	U	U	U	U
beta-BHC	U	U	U	U	U	U	U	U	U	U	U
delta-BHC	U	0.00976	0.0129	U	U	U	U	U	0.0233	U	0.0368
Dieldrin	U	U	U	U	U	U	U	U	U	U	U
Endosulfan I	U	U	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U	U	U
gamma-BHC	0.00704	0.00976	0.0109	U	U	U	U	U	U	U	U
gamma-Chlordane	U	U	U	U	U	U	U	U	U	U	U
Heptachlor	U	U	U	U	U	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U	U	U
Amount (mg/kg)											
Cyanide	U	U	U	U	U	U	U	U	U	U	U

Table 22 Continued. SPLP Pesticides by Layer.

Composite Number	LOWER													
Stations	CC-2.7-5.1 7,9	CE-7.4-11.5 13,14,15	CF-3.7-6.1 16,17,18	CG-14.2-20.7 19,21	CH-13.0-15.2 22,23,24	CI-15.0-18.1 25,26,27	CI-18.1-23.1 25,26,27	CJ-15.3-21.6 28,30	CK13.2-20.5 31,32,33	CK-13.2-20.5 Dup. 31,32,33	CL-18.7-22.0 35,36	CM-15.3-20.5 37,38,39	CO-11.2-28.4 29,34	Sta. 20-15.2-27.0 20
Amount (ug/kg)														
4,4'-DDD	U	U	U	U	U	U	U	U	U	U	U	U	U	0.00488
4,4'-DDE	U	U	U	U	U	U	U	U	U	U	U	U	U	U
4,4'-DDT	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Aldrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
alpha-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
alpha-Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	U	U
beta-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
delta-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Dieldrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan II	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endosulfan sulfate	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin aldehyde	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Endrin ketone	U	U	U	U	U	U	U	U	U	U	U	U	U	U
gamma-BHC	U	U	U	U	U	U	U	U	U	U	U	U	U	U
gamma-Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Heptachlor	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Heptachlor epoxide (B)	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Methoxychlor	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Toxaphene	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Technical Chlordane	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Mirex	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Amount (mg/kg)														
Cyanide	U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table 23. SPLP Semi-volatile Organic Carbons by Layer

UPPER

Composite Number	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup.	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.
Stations	1,2,3	4,5,6	7,9	10,11,12	10,11,13	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24
Amount ug/kg											
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	U	U	2.44	U	U	U	U	U	U	U	U
4-Chloroaniline	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U	U	U	U
Dimethylphthalate	U	U	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U	U	U	U	U
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U
n-Nitrosodiphenylamine	U	U	U	U	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U

U=Undetected
Dup.=Duplicate, Trip.=Triplicate

Table 23 Continued. SPLP Semi-volatile Organic Carbons by Layer

Composite Number	CA-0.0-2.0	CB-0.0-3.0	CC-0.0-2.7	CD-0.0-1.9	CD-0.0-1.9 Dup.	CE-0.0-7.4	CF-0.0-3.7	CG-0.0-14.2	CH-0.0-13.0	CH-0.0-13.0 Dup.	CH-0.0-13.0 Trip.
Stations	1,2,3	4,5,6	7,9	10,11,12	10,11,13	13,14,15	16,17,18	19,21	22,23,24	22,23,24	22,23,24
Amount ug/kg	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	U	2.12	U	U	U
Anthracene	U	U	U	U	U	U	U	U	U	U	U
Carbazole	U	U	U	U	U	U	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	U	U	U	U	U	U	U	U	U	U	U
Pyrene	U	U	U	U	U	U	U	U	U	U	U
Butylbenzylphthalate	U	U	U	U	U	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	U	U	U	U	U	U	U	U	U	U	U
Chrysene	U	U	U	U	U	U	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	U	U	U	U	U	U	U	U	U	U
Di-n-octylphthalate	U	U	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	U	U	U	U	U	U	U	U	U	U	U
Benzo[k]fluoranthene	U	U	U	U	U	U	U	U	U	U	U
Benzo[a]pyrene	U	U	U	U	U	U	U	U	U	U	U
Indeno[1,2,3-cd]pyrene	U	U	U	U	U	U	U	U	U	U	U
Dibenz[a,h]anthracene	U	U	U	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	U	U	U	U	U	U	U	U	U	U	U

U=Undetected

Dup.=Duplicate, Trip.=Triplicate

Table 23 Continued. SPLP Semi-volatile Organic Carbons by Layer									
Composite Number	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	25,26,27	28,30	31,32,33	31, 32, 33	35,36	37,38,39	29,34	8	20
Amount ug/kg									
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	2.04
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	8.76	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	3.16	U	U	U	3.84
Nitrobenzene	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	4.64	U	2.76
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	3.76	U	4.48	U	5.76
4-Chloroaniline	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	3.40	U	3.28
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	3.72	U
Dimethylphthalate	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U
3-Nitroaniline	U	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U	U	U
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U
n-Nitrosodiphenylamine	U	U	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U

U=Undetected
Dup.=Duplicate, Trip.=Triplicate

Table 23 Continued. SPLP Semi-volatile Organic Carbons by Layer									
Composite Number	CI-0.0-15.0	CJ-0.0-15.3	CK-0.0-13.2	CK-0.0-13.2 Dup	CL-0.0-18.7	CM-0.0-15.3	CO-0.0-11.2	Sta. 8-0.0-31.0	Sta. 20-0.0-15.2
Stations	25,26,27	28,30	31,32,33	31, 32, 33	35,36	37,38,39	29,34	8	20
Amount ug/kg									
Hexachlorobenzene	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	2.20	4.16	2.48
Anthracene	U	U	U	U	U	U	U	U	U
Carbazole	U	U	U	U	U	U	U	U	2.56
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U
Fluoranthene	U	U	U	U	U	U	U	U	U
Pyrene	U	U	U	U	U	U	U	U	U
Butylbenzylphthalate	U	U	4.52	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	U	U	U	U	U	U	U	U	U
Chrysene	U	U	U	U	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	U	7.00	U	U	U	U	U	U
Di-n-octylphthalate	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	U	U	U	U	U	U	U	U	U
Benzo[k]fluoranthene	U	U	U	U	U	U	U	U	U
Benzo[a]pyrene	U	U	U	U	U	U	U	U	U
Indeno[1,2,3-cd]pyrene	U	U	U	U	U	U	U	U	U
Dibenz[a,h]anthracene	U	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	U	U	U	U	U	U	U	U	U

U=Undetected
Dup.=Duplicate, Trip.=Triplicate

Table 23 Continued. SPLP Semi-volatile Organic Carbons by Layer

LOWER

Composite Number	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK13.2-20.5	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
Stations	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	20
Amount ug/kg													
bis(2-Chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U	U	U
Phenol	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Chlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Methylphenol	U	U	U	U	U	U	U	U	U	U	U	U	U
Hexachloroethane	U	U	U	U	U	U	U	U	U	U	U	U	U
n-Nitroso-di-n-propylamine	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Methylphenol	U	U	U	U	U	U	U	U	U	U	U	U	U
Nitrobenzene	U	U	U	U	U	U	U	U	U	U	U	U	U
Isophorone	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dimethylphenol	U	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-Chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
1,2,4-Trichlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	U
Naphthalene	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Chloroaniline	U	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobutadiene	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Chloro-3-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Methylnaphthalene	U	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorocyclopentadiene	U	U	U	U	U	U	U	U	U	U	U	U	U
2,4,6-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
2,4,5-Trichlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Chloronaphthalene	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthylene	U	U	U	U	U	U	U	U	U	U	U	3.80	U
Dimethylphthalate	U	U	U	U	U	U	U	U	U	U	U	U	U
2,6-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U	U
Acenaphthene	U	U	U	U	U	U	U	U	U	U	U	U	5.68
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
Dibenzofuran	U	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitrophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluorene	U	U	U	U	U	U	U	U	U	U	U	U	2.08
n-Nitrosodiphenylamine	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Bromophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U	U	U
Hexachlorobenzene	U	U	U	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	U	U	U	U	U	U	U	U	U	U	U	U	U
Phenanthrene	U	U	U	U	U	U	U	U	U	U	U	4.28	7.28
Anthracene	U	U	U	U	U	U	U	U	U	U	U	U	2.16

U=Undetected
Dup.=Duplicate, Trip.=Triplicate

Table 23 Continued. SPLP Semi-volatile Organic Carbons by Layer

Composite Number	CC-2.7-5.1	CE-7.4-11.5	CF-3.7-6.1	CG-14.2-20.7	CH-13.0-15.2	CI-15.0-18.1	CI-18.1-23.1	CJ-15.3-21.6	CK13.2-20.5	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
Stations	7,9	13,14,15	16,17,18	19,21	22,23,24	25,26,27	25,26,27	28,30	31,32,33	35,36	37,38,39	29,34	20
Amount ug/kg													
4-Chlorophenyl-phenylether	U	U	U	U	U	U	U	U	U	U	U	U	U
Carbazole	U	U	U	U	U	U	U	U	U	U	U	U	U
Di-n-butylphthalate	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	U	U	U	U	U	U	U	U	U	U	U	U	U
Pyrene	U	U	U	U	U	U	U	U	U	U	U	U	U
Butylbenzylphthalate	U	U	U	U	U	U	5.04	U	U	U	U	U	U
3,3'-Dichlorobenzidine	U	U	U	U	U	U	U	U	U	U	U	U	U
Benz[a]anthracene	U	U	U	U	U	U	U	U	U	U	U	U	U
Chrysene	U	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-Ethylhexyl)phthalate	U	U	U	U	U	U	U	3.04	U	U	U	U	U
Di-n-octylphthalate	U	U	U	U	U	U	U	U	U	U	U	U	U
Diethylphthalate	U	U	U	U	U	U	30.9	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	U
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[b]fluoranthene	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[k]fluoranthene	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[a]pyrene	U	U	U	U	U	U	U	U	U	U	U	U	U
Indeno[1,2,3-cd]pyrene	U	U	U	U	U	U	U	U	U	U	U	U	U
Dibenz[a,h]anthracene	U	U	U	U	U	U	U	U	U	U	U	U	U
Benzo[g,h,i]perylene	U	U	U	U	U	U	U	U	U	U	U	U	U

U=Undetected

Dup.=Duplicate, Trip.=Triplicate

Table 24. SPLP Volatile Organic Carbons by Layer.

	UPPER								
Composite Number	**CA-0.0-2.0**	**CB-0.0-3.0**	**CC-0.0-2.7**	**CD-0.0-1.9**	**CD-0.0-1.9 Dup**	**CE-0.0-7.4**	**CF-0.0-3.7**	**CG-0.0-14.2**	**CH-0.0-13.0**
Stations	**1,2,3**	**4,5,6**	**7,9**	**10,11,12**	**10,11,12**	**13,14,15**	**16,17,18**	**19,21**	**22,23,24**
Amount (ug/kg)									
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	13	U	U	U	U	U	U	U
Acetone	40	6.4	26	17	U	130	19	19	180
Benzene	U	U	U	U	U	U	U	U	0.61
Bromodichloromethane	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U
Carbon disulfide	U	U	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	23	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U
Ethylbenzene	0.9	0.61	U	U	U	1.4	U	0.9	1.5
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U	U	U
Methylene chloride	U	U	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	U	2.6	U	U	2.5
p/m-Xylene	U	U	U	11	U	2.5	U	2.1	5.7
Styrene	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	19	U	U	U	1.6	12
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U
Trichloroethene	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 24 Continued. SPLP Volatile Organic Carbons by Layer

