Appendices

Appendix A.

Quality Assurance Review of the Project Data.

QA/QC Analysis Checklist for
SEDIMENT CHEMISTRY ANALYSIS

GRANT/IAG NUMBER: GL-97520701-01
PROJECT NAME: Preliminary Investigation of Sediment Contamination in Muskegon Lake
REVIEWER: Richard Rediske
DATE: 2-26-02

1. What sediment chemistry data has been collected (CHECK ALL THAT APPLY)?

Total Metals ___X__ PCBs _____ pH _____ TOC _X____
Dioxins/Furans _____ PAHs ___X__Pesticides _____ DO _____ AVS _____
SEM Metals _____ Particle Size _X____ Other Semivolatile Organics

2. Were the target detection limits met for each parameter?

YES ____
NO X (UNACCEPTABLE) (Two samples did not achieve target detection limits for organics)

3. Were the Method Blanks less than the established MDL for each parameter?

YES X
NO _____ (UNACCEPTABLE)

4. Did the results of Field Duplicate Analysis vary by less than the % RPD specified in the QAPP?

YES X
NO _____ (UNACCEPTABLE)

5. Did the results of the Field Replicates Analysis vary by less than the % RPD specified in the QAPP?

YES X Field replicates were not required in the QAPP
NO _____ (UNACCEPTABLE)

6. Did the surrogate spike recoveries meet the limits set forth in the QAPP?

YES X
NO _____ (UNACCEPTABLE)

7. Did the MS/MSD recoveries meet the limits set forth in the QAPP?

YES _____
NO X (UNACCEPTABLE) (One organic and one metals QC failure. Description provided below)

8. Did the RPD (%) of the MS/MSD sample set meet the limits set forth in the QAPP?

YES _____
NO X (UNACCEPTABLE) (ONE ORGANIC AND ONE METALS QC FAILURE. DESCRIPTION PROVIDED BELOW)

9. Did the initial calibration verification standards meet the requirements set forth in the QAPP?

YES X
NO _____ (UNACCEPTABLE)

10.. Were any level of contaminants detected above the MDL for the trip blanks and storage blanks?

YES _____ (UNACCEPTABLE)
NO X Trip and Storage blanks were not required in the QAPP

11. Did all required analysis take place within the required holding time protocols set forth in the QAPP?

YES X
NO _____ (UNACCEPTABLE)

12. Did the laboratory duplicates vary by less than the % RPD specified in the QAPP?

YES X
NO _____ (UNACCEPTABLE)

13. Are measured dry weight contaminant concentrations reported? (Note: Conversion from wet weight to dry weight concentration may occur ONLY if data on moisture or TOC are provided. Nominal concentrations are unacceptable.)

YES X
NO _____ (UNACCEPTABLE)

14. Please provide details for all of the "UNACCEPTABLE" marked above. Include details on the specific analytes affected by any QA/QC discrepancies, and recommendations regarding usability of data.

Two samples had very low % solids that resulted in raising the detection limits for semivolatiles. The results are listed in the data tables. A larger sample volume should be used at these locations if additional assessments are made. Target detection limits were achieved on all other samples.

Sample from core 16 bottom had MS/MSD results for acenapthene and pyrene as follows:

	Initial	Spiked Amount	MS Result	MSD Result	% Recovery	% RPD
Acenapthene	5.7 mg/kg	2.1 mg/kg	18.9 mg/kg	16.4 mg/kg	152/510	108
Pyrene	4.6 mg/kg	2.1 mg/kg	8.5 mg/kg	16.8 mg/kg	186/581	103

LCS results for extraction batch were within control limits. Results for PAH compounds in this sample were qualified as estimated. Spiked concentrations were low considering the initial concentration and this will account for some of the variability. The sample also contained flecks of coal tar that made it difficult to obtain a homogeneous sample. The lack of reproducibility and high recoveries was due to sample matrix and not analytical failure. The data was still used in the report and discussion since this was a preliminary assessment. Higher spiking concentrations should be used in subsequent surveys.

Sample from core 1 bottom had MS/MSD results for arsenic with 0% recovery. The initial concentration was 10.2 mg/kg and the spiked amount was 1 mg/kg. LCS results were 95%/96% recovery. Since the sample was spiked at a level 10x below the initial concentration, QC failure was not attributed sample matrix. All other arsenic matrix spikes were within QAPP limits.

