Appendix VIII – Sediment Sampling and Analysis Testing Results

1.0 Introduction

The project proponent is proposing to conduct maintenance dredging of the Cerritos Bahia Marina. This site is located in the northeast portion of Alamitos Bay in Long Beach, California (Figure 1). The project design consists of dredging a total of approximately ~~37,064~~ 26,857 cubic yards of material from the project site. This quantity of material includes ~~22,120~~ 11,086 cubic yards of material to a design depth of -8 feet (-2.4 meters) Mean Lower-Low Water (mllw) plus a -2 foot (-0.6m) over-depth allowance, which results in an additional ~~14,944~~ 15,781 cubic yards.

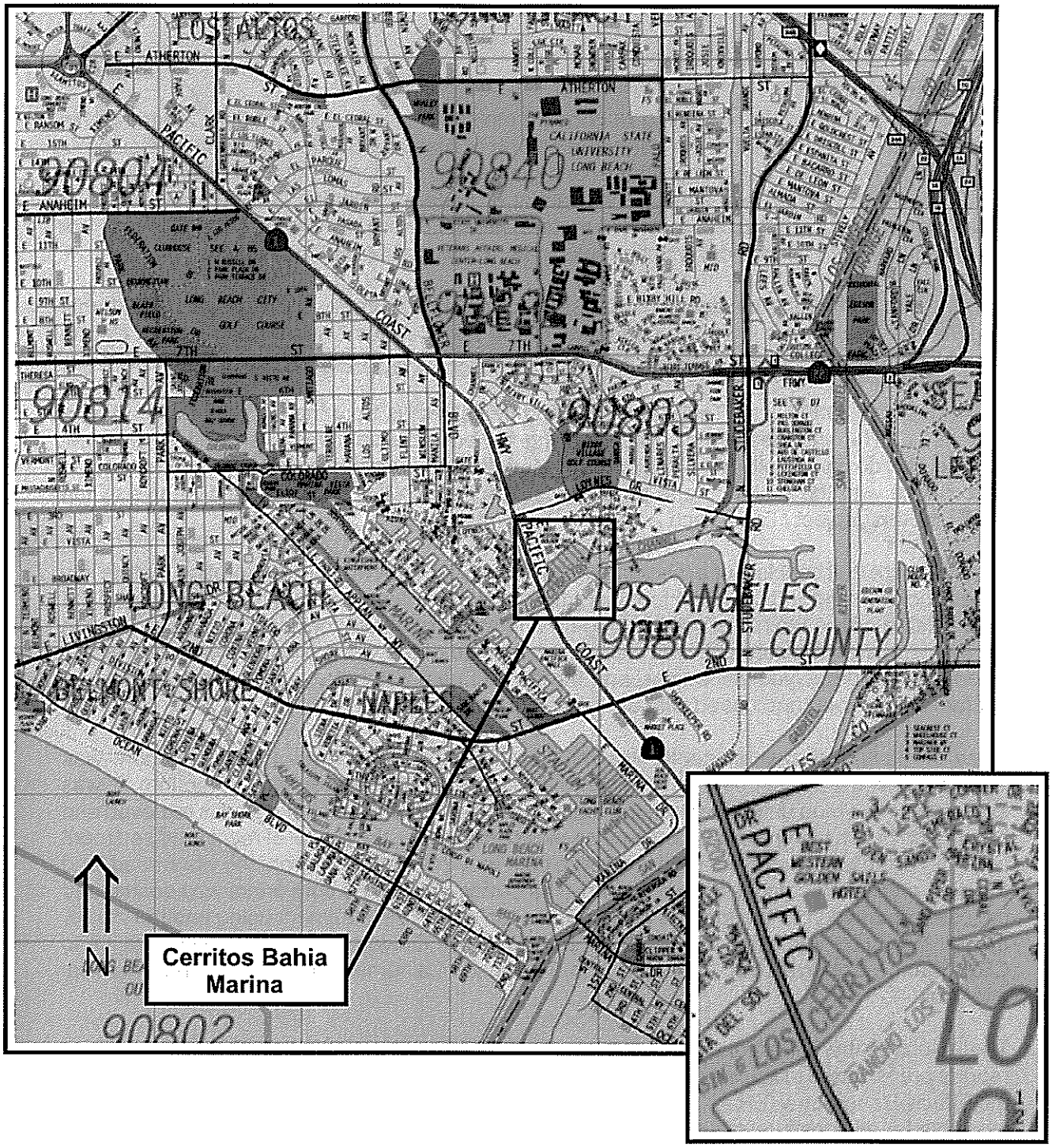
Cerritos Bahia Marina is located at 6289 East Pacific Coast Highway in Long Beach, California (Figure 1). The marina is on the north side of the Los Cerritos Channel and east of Pacific Coast Highway. The project area is approximately 7.8 acres in size (Figure 2).