	UPPER										
Composite Number	**CH-0.0-13.0 Dup.**	**CH-0.0-13.0 Trip.**	**CI-0.0-15.0**	**CJ-0.0-15.3**	**CK-0.0-13.2**	**CK-0.0-13.2 Dup.**	**CL-0.0-18.7**	**CM-0.0-15.3**	**CO-0.0-11.2**	**Sta. 8-0.0-31.0**	**Sta. 20-0.0-15.2**
Stations	**22,23,24**	**22,23,24**	**25,26,27**	**28,30**	**31,32,33**	**31,32,33**	**35,36**	**37,38,39**	**29,34**	**8**	**20**
Amount (ug/kg)	U	U	U	U	U	U	U	U	U	U	U
1,1,1-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U		U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	U	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	U	U	U	U	U	U	U	U	U
Acetone	180	180	U	U	210	280	U	180	170	12	150
Benzene	U	U	130	0.81	U	U	190	U	1.2	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U	U	U	U	U
Carbon disulfide	U	U	U	U	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U	U	U	U	U
Ethylbenzene	U	0.63	U	0.92	U	U	U	U	4.8	U	U
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U	U	U	U	U
Methylene chloride	U	U	U	U	U	U	U	U	U	U	U
o-Xylene	1.8	U	U	1.1	U	U	U	U	12	U	11
p/m-Xylene	1.9	U	U	2.6	U	U	U	U	16	U	14
Styrene	U	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U	U	U	U	U
Toluene	U	U	U	3.1	U	U	U	U	20	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U	U	U	U	U
Trichloroethene	U	0.73	U	U	U	U	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 24 Continued. SPLP Volatile Organic Carbons by Layer							
Composite Number	LOWER						
Stations	CC-2.7-5.1 7,9	CE-7.4-11.5 13,14,15	CF-3.7-6.1 16,17,18	CG-14.2-20.7 19,21	CH-13.0-15.2 22,23,24	CI-15.0-18.1 25,26,27	CI-18.1-23.1 25,26,27
Amount (ug/kg)							
1,1,1-Trichloroethane	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	U	U	U	U	U
Acetone	U	14	U	25	500	360	94
Benzene	U	U	U	U	0.75	U	U
Bromodichloromethane	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Carbon disulfide	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Ethylbenzene	U	U	U	U	2.3	3	U
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
Methylene chloride	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	3.2	3.6	U
p/m-Xylene	U	U	U	U	8.4	8.7	U
Styrene	U	U	U	U	1.7	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Toluene	U	U	U	U	16	16	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	1.3	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

Table 24 Continued. SPLP Volatile Organic Carbons by Layer							
Composite Number							
Stations	CJ-15.3-21.6	CK13.2-20.5	CK-13.2-20.5 Dup.	CL-18.7-22.0	CM-15.3-20.5	CO-11.2-28.4	Sta. 20-15.2-27.0
	28,30	31,32,33	31,32,33	35,36	37,38,39	29,34	20
Amount (ug/kg)							
1,1,1-Trichloroethane	U	U	U	U	U	U	U
1,1,2,2-Tetrachloroethane	U	U	U	U	U	U	U
1,1,2-Trichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethane	U	U	U	U	U	U	U
1,1-Dichloroethene	U	U	U	U	U	U	U
1,2-Dichloroethane	U	U	U	U	U	U	U
1,2-Dichloropropane	U	U	U	U	U	U	U
2-Butanone (MEK)	U	U	U	U	U	U	U
2-Chloroethylvinyl ether	U	U	U	U	U	U	U
2-Hexanone	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	U	U	U	U	U
Acetone	48	170	220	410	59	79	46
Benzene	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U
Bromoform	U	U	U	U	U	U	U
Bromomethane	U	U	U	U	U	U	U
Carbon disulfide	U	U	U	U	U	U	U
Carbon tetrachloride	U	U	U	U	U	U	U
Chlorobenzene	U	U	U	U	U	U	U
Chloroethane	U	U	U	U	U	U	U
Chloroform	U	U	U	U	U	U	U
Chloromethane	U	U	U	U	U	U	U
cis-1,2-Dichloroethene	U	U	U	U	U	U	U
cis-1,3-Dichloropropene	U	U	U	U	U	U	U
Dibromochloromethane	U	U	U	U	U	U	U
Ethylbenzene	U	1.4	U	U	U	U	U
Methyl isobutyl ketone (MIBK)	U	U	U	U	U	U	U
Methyl tert-butyl ether (MTBE)	U	U	U	U	U	U	U
Methylene chloride	U	U	U	U	U	U	U
o-Xylene	U	U	U	U	U	U	U
p/m-Xylene	1.5	U	U	U	U	U	U
Styrene	U	U	U	U	U	U	U
Tetrachloroethene	U	U	U	U	U	U	U
Toluene	0.88	U	U	U	U	U	U
trans-1,2-Dichloroethene	U	U	U	U	U	U	U
trans-1,3-Dichloropropene	U	U	U	U	U	U	U
Trichloroethene	U	1.5	U	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U
Vinyl acetate	U	U	U	U	U	U	U
Vinyl chloride	U	U	U	U	U	U	U

U=Undetected Dup.=Duplicate, Trip.=Triplicate

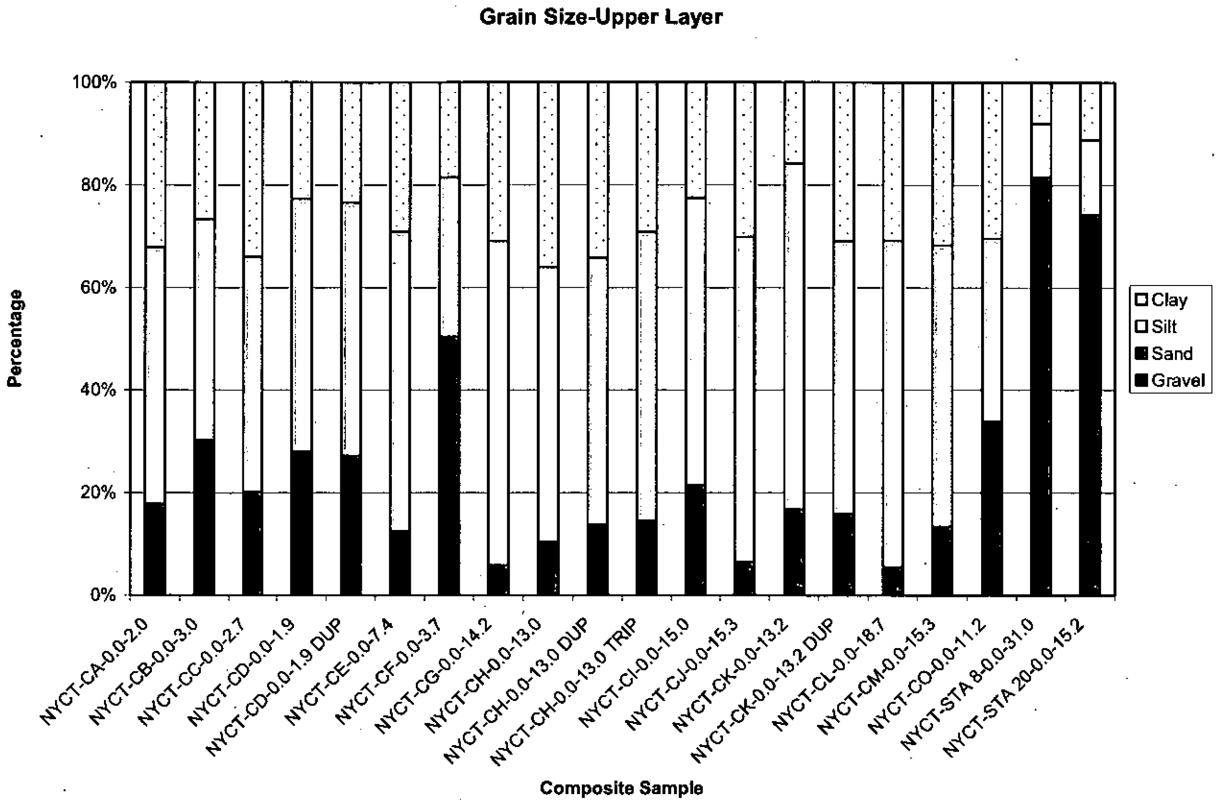
5.0 Grain Size Results

Grain size measurements were made from each of the core samples. Table 25 and Figure 4 show the distribution of grain size within upper and lower core layers. The lower layers of the sediment samples were comprised largely of gravel and sand while the upper layers were comprised of fines (silt and clay). The major mode within the upper sediment layers was silt. The only composites that did not show this trend were CF and Station 20. Composite F 0.0-3.0 (the entire sample) was comprised of nearly equal percentages of gravel, sand, silt, and clay. Station 20 (0.0-15.2 ft) was taken from the area of the Colonial Pipeline and the upper layer was comprised of 73% sand, which is believed to be anthropogenic fill associated with pipeline placement. The lower layer of Station 20 (15.2-27.0 ft) was comprised of only 5.8% sand but with 94.3% silt and clay likely also to be anthropogenic fill used when the pipeline was placed. The remaining samples showed homogeneity where the upper layers that had the most constituents of interest were comprised of fines while the lower layers were comprised of cleaner sands and gravels.

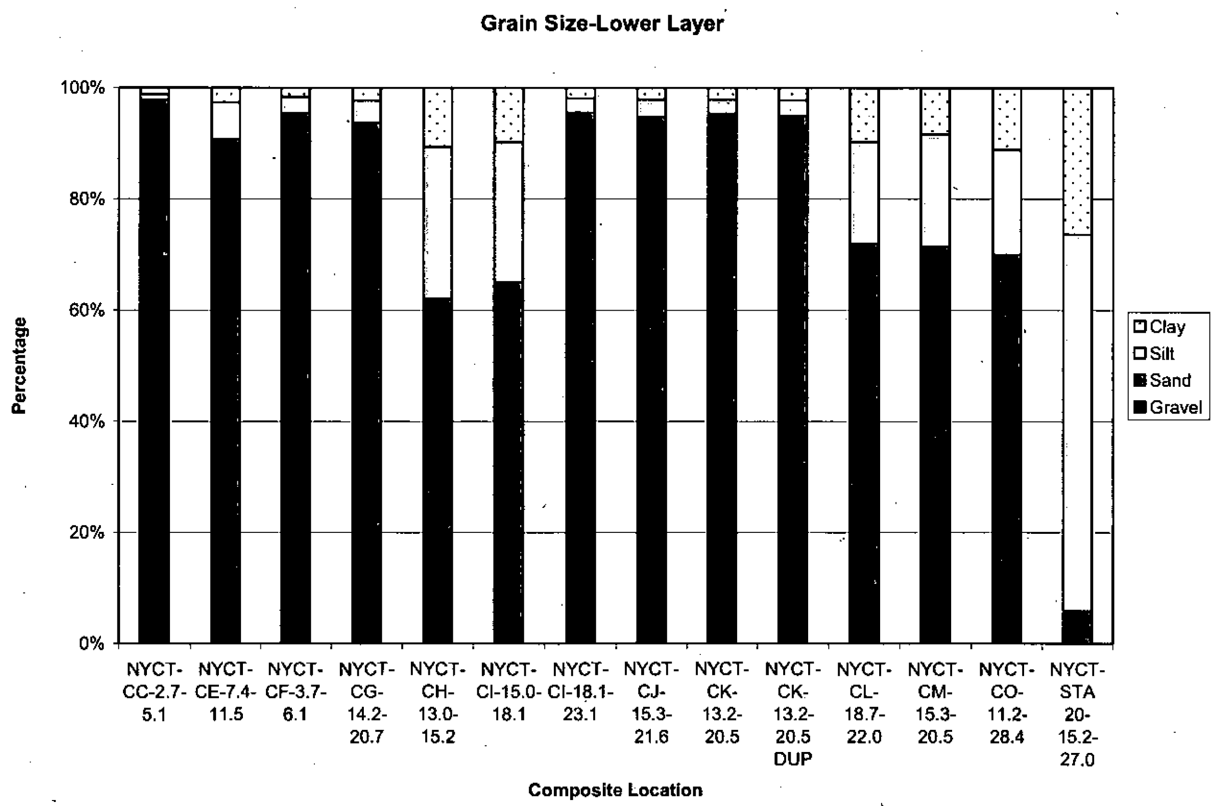
Table 25. Grain size measurements for upper layers of composites and solitary cores