MS/MSD results were within QAPP limits for the other parameters and samples.

QA/QC Analysis Checklist for
ACUTE AND CHRONIC WHOLE SEDIMENT TOXICITY TESTS
(10-day*C. tentans* and 10-day or 28-day *H. azteca*)

GRANT/IAG NUMBER: GL-97520701-01
PROJECT NAME: Preliminary Investigation of Sediment Contamination in Muskegon Lake
REVIEWER: Richard Rediske
DATE: 2-26-02

1. Did toxicity tests employ appropriate procedures? [ASTM: E1367, E1611, E1706, USEPA (2000)]

YES X
NO _____ (UNACCEPTABLE)

2. Does sample storage time exceed the allowable storage time specified in the QAPP?

Allowable Storage Days Specified in QAPP 45
Number of Storage Days Prior to Testing 14 DYAS AND 30 DAYS

YES _____ (UNACCEPTABLE)
NO X

3. Was the age for H. azteca organisms between 7- to 14-days at the start of the test with an age range less than 2-days?

YES X
NO _____ (UNACCEPTABLE)

4A. Were all of the C. tentans organisms second- to third-stage larvae with at least 50% at the third instar?

YES X
NO _____ (UNACCEPTABLE)

4B. How was the developmental stage of the C. tentans larvae measured?

Head Capsule Width _____ (See Table 10.2 of EPA/600/R-99/064, March 2000)
Length X (Should fall between 4 mm to 6 mm)
Weight _____ (Should fall between 0.08 to 0.23 mg/individual)

5. Do flow rates through the different test chambers differ by more than 10% at any particular time during the test?

YES _____ (UNACCEPTABLE)
NO X (QAPP REQUIRED 2X DAILY RENEWAL OF OVERLYING WATER INSTEAD OF FLOW THROUGH)

6. Did Dissolved Oxygen remain above 2.5 mg/L?

YES X
NO _____ (Provide Explanation at end of Checklist)

7. Does daily mean Temperature remain at 23 ± 1^{o}C?

YES X
NO _____ (UNACCEPTABLE)

8. Does the instantaneous Temperature remain in the range of 23 ± 3EC?

YES X
NO _____ (UNACCEPTABLE)

9. Do the Ranges of for Hardness, Alkalinity, pH, and Ammonia fluctuate more than 50% from the mean?

Maximum % Difference:

DO	30%	Alk	22%
pH	6%	NH_3	50%

YES _____ (UNACCEPTABLE)
NO _____

10. Was the Ammonia concentration ever greater than 20 mg/L?

YES _____ (See EPA/600/R-99/064, March 2000 to determine if ammonia contributed to toxicity of H. azteca.)
NO X

11. Was the Ammonia concentration greater than 82 mg/L?

YES _____ (See EPA/600/R-99/064, March 2000 to determine if ammonia contributed to toxicity of C. tentans)
NO X

12. Was the Mean Control Survival in the *H. azteca* Control Sediments greater than or equal to 80%?

YES X
NO _____ (UNACCEPTABLE)

13. Was the Mean Control Survival in the *C. tentans* Control Sediments greater than or eqaul to 70%?

YES X
NO _____ (UNACCEPTABLE)

14. Was the mean weight per surviving C. tentans control organism greater than 0.48 mg (ash-free dry weight)?

YES   X QAPP used dry weight of 0.8 mg/ individual. This was achieved.
NO _____ (UNACCEPTABLE)

15. Was the overlying water renewed at a rate of 2 volumes per day?

YES   X
NO _____ (UNACCEPTABLE)

16. Please provide details for all of the "UNACCEPTABLE" responses marked above. Include details on the specific results that potentially may be affected by any QA/QC discrepancies, and recommendations regarding usability of data.

All discrepancies were related to following methods approved in the project QAPP.

Appendix B.

Results Physical Analyses On Muskegon Lake Sediments, October 1999

TABLE B-1. RESULTS OF GRAIN SIZE, TOC, AND % SOLIDS ANALYSES ON MUSKEGON LAKE SEDIMENT SAMPLES. OCTOBER 1999.