On August 26, 2008, Tetra Tech, Inc. collected five samples from the Cerritos Bahia Marina (Figure 2). The samples were collected using a vibra-core sampler to a depth of two feet beyond the design depth of -8 feet mllw. All field and laboratory work was performed in accordance with the methods and procedures described in the Sampling and Analysis Plan (SAP) for this project (Tetra Tech 2006).

The vibracore unit consists of a vibrating unit (vibra-head) with two counter-rotating motors in a waterproof housing with an eight foot long, four inch diameter aluminum tube. The end of the tube is fitted with a stainless steel cutting tip and stainless steel core catcher. Prior to each deployment, the vibracore unit was washed, the inside of the vibracore tube was lined with a clean food-grade polyethylene liner, and the tip and core catcher were cleaned using a de-contaminating soap and rinsed with de-ionized water.

Once on station, the water depth was measured using a lead line and the vibracore was lowered from the vessel using the winch. Once the vibracore reached the bottom, it was lowered into the mud until it reached the desired depth at which point the unit was retrieved and brought on board using the winch. Once on board the vessel, the length of recovered sediment core inside the tube was measured. The core tube was then detached from the vibra-head, and the core cutter and catcher were removed. The bottom end of the core liners was sealed and the core removed from the top and sealed at the top end of the sediment using another zip tie. Immediately after sampling, the sediment samples were delivered in a cooler with blue ice to CRG Marine Laboratories, Inc. (CRG) in Torrance, California for physical and chemical analyses.

The results of the bulk sediment chemical analyses are presented below. Original chemistry reports are included in Appendix A. The chemical levels obtained in this study are compared to the Effects Range-Low (ER-L), and Effects Range-Median (ER-M). These effects levels are not available for all constituents analyzed.



Source: Thomas Bros. Maps

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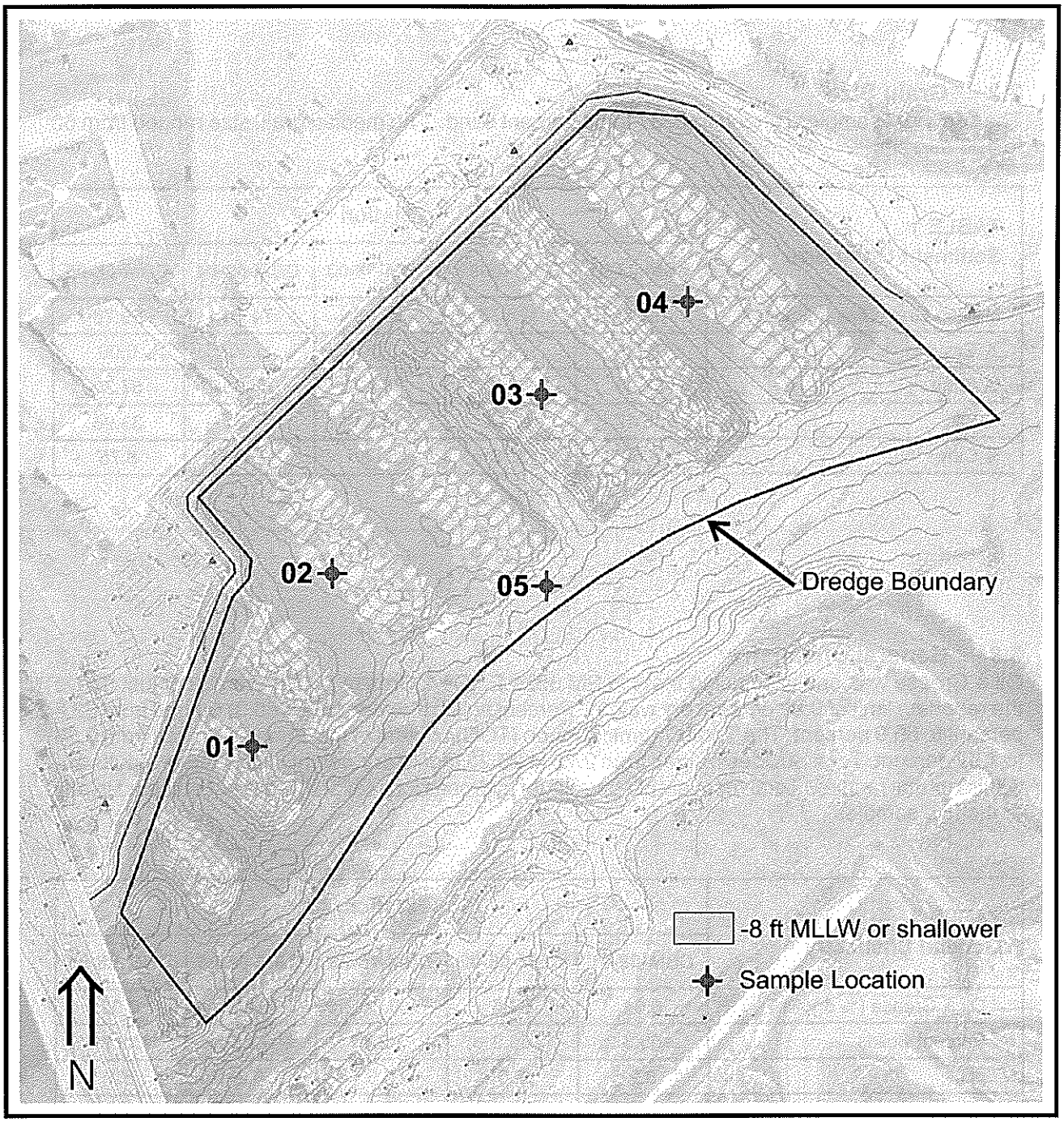
Site Vicinity Map