Sample	% Gravel	% Sand	% Silt	% Clay	PHI PERCENT >-5	-4	-3	-2	-1	0	1	2	3	4	Total Sample Mean	Total Sample Std Dev	Coarse Only Mean	Coarse Only Std Dev
UPPER																		
NYCT-CA-0.0-2.0	1.1	16.7	50.1	32.1	0.00	0.00	0.00	0.00	1.15	0.52	0.86	2.01	5.42	7.85	6.32	2.34	2.39	4.18
NYCT-CB-0.0-3.0	2.2	28.0	43.1	26.6	0.00	0.00	0.00	0.00	2.22	2.39	4.28	6.99	6.45	7.94	5.50	2.90	1.72	4.08
NYCT-CC-0.0-2.7	0.1	20.0	45.9	34.0	0.00	0.00	0.00	0.00	0.13	0.74	2.77	4.75	6.91	4.85	6.23	2.52	2.10	4.29
NYCT-CD-0.0-1.9	7.5	20.6	49.3	22.6	0.00	0.00	0.00	0.00	7.54	1.87	2.28	3.67	5.36	7.37	5.33	3.03	1.20	4.58
NYCT-CD-0.0-1.9 DUP	7.4	19.8	49.4	23.4	0.00	0.00	0.00	0.00	7.41	1.38	2.16	3.68	5.65	6.93	5.40	3.00	1.22	4.62
NYCT-CE-0.0-7.4	1.0	11.5	58.4	29.1	0.00	0.00	0.00	0.00	1.01	0.86	2.09	3.86	2.78	1.92	6.31	2.31	1.48	5.03
NYCT-CF-0.0-3.7	22.9	27.5	31.1	18.5	0.00	18.45	0.00	0.00	4.44	5.31	8.18	7.81	3.61	2.62	2.95	4.70	-1.16	4.96
NYCT-CG-0.0-14.2	0.0	5.8	63.2	30.9	0.00	0.00	0.00	0.00	0.05	0.23	0.54	0.94	1.48	2.63	6.72	1.76	2.45	4.44
NYCT-CH-0.0-13.0	0.4	9.9	53.7	36.0	0.00	0.00	0.00	0.00	0.39	0.51	0.78	0.72	1.62	6.31	6.73	2.03	2.59	4.37
NYCT-CH-0.0-13.0 DUP	3.7	10.1	52.1	34.2	0.00	0.00	3.40	0.00	0.27	0.49	0.54	0.84	1.55	6.66	6.36	2.70	1.18	5.95
NYCT-CH-0.0-13.0 TRIP	1.9	12.6	56.4	29.1	0.00	0.00	0.00	0.00	1.86	0.86	0.66	0.92	1.66	8.48	6.33	2.24	2.24	4.48
NYCT-CI-0.0-15.0	2.1	19.5	56.0	22.5	0.00	0.00	0.00	0.00	2.06	1.41	2.79	6.20	5.34	3.72	5.72	2.59	1.55	4.43
NYCT-CJ-0.0-15.3	0.0	6.4	63.5	30.1	0.00	0.00	0.00	0.00	0.00	0.13	0.34	0.80	1.39	3.78	6.70	1.72	2.80	4.03
NYCT-CK-0.0-13.2	1.4	15.4	67.5	15.8	0.00	0.00	0.00	0.00	1.37	0.65	1.66	5.07	5.17	2.80	5.76	2.18	1.72	4.27
NYCT-CK-0.0-13.2 DUP	1.2	14.6	53.3	30.9	0.00	0.00	0.00	0.64	0.53	0.88	1.58	5.14	4.32	2.72	6.24	2.46	1.64	4.83
NYCT-CL-0.0-18.7	0.7	4.7	63.7	30.9	0.00	0.00	0.00	0.00	0.69	0.29	0.49	1.01	1.04	1.91	6.70	1.85	1.81	5.18
NYCT-CM-0.0-15.3	4.4	9.0	54.9	31.8	0.00	0.00	4.28	0.00	0.10	0.23	0.80	1.39	1.99	4.61	6.23	2.81	0.62	6.36
NYCT-CO-0.0-11.2	9.2	24.7	35.7	30.4	0.00	0.00	8.93	0.00	0.29	0.85	2.28	8.36	7.62	5.58	5.08	3.76	0.59	5.20
NYCT-STA 8-0.0-31.0	1.1	80.5	10.4	8.0	0.00	0.00	0.00	0.00	1.11	1.75	7.13	41.00	25.61	4.98	2.78	2.38	1.76	1.35
NYCT-STA 20-0.0-15.2	1.2	73.0	14.6	11.2	0.00	0.00	0.00	0.00	1.16	3.01	10.22	35.68	19.42	4.68	3.09	2.73	1.62	1.76

Table 25. Grain size measurements for upper layers of composites and solitary cores																		
	%	%	%	%	PHI PERCENT										Total Sample		Coarse Only	
Sample	Gravel	Sand	Silt	Clay	>-5	-4	-3	-2	-1	0	1	2	3	4	Mean	Std Dev	Mean	Std Dev
LOWER																		
NYCT-CC-2.7-5.1	69.7	28.1	1.0	1.2	17.91	23.43	10.34	12.09	5.90	4.53	9.23	12.38	1.69	0.29	-2.36	2.92	-2.59	2.53
NYCT-CE-7.4-11.5	13.4	77.3	6.7	2.6	0.00	0.00	0.00	5.87	7.54	13.95	28.32	27.38	6.25	1.38	1.06	2.28	0.47	1.46
NYCT-CF-3.7-6.1	36.4	59.1	3.0	1.6	16.34	0.00	5.35	6.79	7.86	11.84	21.71	19.18	5.04	1.30	-0.54	3.04	-0.91	2.62
NYCT-CG-14.2-20.7	21.2	72.4	4.1	2.3	0.00	0.00	9.10	6.66	5.42	11.35	16.79	31.22	8.98	4.12	0.75	2.50	0.32	1.95
NYCT-CH-13.0-15.2	20.7	41.3	27.3	10.7	0.00	0.00	10.09	7.04	3.52	3.88	6.47	16.34	9.41	5.24	2.69	3.82	0.15	3.45
NYCT-CI-15.0-18.1	1.4	63.6	25.1	9.8	0.00	0.00	0.00	0.00	1.42	3.37	9.74	30.85	13.90	5.78	3.41	2.77	1.57	2.12
NYCT-CI-18.1-23.1	50.4	45.1	2.6	1.9	0.00	28.17	6.86	7.16	8.23	12.20	13.77	14.21	4.14	0.79	-1.13	3.02	-1.53	2.47
NYCT-CJ-15.3-21.6	45.4	49.3	3.2	2.1	0.00	17.04	5.81	11.14	11.39	11.62	15.14	18.23	3.08	1.28	-0.63	2.89	-1.06	2.31
NYCT-CK-13.2-20.5	43.4	52.0	2.5	2.1	0.00	13.47	17.63	6.09	6.20	8.68	18.21	20.40	3.95	0.72	-0.65	2.91	-1.04	2.38
NYCT-CK-13.2-20.5 DUP	32.3	62.5	2.9	2.3	0.00	0.00	15.21	9.55	7.59	10.96	21.45	23.79	5.23	1.07	0.07	2.56	-0.32	1.99
NYCT-CL-18.7-22.0	10.5	61.5	18.3	9.8	0.00	0.00	1.57	3.97	4.92	9.27	16.60	28.67	4.25	2.66	2.42	3.24	0.61	2.34
NYCT-CM-15.3-20.5	28.3	43.1	20.2	8.3	0.00	7.58	11.72	5.57	3.46	5.62	8.43	16.75	7.86	4.42	1.64	4.02	-0.46	3.31
NYCT-CO-11.2-28.4	1.2	68.8	18.9	11.2	0.00	0.00	0.00	0.00	1.19	1.49	4.75	29.57	25.36	7.60	3.48	2.64	1.92	1.83
NYCT-STA 20-15.2-27.0	0.0	5.8	67.9	26.4	0.00	0.00	0.00	0.00	0.00	0.25	0.46	1.12	1.51	2.46	6.58	1.68	2.45	4.29



Grain Size-Upper Layer
100%
80%
60%
40%
20%
0%
Percentage
Clay
Silt
Sand
Gravel
NYCT-CA-0.0-2.0
NYCT-CB-0.0-3.0
NYCT-CC-0.0-2.7
NYCT-CD-0.0-1.9
NYCT-CD-0.0-1.9 DUP
NYCT-CE-0.0-7.4
NYCT-CF-0.0-3.7
NYCT-CG-0.0-14.2
NYCT-CH-0.0-13.0
NYCT-CH-0.0-13.0 DUP
NYCT-CH-0.0-13.0 TRIP
NYCT-CI-0.0-15.0
NYCT-CJ-0.0-15.3
NYCT-CK-0.0-13.2
NYCT-CK-0.0-13.2 DUP
NYCT-CL-0.0-18.7
NYCT-CM-0.0-15.3
NYCT-CO-0.0-11.2
NYCT-STA 8-0.0-31.0
NYCT-STA 20-0.0-15.2
Composite Sample



Grain Size-Lower Layer
100%
80%
60%
40%
20%
0%
Percentage
Clay
Silt
Sand
Gravel
NYCT-CC-2.7-5.1
NYCT-CE-7.4-11.5
NYCT-CF-3.7-6.1
NYCT-CG-14.2-20.7
NYCT-CH-13.0-15.2
NYCT-CI-15.0-18.1
NYCT-CI-18.1-23.1
NYCT-CJ-15.3-21.6
NYCT-CK-13.2-20.5
NYCT-CK-13.2-20.5 DUP
NYCT-CL-18.7-22.0
NYCT-CM-15.3-20.5
NYCT-CO-11.2-28.4
NYCT-STA 20-15.2-27.0
Composite Location

6.0 Discussion

The data results obtained from this field survey determined that red, glacial till was found at shallower depths than originally anticipated and, as a consequence, reduced the amount of soft strata material that will be potentially required for upland disposal by nearly 31% from original estimates.

Channel Dredging Occurs Prior to Berth Slip Dredging			
	Soft Strata	Glacial Till	Rock
Volume (cubic yards) Prior to Survey Calculations	266,300	195,000	172,000
Volume (cubic yards) Post Survey Calculations	203,079	131,083	181,664
Channel Dredging Occurs After Berth Slip Dredging			
Volume (cubic yards) Prior to Survey Calculations	285,506	201,558	175,511
Volume (cubic yards) Post Survey Calculations	260,395	137,661	195,231

While the NYCT is not responsible for the contamination at the site, it is required to take responsibility for appropriately treating the sediment for potential disposal options. The lower gray sand and gravel layers of sediment from composited cores showed less contamination from constituents when compared to the upper black, silty sediment. The lower sand and gravel layer from each composite lacked the red color consistent with Pleistocene till but had grain size consistent with Pleistocene material. This suggested that the lower layers within the composites may be Pleistocene, Holocene, or a combination of both in origin. NYCT will dredge both the silty black layer and the sandy gray layer simultaneously and intends to mix these two layers together to render the upper silty layer more geotechnically stable. This mixing will also cause dilution of the constituents within the upper layer. Furthermore, the combined upper and lower layers after dredging will be mixed with Portland cement previous to upland use or disposal to reduce risk from possible leaching of constituents and to help improve the geotechnical characteristics of the material.

Raw sediment results showed the presence of a variety of constituents suggesting that the sediment within the footprint of the proposed project is contaminated and presents a level of ecological risk per screening values for metals and dioxin/furan TEQs (Toxic Equivalency Quotients). Amended sediment that was tested using the SPLP process showed far fewer constituents present (undetectable) and when constituents were detected they were at lower concentrations when compared to raw sediment data. In some instances e.g. PCBs, none of the congeners were detected after SPLP testing was completed. By dredging the existing sediment and removing it permanently and subsequently treating it for upland use or disposal with 8% Portland cement, this will prevent leaching of constituents into the environment and will benefit the existing marine habitat at the proposed project site and within the Kill Van Kull. A

DMJM HARRIS | AECOM

DMJM Harris
20 Exchange Place, 12th Floor
T 212-701-2805 F 212-701-2802 www.dmjmharris.com

Mr. Al Hubler
New York Container Terminal
300 Western Avenue
Staten Island, NY 10303
718-568-1749

September 18, 2008

Subject: Draft Geotechnical Data Report

Dear Mr. Hubler,

Attached is a draft copy of the Geotechnical Data Report for your review. The report outlines the findings of the recent water boring program at NYCT Berth 4 for the proposed dredging program. Please let us know if you have any questions or comments.

Yours sincerely,

Aly Mohammad, Ph.D., P.E.
Geotechnical Department Manager
DMJM Harris AECOM

Aly.mohammad@dmjmharris.com
Phone: 212-701-2805

Enclosure: 1 copy Draft Geotechnical Data Report

NY Container Terminal: Berth 4
Staten Island, New York

GEOTECHNICAL DATA REPORT
FIELD SAMPLING RESULTS FOR DREDGING

Client:

NYCT
NEW YORK CONTAINER TERMINAL

September 2008

DMJM HARRIS | AECOM

20 Exchange Place, NY, NY 10005
Project Number: 60004312.0019

Table of Contents

1.0 Introduction

DMJM Harris was subcontracted by New York Container Terminal to evaluate the subsurface condition at the site of their Berth 4 expansion. The site which the adjacent Kill Van Kull and Arthur Kill has a history of varying industrial uses and has been modified several times with various pier configurations over it's history. The proposed site has been previously filled for industrial use and the adjacent channel has been dredged for shipping commerce. To attain approval of the ARMY Corps of Engineers for the proposed dredging of the Berth 4 area, a series of water borings and vibrocores were performed to get a better understanding of the soil condition at the proposed dredge area and help evaluate disposal options for the dredged material.