Sample ID	<2000 Weight %	1000-2000 Weight %	850-1000 Weight %	500-850 Weight %	125-500 Weight %	63-125 Weight %	<63 Weight %	Solids Weight %	TOC Weight %
M-1-top	0.0	0.3	0.1	0.8	6.4	6.6	86	16	4.2
M-1 mid	0.3	0.8	0.4	3.7	35	3.5	56	30	2.1
M-1 bot	1.9	1.7	0.7	5.1	70	1.1	19	77	<0.5
M-3 top	1.0	0.1	0.0	0.2	5.2	9.0	85	16	5.1
M-3-mid	0.1	0.1	0.0	0.3	3.9	5.4	90	17	3.9
M-3 3-4'	0.1	0.1	0.1	0.4	9.9	6.8	83	19	2.6
M-3 4-5'	0.1	0.1	0.1	1.1	61	3.5	34	45	1.1
M-4 top	4.6	0.6	0.2	0.7	45	7.5	41	49	1.2
M-4 bot	2.7	0.5	0.1	0.9	67	3.9	25	55	<0.5
M-8 top	0.0	0.1	0.0	0.3	14	0.2	86	20	4.7
M-8-2	0.7	0.2	0.1	0.9	17	4.6	76	28	3.4
M-8-3	0.0	0.0	0.0	9.1	0.4	7.8	83	31	5.2
M-8-bot	0.8	0.6	0.3	3.2	36	16	43	58	<0.5
M-9 top	2.4	0.2	0.5	10	65	1.9	20	89	<0.5
M-9 bot	3.7	2.1	0.8	6.0	65	3.5	19	77	<0.5
M-10 top	0.5	0.2	0.1	0.4	10	12	76	28	1.5
M-10 mid	6.6	4.1	1.8	7.2	46	3.2	32	54	<0.5
M-10 bot	0.2	0.4	0.2	2.6	79	2.4	15	83	<0.5
M-11 top	0.1	0.1	0.1	0.2	3.2	8.0	88	24	4.3
M-11 2	0.1	0.0	0.0	0.3	6.1	12	81	29	3.2
M-11 3	0.3	0.1	0.0	0.2	5.9	11	82	34	1.3
M-11 bot	0.5	0.1	0.1	0.4	8.5	7.5	83	34	<0.5
M-11D top	0.0	0.1	0.0	0.1	4.6	9.2	86	24	4
M-11D 2	0.0	0.0	0.0	0.6	5.7	8.6	85	29	3.1
M-11D 3	0.0	0.0	0.0	0.2	3.9	8.9	87	34	1.8
M-11D bot	0.1	0.1	0.0	0.2	6.8	9.1	84	37	<0.5
M-12 top	3.4	1.3	0.7	8.4	65	4.7	17	91	<0.5
M-12 mid	0.6	0.5	0.3	2.1	49	15	33	68	<0.5
M-12 bot	0.3	0.3	0.2	0.7	15	9.7	74	50	<0.5
M-13 top	0.2	0.0	0.0	0.1	3.8	9.3	87	34	2.7
M-13 2	0.0	0.0	0.0	0.1	4.7	12	83	37	1.9
M-13 3	0.1	0.1	0.0	0.1	4.9	9.2	86	39	2.6
M-13 bot	2.8	1.1	0.2	1.0	20	8.4	67	44	4.0

TABLE B-1 (CONTINUED). RESULTS OF GRAIN SIZE, TOC, AND % SOLIDS ANALYSES ON MUSKEGON LAKE SEDIMENT SAMPLES. OCTOBER 1999.