Cerritos Bahia Marina

Long Beach, California

FIGURE 1

August 2008



Project Area with Sampling Locations

FIGURE 2

Cerritos Bahia Marina
Long Beach, California

August 2008

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2.0 Grain Size

The sediment samples ranged from 57 to 80 percent sand. The median grain size ranged from 60 to 106 microns.

TABLE 1 Sediment Grain Size	Station				
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05
Median Grain Size (microns)	59.41	106.73	91.08	74.00	59.76
% Gravel	0.00	0.00	0.00	0.00	0.00
% Sand	58.93	80.10	70.42	65.65	57.30
% Silt	35.47	16.14	23.90	27.31	33.96
% Clay	5.60	3.76	5.68	7.05	8.75

3.0 General Chemistry

Oil & Grease was analyzed using Method SM 5520 E. Oil & Grease results were at or just above the reporting limit of 0.02 percent dry weight. Percent solids (Method EPA 160.3) ranged from 62.3 percent to 69.9 percent. The Total Organic Carbon (TOC) content of the samples ranged from 0.38 to 1.52 percent. Total Sulfides ranged from 2.76 to 25.23 mg/kg dry weight. All of these results are within normal ranges. Total recoverable petroleum hydrocarbons (TRPH) were not detected in any of the five samples.

TABLE 2 General Chemistry	Station				
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05
Oil & Grease (% dry wt.)	0.04	0.05	0.04	0.02	0.02
Percent Solids	63.3	66.9	62.3	73.5	69.9
pH	8.2	8.6	8.5	8.2	8.1
Total Nitrogen (mg/dry kg)	590.4	402.9	477.9	251.8	355.9
Total Organic Carbon (%)	1.52	0.72	0.96	0.38	0.7
Total Phosphorus-High Range (mg/dry kg)	691.86	729.85	898.44	598	759.33
Total Sulfides (mg/dry kg)	25.23	2.76	24.75	5.35	3.37
TRPH (% dry wt.)	"	"	"	"	"
" = not detected; TRPH Reporting Limit 0.02					

4.0 Soluble Threshold Limit Concentrations (STLC)

Soluble threshold limit concentrations (STLC) results correspond to concentrations in the leachate (mg/L). The results for both copper and lead were well below the California threshold limits of 25 mg/L and 5 mg/L respectively.

TABLE 3 Soluble Threshold Limit Concentrations (STLC)	Station					STLC
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05	
Copper (mg/L)	"	"	"	0.119	"	25
Lead (mg/L)	0.217	1.820	0.540	0.740	0.745	5
" = not detected						

5.0 Toxicity Characteristic Leaching Procedure (TCLP)

TCLP Toxicity Characteristic Leaching Procedure results for copper ranged from 0.0474 mg/L to 0.8537 mg/L, and from 0.083 mg/L to 0.247 mg/L for lead.