The subsurface conditions in the proposed dredge area were evaluated and profiles were developed long the area to be dredged showing the stratigraphy of the soil to be dredged. This data was then used to evaluate the quantities of material to be removed during the dredge operation. The following report presents the results of this evaluation; the data collected and recommendations.

2.0 Geology

The formation of wetlands in this region began 8,000 to 10,000 years ago when the last advance of the Wisconsin Glacier began to melt and retreat northward. At the height of the last ice age the Wisconsin Ice Sheet covered all of Canada and much of the northern United States. The glacier stopped its advance in New York City. The ice sheet covered most of western and northern Staten Island while the eastern and south shore remained ice-free. The terminal moraine, known as the "Harbor Hill Moraine", stretches from Staten Island, through Brooklyn and Queens and out across Long Island to the tip of Montauk Point. This terminal moraine of the glacier created a large inland lake, Glacial Lake Hackensack, which persisted for several thousand years on the western shore of Staten Island and the eastern shore of New Jersey. Now the Arthur Kill bisects this low, flat expanse.

The NYCT Berth 4 Site lies within the former Glacial Lake Hackensack area and evidence can be seen by the brown red glacial soils that dominate the lower soil strata. This material is generally derived from the Glacier having passed over the local Red Shale bedrock, thus eroding and re-depositing it. More recent deposits, occurring in the upper strata, consist of fill material used to reclaim the land for industrial development. This stratum is separated from the glacial material by compressible layers of Organic Clays and Peats remaining from the former wetlands. These soils were originally formed from the decomposition of vegetation in shallow waters, and as silts and clays simultaneously settled out in stagnant or very slow moving waters.

The site is located where the Kill Van Kull intersects the Arthur Kill Waterway. The Kill Van Kull is a tidal strait which is approximately 3 miles (4.8 km) long and 1,000 feet (305 m) wide and lies between Staten Island and Bayonne, NJ. The strait connects Newark Bay with Upper New York Bay. It is historically the principal access of marine traffic between Manhattan and industrial New Jersey. Currently the U.S. Army Corps of Engineers, in partnership with the Port Authority of New York and New Jersey conducting a drilling and blasting program to increase the depth of the channel from 40 ft to 50 ft, for the use of larger, modern container ships. Similarly, the proposed dredge area at the proposed NYCT Berth 4 Site will be dredge to match the program posed by the ARMY Corp of Engineers.

3.0 Reports Reviewed from Prior Investigations

A geotechnical evaluation of the soil condition of the site of the proposed NYCT Berth 4 was performed. The geotechnical evaluation includes the review of existing geotechnical data. This data includes soil borings, test pits, lab results, from past studies at the site. The four reports reviewed are as follows and also a set of drawings regarding the Channel Deepening of the Arthur Kill:

Geotechnical Data Report, Upland Boring Program
dated May, 2008, Prepared by DMJM Harris

Parcel C Development Area, Marine Container Terminal, Stage 1 Report
dated October 11, 2005, Prepared by the Port Authority of NY and NJ

Site Investigation & Conceptual Remedial Workplan, Future Site 4, Parcel C
dated September, 2005, Prepared by Hatch Mott MacDonald

Geotechnical Reference Data for Port Ivory Parcel C
dated May, 2005, Prepared by the Port Authority of NY and NJ

New York Harbor, Arthur Kill Chanel, Navigation Improvement Project, Contract II, NY and NJ
dated December, 2003, Prepared by the US Army Engineer District, Corp of Engineers, NY, NY

4.0 Current Barge Based Subsurface Investigation for field sampling

The current subsurface investigation was performed from June 3rd to June 29th, 2008 at the site of the proposed NYCT Berth 4. The program consists of 11 water borings located to compliment the existing subsurface data. Table 1 below indicates the latitude and longitude of each of the water borings.

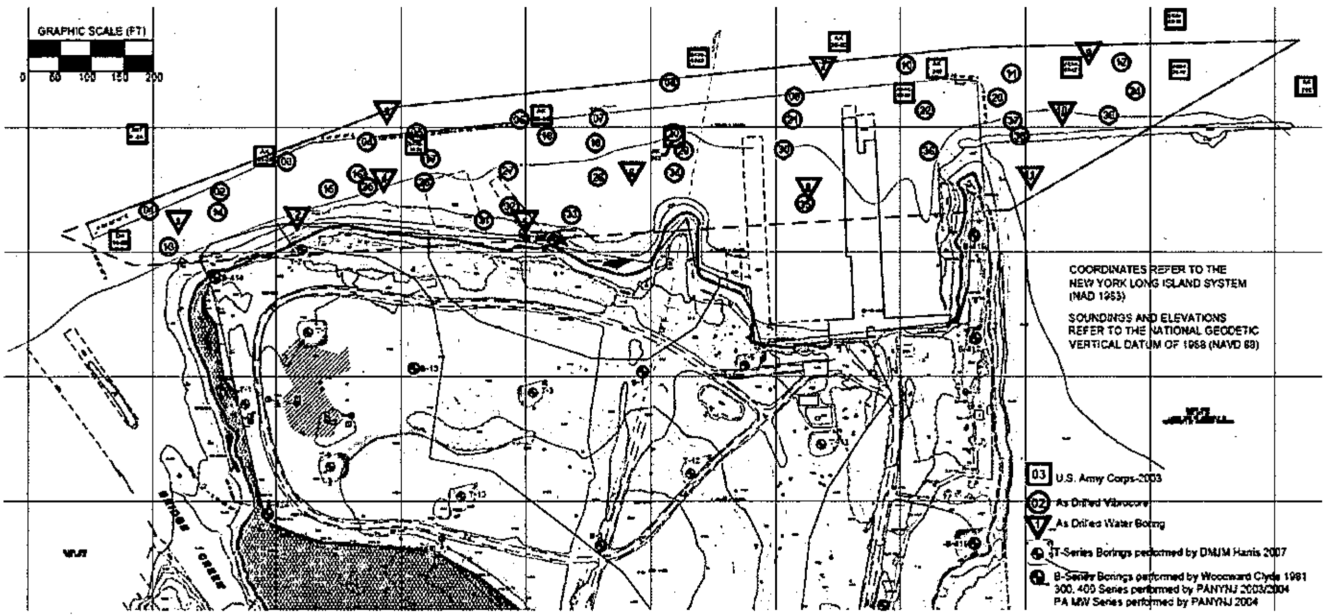
TABLE 1

Station	Latitude	Longitude
GT1	40°38'41.28"N	74°11'1.50"W
GT2	40°38'41.34"N	74°10'59.22"W
GT3	40°38'43.02"N	74°10'57.36"W
GT4	40°38'41.94"N	74°10'57.42"W
GT5	40°38'41.28"N	74°10'54.48"W
GT6	40°38'42.06"N	74°10'52.26"W
GT7	40°38'43.74"N	74°10'48.30"W
GT8	40°38'41.82"N	74°10'48.60"W
GT9	40°38'44.52"N	74°10'42.78"W
GT10	40°38'43.02"N	74°10'43.32"W
GT11	40°38'42.00"N	74°10'43.98"W

Standard Split Spoon Drive Samples were obtained continuously the entire length of the boring, to refusal, and then cores were taken of the bedrock. Each boring penetrated beyond the planned dredge depth of -52ft MLW. Photographic documentation was collected of all boring samples according to the ARMY Corp of Engineers Procedures; including both soil and rock samples. The drilling subcontractor was Warren George, Inc. and the work was inspected on a full time basis by a geotechnical engineer from DMJM Harris.

This investigation was performed concurrently with an environmental investigation consisting of 39 vibro-cores. This report summarizes the data collected in the water boring investigation only, further detail regarding the vibro-core program can be found in the environmental report by ENSR, Inc. Figure 1 below shows the water boring locations and the vibrocore locations.

FIGURE 1 - Boring Location (indicating water borings, vibrocores and prior relevant borings)



Note, for a larger version of the location plan shown above see the Figures at the end of this report

5.0 Subsurface Conditions

In general, the soil strata identified from the borings consist of the following three basic layers:

- Layer 1(a/b): Grey colored recent Alluvial Soil
- Layer 2: Red-Brown colored Glacial Soil
- Layer 3: Red-Brown Sedimentary Bedrock

Layer 1(a) Grey Organic Clay/Silt: At the mudline an Organic Grey Clay/Silt layer was encountered over the majority of the site. The organic layer consists of Grey to Black Silty Clay and has a thickness varying from 2.2 to 36.1 feet. The average thickness of this layer is 13.8 feet. The N-value for this layer ranged from 2 to 7 and averaged a value of 3.4. In some borings Peat was observed mixed with the Organic Clays

Layer 1 (b) Grey Sand: With depth the Organic Clay/Silt transitioned into Grey Brown, coarse to fine Sand with varying amounts of medium to fine Gravel and intermixed silt and clay this transitional change was encountered with depth over the majority of the site. The Sand varied in thickness from 0.6 to 36.3 feet and averaged a thickness of 5.5 feet. The N-value for this layer ranged from 2 to 146 and averaged a value of 31.9.

(2) Red-brown Glacial Deposit: The layer consists of Red Brown Sand and Gravel, with varying amounts of Clay and Silt. The layer was encountered underneath the entire site and varies in consistency from medium stiff to hard. The N-value for this layer ranged from 14 to 131 an averaged a value of 43.6.

(3) Red-brown Sedimentary Bedrock: Red Shale was encountered at a depth varying between 29 to 58 feet below Mean Low Water (MLW). Rock cores obtained indicated recovery ratios (REC) that varied from 45.8% to 100% and averaged 91.7%. The Rock Quality Designation (RQD) of the 5 foot core runs ranged from 0.0% to 95.8% and averaged 44.8%.

6.0 Soil and Rock Laboratory Testing

6.1 Soil Testing Select samples of the soil to be dredged were sent for laboratory testing to determine the gradation and plasticity, organic content and moisture content of the various strata. The data received is tabulated below according to the soil layer where the test sample was taken from.