Sample ID	<2000 Weight %	1000-2000 Weight %	850-1000 Weight %	500-850 Weight %	125-500 Weight %	63-125 Weight %	<63 Weight %	Solids Weight %	TOC Weight %
M-14 top	0.4	0.1	0.1	0.2	8.5	13	78	28	2.4
M-14 2	0.9	0.1	0.0	0.3	23	16	60	46	1.5
M-14 3	0.3	0.1	0.1	0.3	23	16	60	45	1.1
M-14 bot	0.0	0.4	0.1	0.4	6.0	9.2	84	38	<0.5
M-15 top	0.0	0.1	0.0	0.1	2.1	3.7	94	18	2.2
M-15 mid	0.0	0.0	0.0	0.3	9.8	7.5	82	28	1.6
M-15 Bot	0.4	0.2	0.0	1.3	85	1.3	11	88	<0.5
M-16 top	9.0	1.8	0.4	2.2	61	6.8	18	78	0.8
M-16 mid	2.6	0.3	0.3	3.0	73	0.8	20	81	<0.5
M-16A top	2.9	0.5	0.3	1.2	34	8.6	53	39	1.9
M-16A bot	7.8	4.0	1.7	11	64	1.4	10	88	<0.5
M-1P	0.9	0.0	-0.1	0.2	6.2	2.1	91	15	4.5
M-3P	0.5	0.2	0.0	0.2	6.9	9.0	83	18	5.5
M-4P	5.6	0.5	0.1	1.6	73	4.2	15	72	<0.5
M-5P	0.2	0.1	0.0	0.3	7.2	11	81	22	4.1
M-6P	0.3	0.2	0.0	0.2	11	13	75	23	5.3
M-7P	0.9	0.1	0.0	0.2	7.9	15	76	20	8.0
M-8P	0.0	0.0	0.0	0.3	6.4	10	83	16	5.2
M-8PD	0.0	0.1	0.0	0.2	4.5	7.7	87	17	4.5
M-9P	1.3	1.1	0.6	5.9	74	2.2	15	66	<0.5
M-10P	0.5	0.0	-0.1	0.1	3.2	7.5	89	22	1.1
M-11P	0.0	0.1	-0.1	0.0	2.9	8.4	89	23	4.3
M-12P	17	2.7	1.2	8.9	53	1.7	15	85	<0.5
M-13P	0.9	0.2	0.1	0.3	7.1	13	79	25	4.2
M-14P	0.9	0.2	0.1	0.2	6.5	12	81	25	2.3
M-15P	2.9	0.1	0.0	0.1	9.7	4.5	83	19	2.5
M-16AP	8.8	1.8	0.3	1.8	67	9.6	11	65	1.4

TABLE B-2. TOC MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RESULTS FOR MUSKEGON LAKE SEDIMENT SAMPLES. OCTOBER 1999.

Matrix Spike Data

Sample ID	Sample Conc. mg/l	MS Conc. mg/l	MS Spike Conc. mg/l	% Recovery
M-1 Top	4.2	15.32	14	79.4
M-10 Top	1.5	15.18	13.12	104.3
M-11 Bot	0	20.95	18.24	114.9
M-13 3	2.6	19.95	16.32	106.3
M-15 P	2.5	21.85	17.72	109.2
M-16 AP	1.4	15.32	13.64	102.1

Sample ID	Sample Conc. mg/l	MSD Conc mg/l	MSD Spike Conc. mg/l	% Recovery	RPD
M-1 Top	4.2	11.9	12.4	62.1	24
M-10 Top	1.5	16.4	15.32	97.3	7
M-11 Bot	0	21.35	17.24	123.8	8
M-13 3	2.6	20	15.88	109.6	3
M-15 P	2.5	20.02	15.84	110.6	1
M-16 AP	1.4	15.16	13.36	103.0	1

TABLE B-3. QUALITY CONTROL RESULTS FOR GRAIN SIZE ANALYSES ON MUSKEGON LAKE SEDIMENT SAMPLES. OCTOBER 1999.

Sample ID	>2000 *u*m Weight %	200-1000 *u*m Weight%	100-850 *u*m Weight %	850-500 *u*m Weight %	500-125 *u*m Weight %	125-63 *u*m Weight %	<63 *u*m Weight %
M - 1P	1	0	0	0	6	2	91
M - 1P Dup	0	0	0	0	8	6	86
M - 16 Mid	3	0	0	3	73	1	20
M - 16 Mid Dup	3	1	0	2	75	1	18
M - 13 Top	0	0	0	0	4	9	87
M - 13 Top Dup	0	0	0	0	4	11	85
M - 8 4	1	1	0	3	36	16	43
M - 8 4 Dup	1	1	0	3	37	17	41
M - 1 Top	0	0	0	1	6	7	86
M - 1 Top Dup	0	0	0	0	8	8	84
M - 10 Top	1	0	0	0	10	12	76
M - 10 top Dup	0	0	0	0	11	10	79
M - 14 3	0	0	0	0	23	16	60
M - 14 3 Dup	3	0	0	0	27	13	57

Appendix C.