TABLE 4 Toxicity Characteristic Leaching Procedure (TCLP)	Station					TCLP
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05	
Copper (mg/L)	0.0474	0.0599	0.8537	0.0773	0.0906	
Lead (mg/L)	0.2124	0.2475	0.2316	0.0831	0.11	5

6.0 Trace Metals

Metal results (dry weight) are presented in Table 5. All of the analyzed metals were detected in all five samples. Arsenic, cadmium, copper, lead, nickel, and zinc levels exceeded the Effects Range-Low (ER-L) levels at three to five stations each. No metals were found to exceed the Effects Range-Median (ER-M) levels at any of the five stations.

TABLE 5 Metals (µg/dry g)	Station					Effects Range-Low (ER-L)	Effects Range-Median (ER-M)
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05		
Aluminum (Al)	16940	18000	21450	14160	28600		
Antimony (Sb)	0.86	0.95	1.09	0.64	0.61		
Arsenic (As)	**9.16**	**15.56**	**10.91**	4.15	4.53	8.2	70
Barium (Ba)	161.2	278.8	247.9	144.4	115.2		
Beryllium (Be)	0.599	0.790	0.726	0.411	0.562		
Cadmium (Cd)	0.849	0.739	0.866	0.204	0.292	1.2	9.6
Chromium (Cr)	40.35	60.27	42.46	26.26	31.52	81	370
Cobalt (Co)	12.53	19.99	14.44	10.08	10.39		
Copper (Cu)	**73.6**	**71.4**	**104.8**	**37.0**	**48.9**	34	270
Iron (Fe)	29510	29820	34570	25120	46920		
Lead (Pb)	**61.71**	**67.05**	**74.35**	17.56	26.85	46.7	218
Manganese (Mn)	351.6	363.6	437.0	343.7	551.0		
Mercury (Hg)	0.15	0.15	0.17	0.05	0.10	0.15	0.71
Molybdenum (Mo)	2.232	1.689	1.631	0.698	0.936		
Nickel (Ni)	**27.11**	**39.1**	**29.9**	18.9	**21.5**	20.9	51.6
Selenium (Se)	0.287	0.245	0.201	0.093	0.192		
Silver (Ag)	0.204	0.204	0.303	0.219	0.231	1.00	3.7
Strontium (Sr)	97.29	74.33	82.90	37.27	83.45		
Thallium (Tl)	0.251	0.257	0.245	0.163	0.215		
Tin (Sn)	13.6	2.6	3.2	1.3	1.7		
Titanium (Ti)	1462	1449	1757	1566	2554		
Vanadium (V)	63.2	109.4	70.1	49.5	55.6		
Zinc (Zn)	**167.2**	**191.9**	**167.9**	96.0	**113.4**	150	410

Bold: ≥ER-L (Effects Range-Low reported by Long, et al. 1995)

All values presented as dry weight

5.0 Pesticides

The pesticides detected included DDTs (2,4'-DDD, 2,4'-DDE, 4,4'-DDD, 4,4'-DDE), Chlordanes (Chlordane-alpha, Chlordane-gamma, cis-Nonachlor, and trans-Nonachlor) and Dicofol.

TABLE 6 Pesticides (ng/dry g)	Station					Effects Range-Low (ER-L)	Effects Range-Median (ER-M)
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05		
2,4'-DDD	**5.3**	**18.5**	**20.6**	"	"	2.0	20
2,4'-DDE	**J 4.4**	**7.1**	**8.5**	"	"	2.2	27
2,4'-DDT	"	"	"	"	"	1.0	7
4,4'-DDD	**18.0**	**63.4**	**73.4**	J 1.5	"	2.0	20
4,4'-DDE	**40.5**	**61.9**	**54.2**	**15.8**	**20.4**	2.2	27
4,4'-DDT	"	"	"	"	"	1.0	7
Aldrin	"	"	"	"	"		
BHC-alpha	"	"	"	"	"		
BHC-beta	"	"	"	"	"		
BHC-delta	"	"	"	"	"		
BHC-gamma	"	"	"	"	"		
Chlordane-alpha	J 1.5	J 2.4	J 2.6	J 1.5	J 1.0		
Chlordane-gamma	J 2.3	J 3.0	J 3.6	"	"		
cis-Nonachlor	J 1.4	J 1.1	J 1.9	"	"		
trans-Nonachlor	"	J 1.2	J 1.3	"	"		
Oxychlordane	"	"	"	"	"		
DCPA (Dacthal)	"	"	"	"	"		
Dicofol	19.6	60.8	49.5	"	"		
Dieldrin	"	"	"	"	"	0.02	8.00
Endosulfan Sulfate	"	"	"	"	"		
Endosulfan-I	"	"	"	"	"		
Endosulfan-II	"	"	"	"	"		
Endrin	"	"	"	"	"		
Endrin Aldehyde	"	"	"	"	"		
Endrin Ketone	"	"	"	"	"		
Heptachlor	"	"	"	"	"		
Heptachlor Epoxide	"	"	"	"	"		
Methoxychlor	"	"	"	"	"		
Mirex	"	"	"	"	"		
Perthane	"	"	"	"	"		
Toxaphene	"	"	"	"	"		