TABLE 2

										Sieve Analysis			
Soil Type	Boring Logs	Sample	Depth (ft)	Elevation	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index (PI)	Organic Content (%)	% Gravel	%Sand	% Silt	% Clay
Grey Organic Silty Clay (Layer 1 a)	GT-1	S-1	25.0	-25.0	123.9	88.0	34.0	54.0	8.4	4.3	23.9	50.2	21.6
	GT-2	S-4	11.0	-11.0	71.2	90.0	42.0	48.0	7.0	0.0	2.2	60.3	37.5
	GT-2	S-8a	18.5	-18.5	69.0	83.0	36.0	47.0	8.1	0.0	41.7	41.0	17.3
	GT-4	S-1	13.0	-13.0	80.6	91.0	33.0	58.0	5.4	0.4	19.2	55.6	24.8
	GT-5	S-4	7.0	-7.0	100.9	105.0	40.0	65.0	8.2	0.0	3.4	55.0	41.6
	GT-5	S-9	17.0	-17.0	75.4	99.0	41.0	58.0	8.9	0.0	14.8	64.3	20.9
	GT-6	S-1	3.0	-3.0	99.4	114.0	95.0	19.0	9.7	0.0	22.2	38.4	39.4
	GT-6	S-4	9.0	-9.0	105.7	173.0	116.0	57.0	12.3	0.0	15.7	53.4	30.9
	GT-7	S-1	39.0	-39.0	20.7	21.0	13.0	8.0	5.7	29.5	52.0	12.4	6.1
	GT-8	S-7	18.0	-18.0	82.4	97.0	45.0	52.0	8.7	0.0	2.7	89.5	7.8
	GT-8	S-8a	20.0	-20.0	132.9	125.0	36.0	89.0	13.2	0.0	35.3	56.3	8.4
	GT-10	S-2	8.0	-8.0	74.6	80.0	36.0	44.0	5.7	0.0	6.2	63.9	29.9
	GT-10	S-6	16.0	-16.0	79.8	90.0	40.0	50.0	7.0	0.0	11.5	59.8	28.7
	GT-11	S-4	7.0	-7.0	78.7	85.0	36.0	49.0	5.8	0.0	1.7	73.1	25.2
	GT-11	S-9	17.0	-17.0	304.9	441.0	110.0	331.0	59.9	0.0	70.7	24.0	5.3
				Average	**100.0**	**118.8**	**50.2**	**68.6**	**11.6**	**2.3**	**21.5**	**53.1**	**23.0**
Grey Organic Sand (w/Silt) (Layer 1 b)	GT-1	S-2	27.0	-27.0	16.4	NV	NP	NP	1.8	46.1	34.3	11.2	8.4
	GT-2	S-9	21.0	-21.0	73.8	49.0	NP	NP	3.9	11.9	48.8	27.7	11.6
	GT-2	S-10	23.0	-23.0	16.4	NV	NP	NP	1.4	12.1	72.1	8.2	7.6
	GT-3	S-1a	43.5	-43.5	19.6	NV	NP	NP	5.5	23.6	66.0	7.6	2.8
	GT-4	S-4	19.0	-19.0	26.2	NV	NP	NP	1.7	0.7	55.2	39.9	4.2
	GT-5	S-12	23.0	-23.0	13.8	NV	NP	NP	1.4	40.8	42.0	10.7	6.5
	GT-8	S-9	22.0	-22.0	11.8	NV	NP	NP	0.8	21.3	69.2	6.0	3.5
	GT-10	S-7	18.0	-18.0	23.1	NV	NP	NP	1.1	1.5	74.5	15.6	8.4
	GT-10	S-9	22.0	-22.0	15.5	23.0	14.0	9.0	1.3	28.2	17.6	37.4	16.8
				Average	**24.1**	**36.0**	**14.0**	**9.0**	**2.1**	**20.7**	**53.3**	**18.3**	**7.8**
Red-Brown Glacial Sand, Gravel, Silt & Clay (Layer 2)	GT-2	S-8b	19.5	-19.5	34.7	NV	NP	NP	4.7	2.7	71.1	17.0	9.2
	GT-2	S-11	25.0	-25.0	15.4	NV	NP	NP	1.1	44.7	47.7	4.9	2.7
	GT-2	S-13	29.0	-29.0	17.8	21.0	13.0	8.0	0.8	76.9	18.3	2.9	1.9
	GT-5	S-16	31.0	-31.0	17.3	24.0	18.0	6.0	1.3	0.0	5.4	79.0	15.6
	GT-5	S-19	37.0	-37.0	11.3	15.0	5.0	10.0	1.5	52.6	20.7	15.8	10.9
	GT-6	S-11	23.0	-23.0	11.2	NV	NP	NP	0.8	79.1	15.6	4.4	0.9
	GT-7	S-2	41.0	-41.0	31.2	30.0	15.0	15.0	1.9	57.3	11.0	17.1	14.6
	GT-9	S-1	46.0	-46.0	35.4	38.0	NP	NP	1.8	51.8	10.9	21.4	15.9
	GT-9	S-2	48.0	-48.0	20.1	NV	NP	NP	1.9	46.1	38.4	7.4	8.1
	GT-11	S-12	23.0	-23.0	14.3	NV	NP	NP	1.2	34.1	51.6	9.4	4.9
	GT-11	S-17	33.0	-33.0	14.0	NV	NP	NP	0.8	62.0	22.4	9.9	5.7
				Average	**20.2**	**25.6**	**12.8**	**9.8**	**1.6**	**46.1**	**28.5**	**17.2**	**8.2**

Elevation in MLW Datum

6.2 Rock Testing: The bedrock was identified in the field as red-brown Shale. Rock was cored in each boring from the start of bedrock to a depth of 55 feet below MLW in order to observe the properties of the rock to be dredged in this program. (Proposed dredge depth -52 ft MLW) Select rock samples were tested to determine the unconfined compression strength. The unconfined compressive strength test results ranged from 2,440psi to 12,390psi, with an average of 7,251psi. The core samples had an average Recovery (REC) of 91.7% and an average Rock Quality Designation (RQD) of 44.8%.

TABLE 3

Station	Core #	Depth (ft) below MLW	RQD (%)	REC (%)	Unconfined Compressive Strength (psi)
GT 1	C1	29	0.0%	87.5%	4,310
	C2	33	0.0%	93.3%	(not tested)
	C3	38	34.2%	95.0%	7,890
	C4	43	47.1%	100.0%	(not tested)
	C5	48	19.2%	100.0%	6,940
	C6	53	89.2%	100.0%	8,900
GT 2	C1	38	31.7%	98.3%	7,160
	C2	43	55.0%	90.0%	6,420
	C3	48	76.7%	100.0%	10,750
	C4	53	95.8%	100.0%	6,840
GT 3	C1	48	36.7%	98.3%	4,360
	C2	53	58.8%	100.0%	12,390
GT 4	C1	33	0.0%	16.7%	(not tested)
	C2	38	27.0%	96.7%	(not tested)
	C3	43	57.5%	100.0%	(not tested)
	C4	48	83.3%	100.0%	(not tested)
	C5	53	90.8%	100.0%	(not tested)
GT 5	C1	46	50.8%	95.0%	(not tested)
	C2	51	77.5%	100.0%	(not tested)
	C3	54	45.8%	93.8%	(not tested)
GT 6	C1	38	52.1%	90.6%	(not tested)
	C2	43	36.7%	100.0%	(not tested)
	C3	48	68.3%	100.0%	(not tested)
	C4	53	48.3%	100.0%	(not tested)
GT 7	C1	44	56.3%	87.5%	8,090
	C2	48	79.2%	100.0%	(not tested)
	C3	53	55.0%	100.0%	(not tested)
GT 8	C1	44	55.6%	94.4%	7,920
	C2	48	23.3%	95.8%	4,580
	C3	53	40.0%	90.0%	9,470
GT 9	C1	53	7.0%	80.0%	9,180
	C2	58	55.0%	100.0%	4,520
GT 10	C1	39	11.1%	94.4%	(not tested)
	C2	42	10.4%	45.8%	4,240
	C3	46	18.8%	52.1%	6,060
	C4	50	58.3%	93.8%	8,230
	C5	54	47.2%	94.4%	9,130
GT 11	C1	49	22.2%	91.7%	(not tested)
	C2	53	25.0%	100.0%	4,890
		AVERAGE	**44.8%**	**91.7%**	**7,251**

(See Appendix B for full lab data sheets for Rock and Soil Testing)

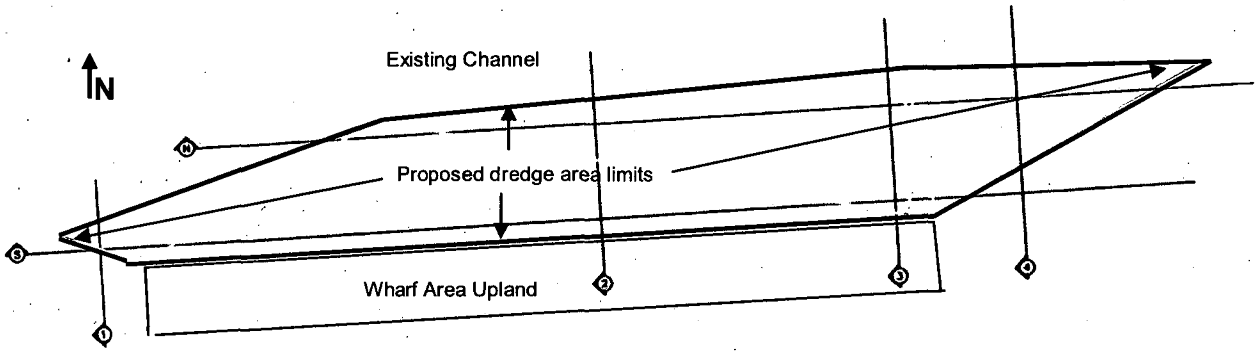
7.0 Dredge Quantities

In order to better determine the volume and composition of material to be dredged, the dredge material quantities were divided into three strata matching the soil/rock stratigraphy.

- Layer 1: The Upper Strata consisting of Grey colored alluvial soil deposits composed of Grey Organic Silty Clay transitioning into Grey Sand and Silt. The density of this soil is typically soft/loose.
- Layer 2: The Glacial Strata consisting of red-brown soils composed of a combination of Gravel, Sand, Silt and Clay of various combinations. The density of this soil is typically dense/stiff.
- Layer 3: The Bedrock which consists of sedimentary rock identified in the field as red-brown Shale.

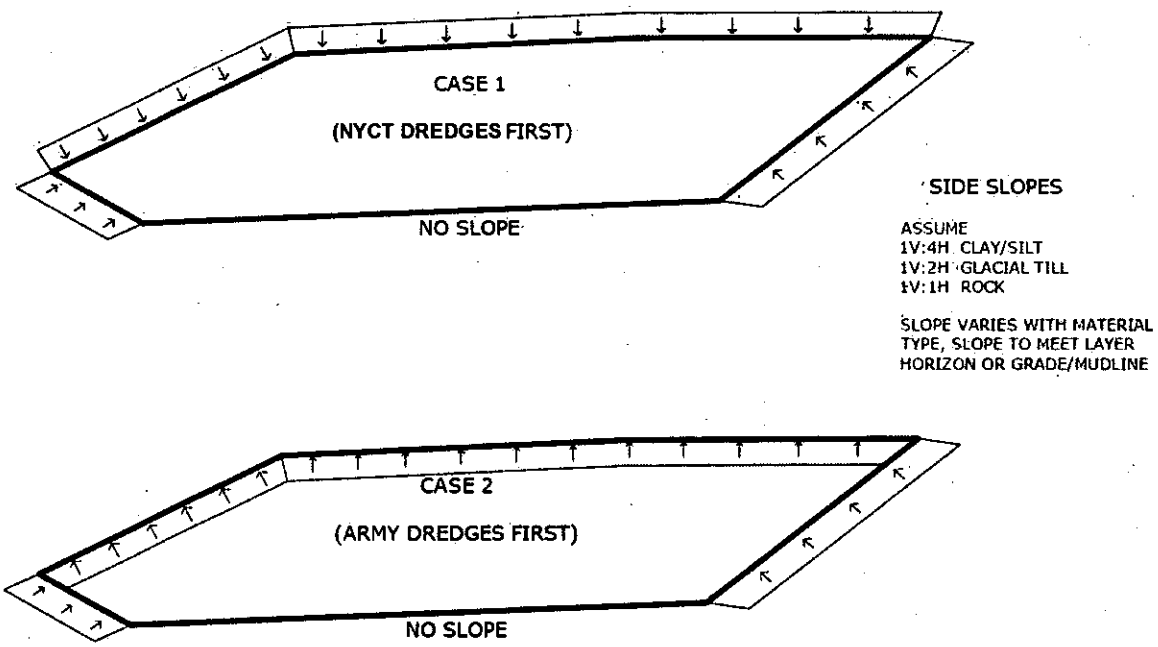
The data collected from the water borings, the vibrocores and some available borings from prior investigations by the Port Authority of NY & NJ and by the ARMY Corp of Engineers were utilized to form a 3D model in Microstation of the soil to be dredged. The volume between each material transition surface was then calculated in the Microstation software to determine the volume between each surface. Once the soil stratigraphy was modeled it was then possible to find the volume of each material and also to cut cross sections through the stratigraphy to see the thicknesses of the various soil layers in different areas.

FIGURE 2 – Plan View of Proposed Dredge Limits and Cross-section Locations



To set the boundary conditions at the limits of the dredge area, the soil was modeled to slope at various slopes depending on the properties of the material in each layer. This is because it was assumed that during the dredge the soil would not stand vertically and soil would tend to slide naturally into the dredged area to meet a more natural stable slope condition. The only area modeled as a vertical face was along the future Wharf face where a bulkhead will maintain a vertical face. The slopes used in the model were as follows: Organic Soils at the mudline (Layers 1a/b) were modeled as a 1V:4H slope, Glacial soils (Layer 2) were modeled as a 1V:2H slope and Rock (Layer 3) was modeled as a 1V:1H slope. As a result, the quantity of soil to be dredge would vary depending whether the dredge program was performed before the scheduled ARMY Corp deepening of the channel or after the ARMY Corp deepening of the channel. Two cases were developed as shown in Figure 3 below.