Organic Analyses On Muskegon Lake Sediments, October 1999.

TABLE C-1. RESULTS OF SEMIVOLATILE ORGANIC ANALYSES ON MUSKEGON LAKE SEDIMENTS, OCTOBER 1999.

Station	M1	M1	M1	M3	M3	M3	M3	M4	M4	M8	M8	M8
Core Section	Top	Middle	Bottom	Top	Middle	3-4	4-5	Top	Bottom	Top	2	3
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
bis(2-Chloro-ethyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,3-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,4-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzyl alcohol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-isopropyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3/4-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitroso-di-n-propylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-ethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Nitro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Isophorone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dimethyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-ethoxy)methane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzoic acid	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2,4-Trichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-aniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-1,3-b<0.33tadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-3-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-cyclopentadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,6-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,5-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dimethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaph-thylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,6-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Diethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chlorophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4,6-Dinitro-2-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitrosodi-phenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Bromophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pentachloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Carbazole	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-butylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Buylbenzyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Chrysene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3,3'-Dichloro-benzidine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Ethylhexyl)-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-octylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(b)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(k)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Indeno(1,2,3-cd)pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzo(a,h)anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(g,h,i)perylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

TABLE C-1 (CONTINUED). RESULTS OF SEMIVOLATILE ORGANIC ANALYSES ON MUSKEGON LAKE SEDIMENTS, OCTOBER 1999.

Station	M8	M9	M9	M10	M10	M10	M11	M11	M11	M11	M11D	M11D
Core Section	4	Top	Bottom	Top	Middle	Bottom	Top	2	3	Bottom	Top	2
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
bis(2-Chloro-ethyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,3-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,4-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzyl alcohol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-isopropyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3/4-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitroso-di-n-propylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-ethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Nitro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Isophorone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dimethyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-ethoxy)methane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzoic acid	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2,4-Trichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-aniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-1,3-b<0.33tadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-3-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-cyclopentadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,6-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,5-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dimethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaph-thylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,6-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Diethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chlorophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4,6-Dinitro-2-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitrosodi-phenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Bromophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pentachloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Carbazole	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-butylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluoranthene	<0.33	<0.33	<0.33	<0.33	0.34	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.66
Pyrene	<0.33	<0.33	<0.33	1.9	0.47	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.76
Buylbenzyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-anthracene	<0.33	<0.33	<0.33	1.7	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Chrysene	<0.33	<0.33	<0.33	1.8	0.36	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3,3'-Dichloro-benzidine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Ethylhexyl)-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-octylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(b)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(k)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-pyrene	<0.33	<0.33	<0.33	2.2	0.45	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Indeno(1,2,3-cd)pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzo(a,h)anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(g,h,i)perylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

TABLE C-1 (CONTINUED). RESULTS OF SEMIVOLATILE ORGANIC ANALYSES ON MUSKEGON LAKE SEDIMENTS, OCTOBER 1999.

Station	M11D	M11D	M12	M12	M12	M13	M13	M13	M13	M14	M14	M14
Core Section	3	Bottom	Top	Middle	Bottom	Top	2	3	Bottom	Top	2	3
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
bis(2-Chloro-ethyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,3-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,4-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzyl alcohol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-isopropyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3/4-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitroso-di-n-propylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-ethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Nitro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Isophorone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dimethyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-ethoxy)methane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzoic acid	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2,4-Trichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-aniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-1,3-b<0.33tadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-3-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-cyclopentadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,6-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,5-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dimethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaph-thylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,6-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Diethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chlorophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4,6-Dinitro-2-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitrosodi-phenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Bromophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pentachloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Carbazole	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-butylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pyrene	<0.33	1.4	<0.33	<0.33	1.4	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Buylbenzyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Chrysene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3,3'-Dichloro-benzidine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Ethylhexyl)-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-octylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(b)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(k)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Indeno(1,2,3-cd)pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzo(a,h)anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(g,h,i)perylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

TABLE C-1 (CONTINUED). RESULTS OF SEMIVOLATILE ORGANIC ANALYSES ON MUSKEGON LAKE SEDIMENTS, OCTOBER 1999.