" = not detected

Bold: ≤ER-L (Effects Range-Low reported by Long, et al. 1995)

Bold: ≤ER-M (Effects Range-Median reported by Long, et al. 1995)

J = Estimated value below the reporting limit

All values presented as dry weight

6.0 Polynuclear Aromatic Hydrocarbons (PAHs)

PAH results are presented in Table 7. PAHs are typical components of asphalts, fuels, oils, and greases. Various PAHs were detected at low levels in all five samples. No detected PAH levels exceeded ER-L levels in any of the samples.

TABLE 7 Polynuclear Aromatic Hydrocarbons (ng/dry g)	Station					Effects Range-Low (ER-L)	Effects Range-Median (ER-M)
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05		
1-Methylnaphthalene	J 1.3	J 2.5	J 2.2	"	"		
1-Methylphenanthrene	J 2.7	J 3.5	J 3.5	J 1.3	J 2.1		
2,3,5-Trimethylnaphthalene	"	J 1.6	J 1	"	"		
2,6-Dimethylnaphthalene	J 4.9	11.6	7.5	J 1.6	J 1.7		
2-Methylnaphthalene	J 3.9	7.4	6	J 1.6	J 1.4		
Acenaphthene	"	"	J 1.2	"	"	16	500
Acenaphthylene	J 1.6	J 2	J 2.3	J 1.1	J 1	44	640
Anthracene	7.6	10.5	10.2	J 2.6	J 3.5	85.3	1100
Benz[a]anthracene	24.3	18.9	22.1	11.5	17.4	261	1600
Benzo[a]pyrene	38.4	34.5	33	17.6	23	430	1600
Benzo[b]fluoranthene	56.6	43.1	50	25.3	32.3		
Benzo[e]pyrene	49.3	38.5	50.1	23.7	26.1		
Benzo[g,h,i]perylene	46.2	32.4	38	25.9	30.2		
Benzo[k]fluoranthene	23.8	21.5	22.6	11.2	13.7		
Biphenyl	J 1.0	1.2	"	"	"		
Chrysene	38.7	29.2	39.6	18.1	25.2	384	2800
Dibenz[a,h]anthracene	10.4	8.8	9.9	7.6	8.1	63.4	260
Dibenzothiophene	J 2.9	J 2.2	J 3.3	J 1.6	J 2.1		
Fluoranthene	48.9	35.3	40.4	20.6	28.7	600	5100
Fluorene	J 1.1	J 2.4	J 2	"	J 1.1	19	540
Indeno[1,2,3-c,d]pyrene	33.8	30.3	29.5	18	24.9		
Naphthalene	J 2.3	J 2.4	J 2.5	J 1.4	J 1.1	160	2100
Perylene	16.5	13	31.2	6.6	9.6		
Phenanthrene	12.5	15.7	15.6	7	10.6	240	1500
Pyrene	61	53.3	83.8	26.9	34.1	665	2600

J = Estimated value below the reporting limit

" = not detected

All values presented as dry weight

7.0 Polychlorinated Biphenyls (PCBs)

PCBs results are presented in Table 8. PCBs were detected in all five samples. Aroclor 1254 was detected at levels ranging from 12 (ng/dry kg) to 154 (ng/dry kg) in four of the five samples. The levels of each of the Congener-based PCBs were relatively low with most values below the reporting limit (5 ng/dry kg).