FIGURE 3 – Soil Model Edge Comparison



The resulting models provided volumes for each material type as shown in Table 4 below:

TABLE 4

Material Type	Dredge completed prior to ARMY Corp Channel Deepening	Dredge completed after ARMY Corp Channel Deepening
Gray Organic Soil	260,395 cy	203,079 cy
Red-Brown Glacial Soil	137,661 cy	131,083 cy
Sandstone Bedrock	195,231 cy	181,664 cy
Total	**593,287 cy**	**515,826 cy**

TABLES

Station	Latitude	Longitude
GT1	40°38'41.28"N	74°11'1.50"W
GT2	40°38'41.34"N	74°10'59.22"W
GT3	40°38'43.02"N	74°10'57.36"W
GT4	40°38'41.94"N	74°10'57.42"W
GT5	40°38'41.28"N	74°10'54.48"W
GT6	40°38'42.06"N	74°10'52.26"W
GT7	40°38'43.74"N	74°10'48.30"W
GT8	40°38'41.82"N	74°10'48.60"W
GT9	40°38'44.52"N	74°10'42.78"W
GT10	40°38'43.02"N	74°10'43.32"W
GT11	40°38'42.00"N	74°10'43.98"W

Soil Type	Boring Logs	Sample	Depth (ft)	Elevation	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index (PI)	Organic Content (%)	Sieve Analysis			
										% Gravel	%Sand	% Silt	% Clay
Grey Organic Silty Clay (Layer 1 a)	GT-1	S-1	25.0	-25.0	123.9	88.0	34.0	54.0	8.4	4.3	23.9	50.2	21.6
	GT-2	S-4	11.0	-11.0	71.2	90.0	42.0	48.0	7.0	0.0	2.2	60.3	37.5
	GT-2	S-8a	18.5	-18.5	69.0	83.0	36.0	47.0	8.1	0.0	41.7	41.0	17.3
	GT-4	S-1	13.0	-13.0	80.6	91.0	33.0	58.0	5.4	0.4	19.2	55.6	24.8
	GT-5	S-4	7.0	-7.0	100.9	105.0	40.0	65.0	8.2	0.0	3.4	55.0	41.6
	GT-5	S-9	17.0	-17.0	75.4	99.0	41.0	58.0	8.9	0.0	14.8	64.3	20.9
	GT-6	S-1	3.0	-3.0	99.4	114.0	95.0	19.0	9.7	0.0	22.2	38.4	39.4
	GT-6	S-4	9.0	-9.0	105.7	173.0	116.0	57.0	12.3	0.0	15.7	53.4	30.9
	GT-7	S-1	39.0	-39.0	20.7	21.0	13.0	8.0	5.7	29.5	52.0	12.4	6.1
	GT-8	S-7	18.0	-18.0	82.4	97.0	45.0	52.0	8.7	0.0	2.7	89.5	7.8
	GT-8	S-8a	20.0	-20.0	132.9	125.0	36.0	89.0	13.2	0.0	35.3	56.3	8.4
	GT-10	S-2	8.0	-8.0	74.6	80.0	36.0	44.0	5.7	0.0	6.2	63.9	29.9
	GT-10	S-6	16.0	-16.0	79.8	90.0	40.0	50.0	7.0	0.0	11.5	59.8	28.7
	GT-11	S-4	7.0	-7.0	78.7	85.0	36.0	49.0	5.8	0.0	1.7	73.1	25.2
	GT-11	S-9	17.0	-17.0	304.9	441.0	110.0	331.0	59.9	0.0	70.7	24.0	5.3
				Average	**100.0**	**118.8**	**50.2**	**68.6**	**11.6**	**2.3**	**21.5**	**53.1**	**23.0**
Grey Organic Sand (w/Silt) (Layer 1 b)	GT-1	S-2	27.0	-27.0	16.4	NV	NP	NP	1.8	46.1	34.3	11.2	8.4
	GT-2	S-9	21.0	-21.0	73.8	49.0	NP	NP	3.9	11.9	48.8	27.7	11.6
	GT-2	S-10	23.0	-23.0	16.4	NV	NP	NP	1.4	12.1	72.1	8.2	7.6
	GT-3	S-1a	43.5	-43.5	19.6	NV	NP	NP	5.5	23.6	66.0	7.6	2.8
	GT-4	S-4	19.0	-19.0	26.2	NV	NP	NP	1.7	0.7	55.2	39.9	4.2
	GT-5	S-12	23.0	-23.0	13.8	NV	NP	NP	1.4	40.8	42.0	10.7	6.5
	GT-8	S-9	22.0	-22.0	11.8	NV	NP	NP	0.8	21.3	69.2	6.0	3.5
	GT-10	S-7	18.0	-18.0	23.1	NV	NP	NP	1.1	1.5	74.5	15.6	8.4
	GT-10	S-9	22.0	-22.0	15.5	23.0	14.0	9.0	1.3	28.2	17.6	37.4	16.8
				Average	**24.1**	**36.0**	**14.0**	**9.0**	**2.1**	**20.7**	**53.3**	**18.3**	**7.8**
Red-Brown Glacial Sand, Gravel, Silt & Clay (Layer 2)	GT-2	S-8b	19.5	-19.5	34.7	NV	NP	NP	4.7	2.7	71.1	17.0	9.2
	GT-2	S-11	25.0	-25.0	15.4	NV	NP	NP	1.1	44.7	47.7	4.9	2.7
	GT-2	S-13	29.0	-29.0	17.8	21.0	13.0	8.0	0.8	76.9	18.3	2.9	1.9
	GT-5	S-16	31.0	-31.0	17.3	24.0	18.0	6.0	1.3	0.0	5.4	79.0	15.6
	GT-5	S-19	37.0	-37.0	11.3	15.0	5.0	10.0	1.5	52.6	20.7	15.8	10.9
	GT-6	S-11	23.0	-23.0	11.2	NV	NP	NP	0.8	79.1	15.6	4.4	0.9
	GT-7	S-2	41.0	-41.0	31.2	30.0	15.0	15.0	1.9	57.3	11.0	17.1	14.6
	GT-9	S-1	46.0	-46.0	35.4	38.0	NP	NP	1.8	51.8	10.9	21.4	15.9
	GT-9	S-2	48.0	-48.0	20.1	NV	NP	NP	1.9	46.1	38.4	7.4	8.1
	GT-11	S-12	23.0	-23.0	14.3	NV	NP	NP	1.2	34.1	51.6	9.4	4.9
	GT-11	S-17	33.0	-33.0	14.0	NV	NP	NP	0.8	62.0	22.4	9.9	5.7
				Average	**20.2**	**25.6**	**12.8**	**9.8**	**1.6**	**46.1**	**28.5**	**17.2**	**8.2**

Elevation in MLW Datum

Station	Core #	Depth (ft) below MLW	RQD (%)	REC (%)	Unconfined Compressive Strength (psi)
GT 1	C1	29	0.0%	87.5%	4,310
	C2	33	0.0%	93.3%	(not tested)
	C3	38	34.2%	95.0%	7,890
	C4	43	47.1%	100.0%	(not tested)
	C5	48	19.2%	100.0%	6,940
	C6	53	89.2%	100.0%	8,900
GT 2	C1	38	31.7%	98.3%	7,160
	C2	43	55.0%	90.0%	6,420
	C3	48	76.7%	100.0%	10,750
	C4	53	95.8%	100.0%	6,840
GT 3	C1	48	36.7%	98.3%	4,360
	C2	53	58.8%	100.0%	12,390
GT 4	C1	33	0.0%	16.7%	(not tested)
	C2	38	27.0%	96.7%	(not tested)
	C3	43	57.5%	100.0%	(not tested)
	C4	48	83.3%	100.0%	(not tested)
	C5	53	90.8%	100.0%	(not tested)
GT 5	C1	46	50.8%	95.0%	(not tested)
	C2	51	77.5%	100.0%	(not tested)
	C3	54	45.8%	93.8%	(not tested)
GT 6	C1	38	52.1%	90.6%	(not tested)
	C2	43	36.7%	100.0%	(not tested)
	C3	48	68.3%	100.0%	(not tested)
	C4	53	48.3%	100.0%	(not tested)
GT 7	C1	44	56.3%	87.5%	8,090
	C2	48	79.2%	100.0%	(not tested)
	C3	53	55.0%	100.0%	(not tested)
GT 8	C1	44	55.6%	94.4%	7,920
	C2	48	23.3%	95.8%	4,580
	C3	53	40.0%	90.0%	9,470
GT 9	C1	53	7.0%	80.0%	9,180
	C2	58	55.0%	100.0%	4,520
GT 10	C1	39	11.1%	94.4%	(not tested)
	C2	42	10.4%	45.8%	4,240
	C3	46	18.8%	52.1%	6,060
	C4	50	58.3%	93.8%	8,230
	C5	54	47.2%	94.4%	9,130
GT 11	C1	49	22.2%	91.7%	(not tested)
	C2	53	25.0%	100.0%	4,890
		AVERAGE	**44.8%**	**91.7%**	**7,251**

Material Type	Dredge completed prior to ARMY Corp Channel Deepening	Dredge completed after ARMY Corp Channel Deepening
Gray Organic Soil	260,395 cy	203,079 cy
Red-Brown Glacial Soil	137,661 cy	131,083 cy
Sandstone Bedrock	195,231 cy	181,664 cy
Total	**593,287 cy**	**515,826 cy**