Station	M14	M15	M15	M15	M16A	M16A
Core Section	Bottom	Top	Middle	Bottom	Top	Bottom
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
bis(2-Chloro-ethyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,3-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,4-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzyl alcohol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-isopropyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3/4-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitroso-di-n-propylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-ethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Nitro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Isophorone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dimethyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-ethoxy)methane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzoic acid	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2,4-Trichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Naphthalene	<0.33	<0.33	<0.33	<0.33	320	1.5
4-Chloro-aniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-1,3-b<0.33tadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-3-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-naphthalene	<0.33	<0.33	<0.33	<0.33	450	3.3
Hexachloro-cyclopentadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,6-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,5-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dimethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaph-thylene	<0.33	<0.33	<0.33	<0.33	39	0.60
2,6-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaphthene	<0.33	<0.33	<0.33	<0.33	390	5.7
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	40	0.53
2,4-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Diethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluorene	<0.33	<0.33	<0.33	<0.33	220	3.1
4-Chlorophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4,6-Dinitro-2-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitrosodi-phenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Bromophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pentachloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenanthrene	<0.33	<0.33	<0.33	<0.33	640	8.6
Anthracene	<0.33	<0.33	<0.33	<0.33	200	2.9
Carbazole	<0.33	<0.33	<0.33	<0.33	4.7	<0.33
Di-n-butylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluoranthene	<0.33	<0.33	<0.33	<0.33	250	3.8
Pyrene	<0.33	<0.33	<0.33	<0.33	290	4.6
Buylbenzyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-anthracene	<0.33	<0.33	<0.33	<0.33	110	1.7
Chrysene	<0.33	<0.33	<0.33	<0.33	100	1.6
3,3'-Dichloro-benzidine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Ethylhexyl)-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-octylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(b)-fluoranthene	<0.33	<0.33	<0.33	<0.33	88	1.4
Benzo(k)-fluoranthene	<0.33	<0.33	<0.33	<0.33	53	<0.33
Benzo(a)-pyrene	<0.33	<0.33	<0.33	<0.33	97	1.4
Indeno(1,2,3-cd)pyrene	<0.33	<0.33	<0.33	<0.33	13	0.43
Dibenzo(a,h)anthracene	<0.33	<0.33	<0.33	<0.33	4.4	<0.33
Benzo(g,h,i)perylene	<0.33	<0.33	<0.33	<0.33	10	0.42

TABLE C-1 (CONTINUED). RESULTS OF SEMIVOLATILE ORGANIC ANALYSES ON MUSKEGON LAKE SEDIMENTS, OCTOBER 1999.

Station	M 1P	M 3P	M 4P	M 5P	M 6P	M 71P	M 8P	M 8PD
Core Section								
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
bis(2-Chloro-ethyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,3-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,4-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzyl alcohol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-isopropyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3/4-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitroso-di-n-propylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-ethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Nitro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Isophorone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dimethyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-ethoxy)methane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzoic acid	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2,4-Trichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-aniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-1,3-b<0.33tadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-3-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-cyclopentadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,6-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,5-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dimethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaph-thylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,6-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Diethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chlorophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4,6-Dinitro-2-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitrosodi-phenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Bromophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pentachloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Carbazole	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-butylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluoranthene	<0.33	<0.33	<0.33	0.82	1.3	<0.33	<0.33	<0.33
Pyrene	<0.33	<0.33	<0.33	0.83	1.1	<0.33	<0.33	<0.33
Buylbenzyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Chrysene	<0.33	<0.33	<0.33	<0.33	0.81	<0.33	<0.33	<0.33
3,3'-Dichloro-benzidine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Ethylhexyl)-phthalate	<0.33	<0.33	<0.33	1.0	1.6	<0.33	<0.33	<0.33
Di-n-octylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(b)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(k)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Indeno(1,2,3-cd)pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dibenzo(a,h)anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(g,h,i)perylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33

TABLE C-1 (CONTINUED). RESULTS OF SEMIVOLATILE ORGANIC ANALYSES ON MUSKEGON LAKE SEDIMENTS, OCTOBER 1999.