TABLE 8 Polychlorinated biphenyls (ng/dry g)	Station				
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05
Aroclor 1016	"	"	"	"	"
Aroclor 1221	"	"	"	"	"
Aroclor 1232	"	"	"	"	"
Aroclor 1242	"	"	"	"	"
Aroclor 1248	"	"	"	"	"
Aroclor 1254	87	40	154	"	J 12
Aroclor 1260	"	"	"	"	"
PCB044	J 3.3	"	5.8	"	J 1.9
PCB049	6.1	"	7.8	"	J 2.1
PCB052	J 4.1	J 2.6	7.5	"	"
PCB066	J 3.8	J 1.7	J 4.6	J 1.0	J 1.2
PCB070	5.5	J 2.0	7.3	"	J 1.2
PCB087	J 3.2	"	5.0	"	"
PCB095	8.7	5.0	16.1	"	J 1.3
PCB097	J 4.8	"	9.3	"	"
PCB099	6.2	J 4.0	10.0	J 1.5	J 1.5
PCB101	13.6	8.2	25.0	J 1.9	J 2.1
PCB110	10.7	J 4.9	18.9	"	J 1.5
PCB118	9.1	"	13.7	"	"
PCB138	8.9	"	20.5	"	"
PCB149	6.2	5.0	14.2	"	J 1.9
PCB151	J 2.9	"	J 3.2	"	J 1.2
PCB153	5.9	J 3.9	14.1	"	J 1.8
PCB168+132	J 2.1	"	J 4.4	"	"
PCB174	J 2.7	J 3.3	J 3.6	"	"
PCB177	J 1.8	J 1.3	J 4.2	"	"
PCB180	J 2.7	J 3.0	J 4.3	"	"
PCB183	J 1.6	J 1.3	J 1.6	"	J 1.6
PCB187	J 2.7	J 2.8	5.0	"	J 1.8
PCB201	J 4.5	"	J 4.9	"	"
PCB203	J 1.8	"	6.9	"	"
PCB206	J 1.4	"	"	"	"

" = not detected; J = Estimated value below the reporting limit; All values presented as dry weight

The following Congener-based PCBs were analyzed and not detected: PCB003, PCB008, PCB018, PCB028, PCB031, PCB033, PCB037, PCB056/060, PCB074, PCB077, PCB081, PCB105, PCB114, PCB119, PCB123, PCB126, PCB128, PCB141, PCB156, PCB157, PCB158, PCB167, PCB169, PCB170, PCB189, PCB194, PCB195, PCB200, and PCB209.

8.0 Phthalates

The phthalate bis(2-Ethylhexyl) phthalate was detected in all five samples. Butylbenzyl phthalate was below the reporting limit at one station and not detected at the remaining four stations.

TABLE 9 Phthalates (ng/dry g)	Station				
	CBM-08-01	CBM-08-02	CBM-08-03	CBM-08-04	CBM-08-05
bis(2-Ethylhexyl) Phthalate	2789	1244	394	385	418
Butylbenzyl Phthalate	J 47	"	"	J 39	"
Diethyl Phthalate	"	"	"	"	"
Dimethyl Phthalate	"	"	"	"	"
Di-n-butyl Phthalate	"	"	"	"	"
Di-n-octyl Phthalate	"	"	"	"	"

J = Estimated value below the reporting limit

" = not detected

All values presented as dry weight

9.0 Phenols & Organotins

Phenols and were not detected in any of the five samples. Only the Organotins Dibutyltin and Tributyltin were detected. Dibutyltin was found at two stations and Tributyltin was found at all five stations.

TABLE 10	Station					
Phenols (ng/dry g)	**CBM-08-01**	**CBM-08-02**	**CBM-08-03**	**CBM-08-04**	**CBM-08-05**	**Reporting Limit**
2,4,6-Trichlorophenol	"	"	"	"	"	100
2,4-Dichlorophenol	"	"	"	"	"	100
2,4-Dimethylphenol	"	"	"	"	"	200
2,4-Dinitrophenol	"	"	"	"	"	200
2-Chlorophenol	"	"	"	"	"	100
2-Methyl-4,6-dinitrophenol	"	"	"	"	"	200
2-Nitrophenol	"	"	"	"	"	200
4-Chloro-3-methylphenol	"	"	"	"	"	200
4-Nitrophenol	"	"	"	"	"	200
Pentachlorophenol	"	"	"	"	"	100
Phenol	"	"	"	"	"	200
Organotins (ng/dry g)	**CBM-08-01**	**CBM-08-02**	**CBM-08-03**	**CBM-08-04**	**CBM-08-05**	**Reporting Limit**
Dibutyltin	12.1	"	54.9	"	"	3
Monobutyltin	"	"	"	"	"	3
Tetrabutyltin	"	"	"	"	"	3
Tributyltin	16.1	7.8	385.9	5.3	7.3	3
" = not detected						