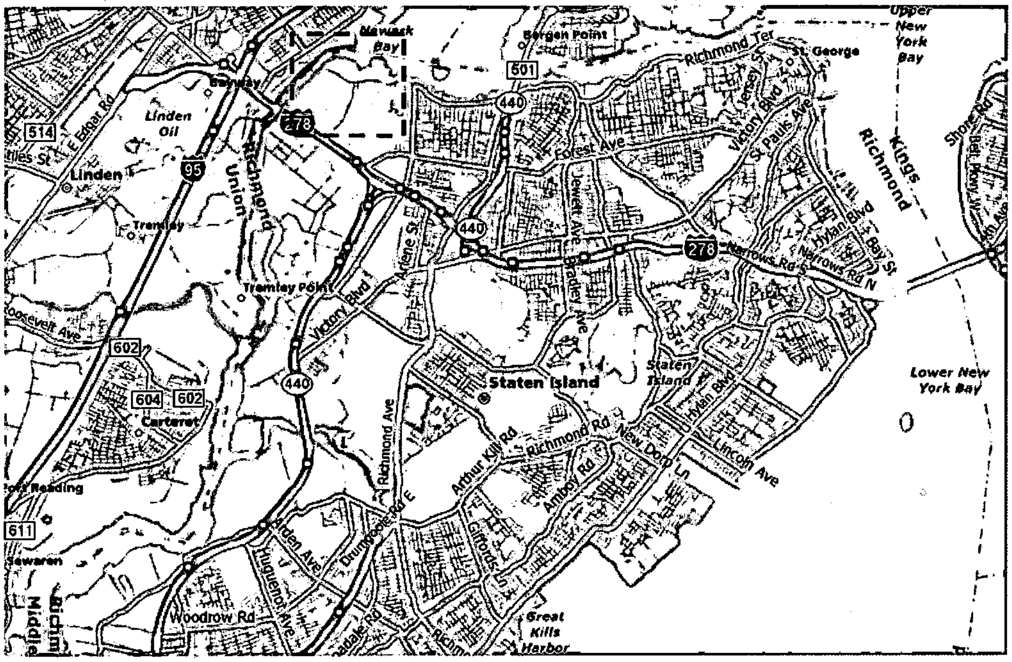
FIGURES

Site Plan

Boring Location Plan

Dredge Stratigraphy Cross Sections

- Plan View
- Cross-sections



Detail of Inset Shown Above

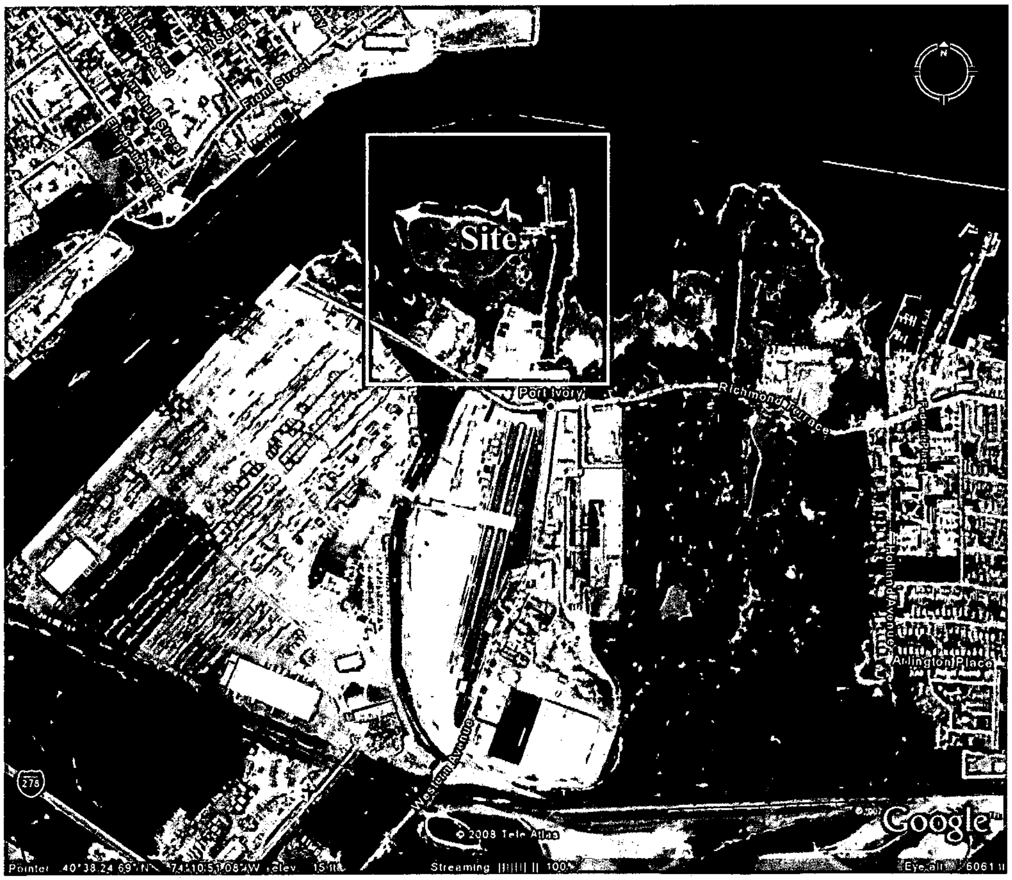
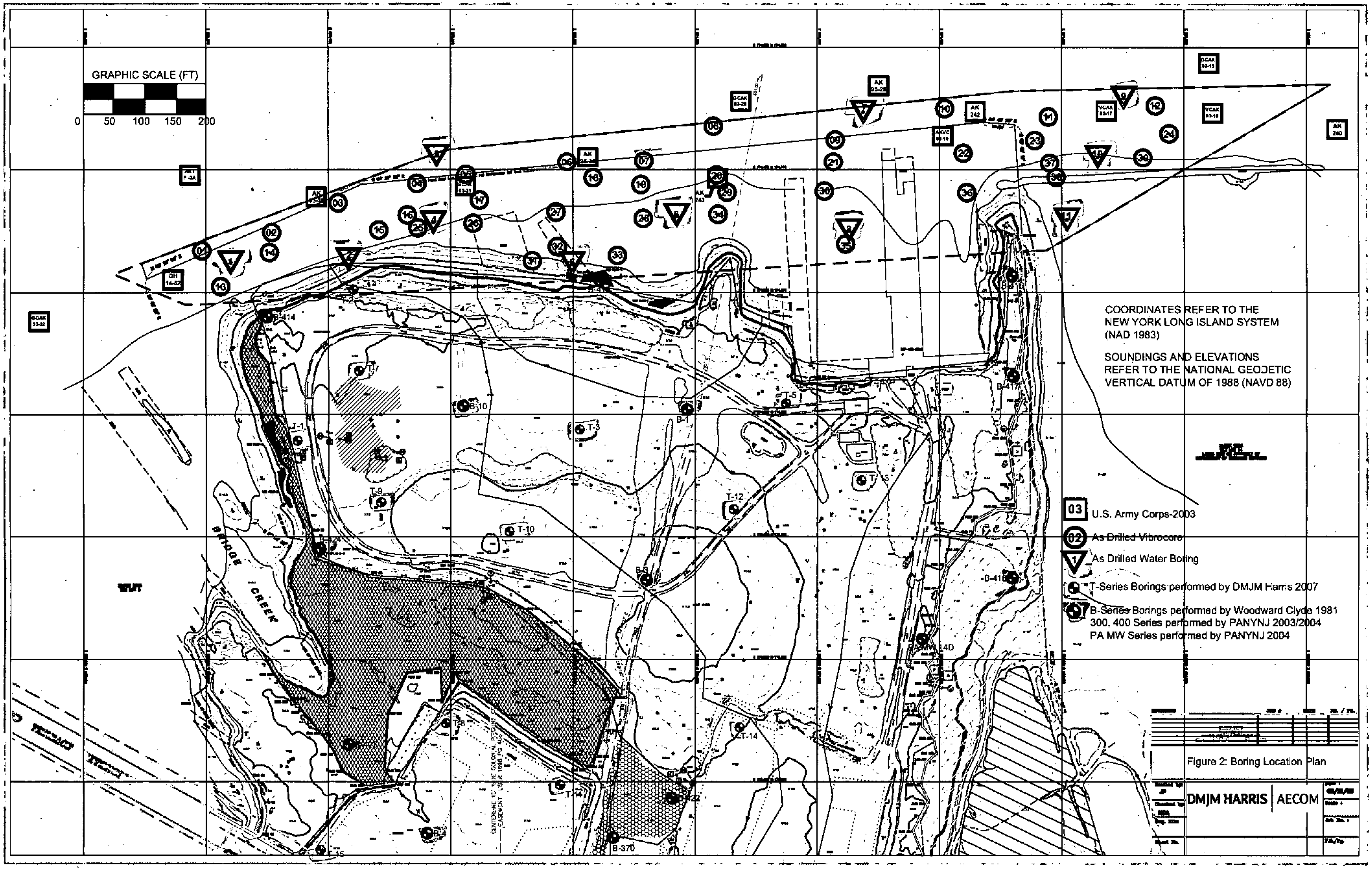
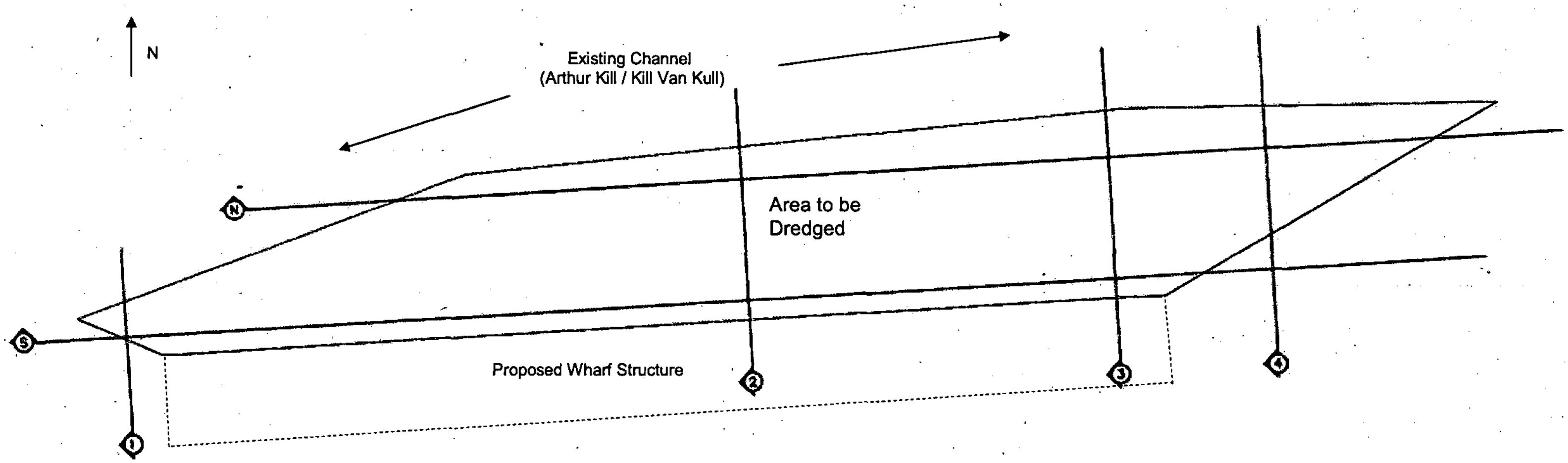
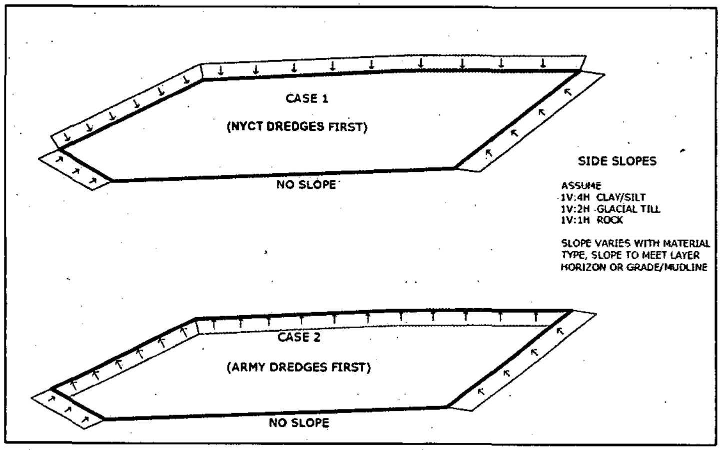


Figure 1 Site is located in North-western Staten Island as shown in the maps above.


GRAPHIC SCALE (FT)
0 50 100 150 200
COORDINATES REFER TO THE
NEW YORK LONG ISLAND SYSTEM
(NAD 1983)
SOUNDINGS AND ELEVATIONS
REFER TO THE NATIONAL GEODETIC
VERTICAL DATUM OF 1988 (NAVD 88)
03 U.S. Army Corps-2003
02 As Drilled Vibrocore
1 As Drilled Water Boring
T-Series Borings performed by DMJM Harris 2007
B-Series Borings performed by Woodward Clyde 1981
300, 400 Series performed by PANYNJ 2003/2004
PA MW Series performed by PANYNJ 2004
BRIDGE CREEK
Figure 2: Boring Location Plan
DMJM HARRIS | AECOM

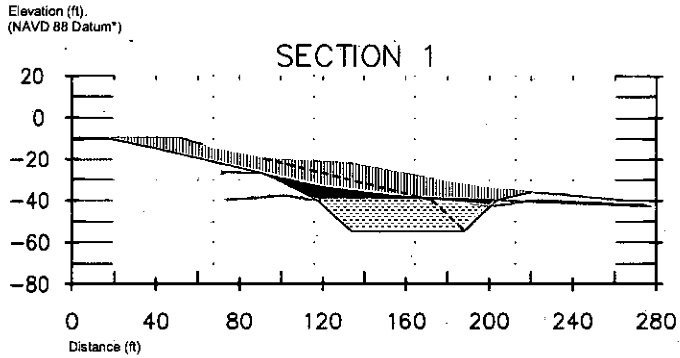


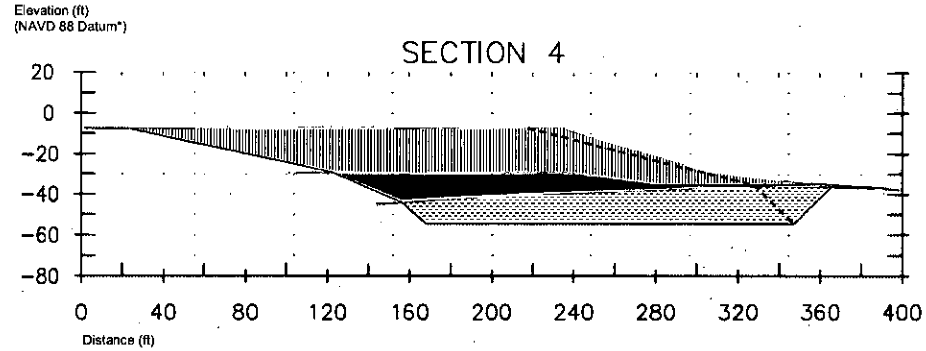
Plan View of Section Locations

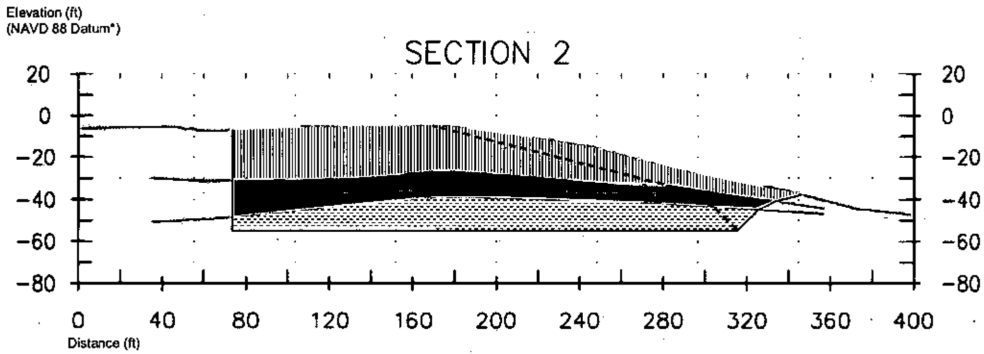


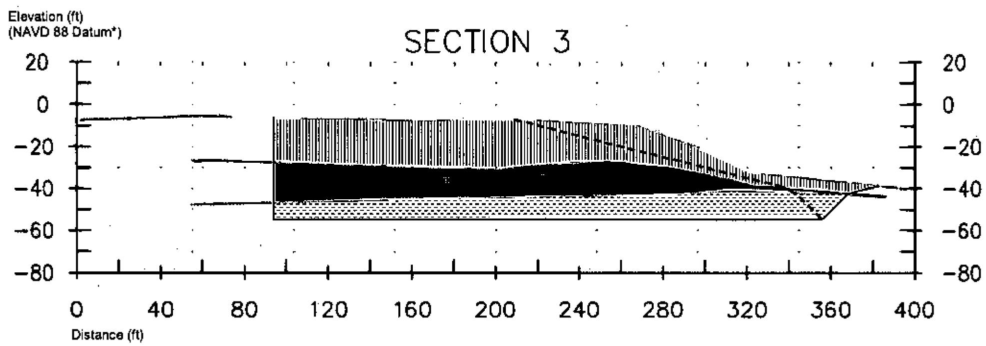
<u>Note:</u> The volume to be dredged varies slightly if the dredging program is performed before or after the *dredging of the Arthur Kill/Kill Van Kull dredging program* due to the likely natural sloping of the material at the dredge limits. See sketch for variation in volume calculation modeling.

Figure 3 –Cross Section Location Plan		
	NYCT Berth 4 - Dredging	
Drawn by: KCA	NYCT NEW YORK CONTAINER TERMINAL	Date: 09/11/08
Checked by: AM	DMJM HARRIS | AECOM	Job Number: 60004312.0019









Planned limits of dredge:

——— Case 1: NYCT dredges prior to ARMY dredging program.

- - - - Case 2: Alternate surface assumed if NYCT dredges after to ARMY dredging program in Arthur Kill.

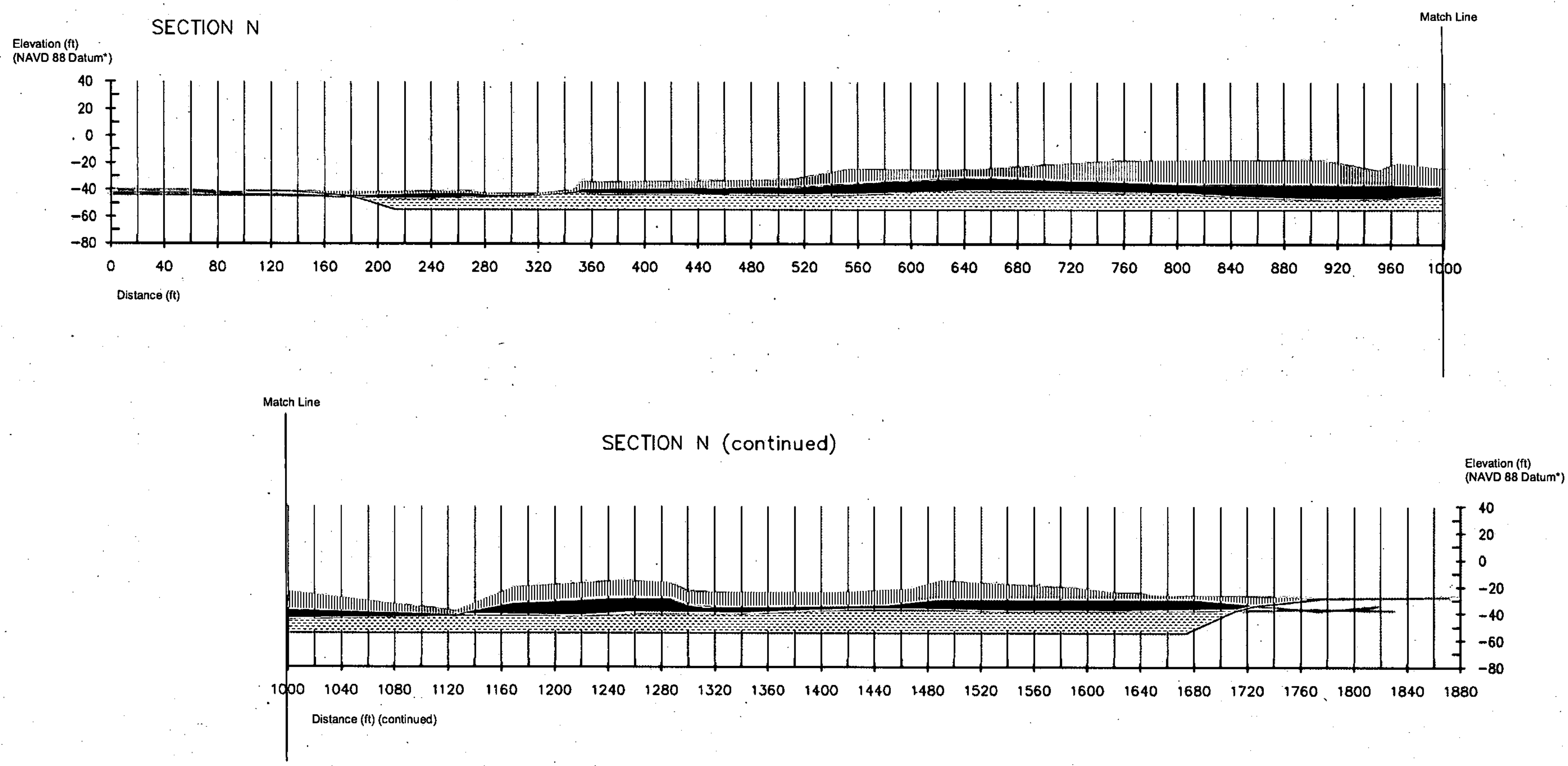
Legend:

- Grey Alluvial Sands, Silts & Clays
- Red-brown Glacial Gravel, Sands Silts & Clays
- Red-Brown Sedimentary Bedrock Shale or Sandstone

*Note: elevations shown above are in NAVD 88 Datum. Adjustment from NAVD 88 Datum to MLW Datum is 2.74' based on nearest NOAA tide and current station data at Bergen Point. Planned dredge depth is -52ft MLW shown above as -54.74ft NAVD88.

Figure 4 – Transverse Cross Sections

	NYCT Berth 4 - Dredging	
Drawn by: KCA	NYCT New York Container Terminal	Date: 09/11/08
Checked by: AM	DMJM HARRIS | AECOM	Job Number: 60004312.0019

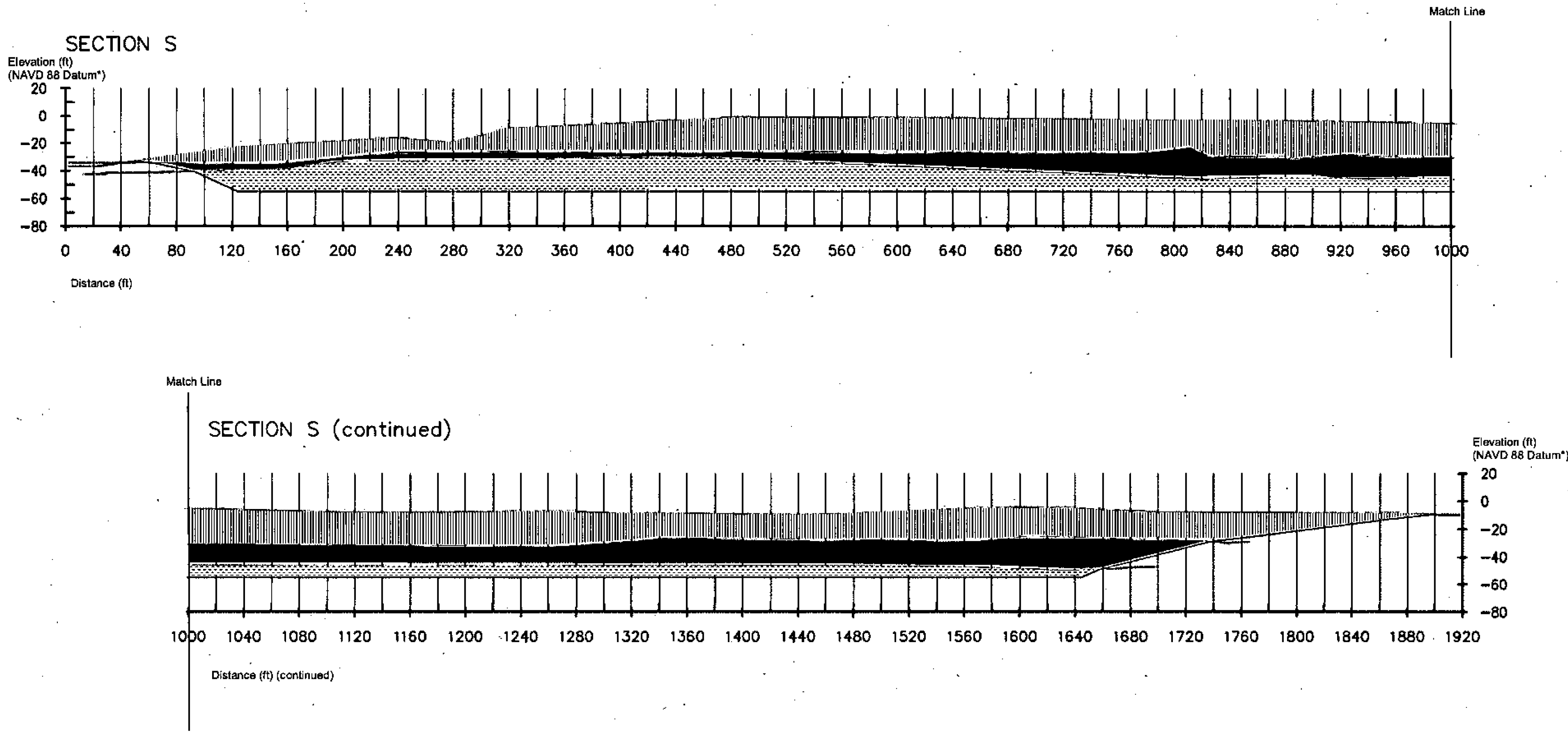


Legend:

- Grey Alluvial Sands, Silts & Clays
- Red-brown Glacial Gravel, Sands Silts & Clays
- Red-Brown Sedimentary Bedrock Shale or Sandstone

*Note: elevations shown above are in NAVD 88 Datum. Adjustment from NAVD 88 Datum to MLW Datum is 2.74' based on nearest NOAA tide and current station data at Bergen Point. Planned dredge depth is -52ft MLW shown above as -54.74ft NAVD88.

Figure 5 – North Cross Section		
	NYCT Berth 4 - Dredging	
Drawn by: KCA	NYCT New York Container Terminal	Date: 09/09/08
Checked by: AM	DMJM HARRIS | AECOM	Job Number: 60004312.0019



Legend:

- Grey Alluvial Sands, Silts & Clays
- Red-brown Glacial Gravel, Sands Silts & Clays
- Red-Brown Sedimentary Bedrock Shale or Sandstone

*Note: elevations shown above are in NAVD 88 Datum. Adjustment from NAVD 88 Datum to MLW Datum is 2.74' based on nearest NOAA tide and current station data at Bergen Point. Planned dredge depth is -52ft MLW shown above as -54.74ft NAVD88.

Figure 6 – South Cross Section		
	NYCT Berth 4 - Dredging	
Drawn by: KCA	NYCT NEW YORK CONTAINER TERMINAL	Date: 09/09/08
Checked by: AM	DMJM HARRIS | AECOM	Job Number: 60004312.0019