Station	M 9P	M 10P	M 11P	M 12P	M 13P	M 14P	M 15P	M 16AP
Core Section								
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
bis(2-Chloro-ethyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,3-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,4-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2-Dichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzyl alcohol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-isopropyl)ether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3/4-Methyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitroso-di-n-propylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-ethane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Nitro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Isophorone	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dimethyl-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Chloro-ethoxy)methane	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzoic acid	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
1,2,4-Trichloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.87
4-Chloro-aniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-1,3-b<0.33tadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Chloro-3-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methyl-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-cyclopentadiene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,6-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4,5-Trichloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Chloro-naphthalene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Dimethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaph-thylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	3.8
2,6-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
3-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Acenaphthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	8.8
Dibenzofuran	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.74
2,4-Dinitro-toluene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2,4-Dinitro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Diethyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluorene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	6.7
4-Chlorophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Nitroaniline	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4,6-Dinitro-2-methylphenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
N-Nitrosodi-phenylamine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
4-Bromophenyl-phenylether	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Hexachloro-benzene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pentachloro-phenol	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Phenanthrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	30
Anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	11
Carbazole	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-butylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	16
Pyrene	0.34	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	20
Buylbenzyl-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(a)-anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	9.6
Chrysene	0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	9.1
3,3'-Dichloro-benzidine	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
bis(2-Ethylhexyl)-phthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Di-n-octylphthalate	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Benzo(b)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	5.2
Benzo(k)-fluoranthene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	7.0
Benzo(a)-pyrene	0.36	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	9.6
Indeno(1,2,3-cd)pyrene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	2.2
Dibenzo(a,h)anthracene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	0.72
Benzo(g,h,i)perylene	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	1.8

Table C-2. Surrogate Standard Recoveries For Semivolatile Organics Analyses On Muskegon Lake Sediments, October 1999.

Sample	2-Fluorophenol	Phenol-d5	Nitrobenzene-d5	2-Fluorobiphenyl	2,4,6-Tribromophenol	p-Terphenyl-d14
% Recovery	%	%	%	%	%	%
Control Limits	44% - 91%	51% - 107%	46% - 95%	38% - 100%	43% - 107%	66% - 121%
M -. 1 Top	62%	63%	54%	43%	69%	58%
M -. 1 Mid.	72%	76%	71%	58%	75%	75%
M -. 1 Bot.	72%	77%	66%	77%	87%	82%
M -. 3 Top	70%	71%	66%	44%	78%	49%
M -. 3 Mid.	71%	77%	74%	66%	89%	64%
M -. 3 3-4	67%	67%	66%	63%	86%	76%
M -. 3 4-5	68%	71%	68%	61%	72%	74%
M -. 4 Top	60%	60%	60%	60%	82%	73%
M -. 4 Bot.	73%	73%	73%	77%	103%	90%
M -. 8 Top	60%	62%	68%	71%	83%	77%
M -. 8 2	63%	64%	59%	67%	82%	82%
M -. 8 3	72%	76%	71%	69%	89%	82%
M -. 8 4	66%	68%	66%	61%	81%	82%
M -. 9 Top	74%	75%	77%	82%	87%	88%
M -. 9 Bot.	61%	63%	63%	75%	78%	81%
M -. 10 Top	64%	63%	66%	69%	79%	79%
M -. 10 Mid.	70%	74%	65%	61%	78%	78%
M -. 10 Bot.	75%	80%	76%	79%	84%	82%
M -. 11 Top	69%	70%	65%	59%	79%	60%
M -. 11 2	66%	65%	64%	71%	85%	81%
M -. 11 3	71%	73%	69%	65%	89%	81%
M -. 11 Bot.	71%	72%	71%	74%	90%	77%
M -. 11 D Top	65%	67%	61%	66%	87%	73%
M -. 11 D 2	76%	82%	76%	74%	91%	80%
M -. 11 D 3	62%	58%	65%	71%	77%	73%
M -. 11 D Bot.	68%	63%	63%	65%	75%	71%
M -. 12 Top	74%	76%	81%	84%	96%	85%
M -. 12 Mid.	72%	66%	74%	76%	80%	85%
M -. 12 Bot.	65%	60%	81%	73%	74%	82%
M -. 13 Top	68%	71%	70%	62%	80%	63%
M -. 13 2	72%	71%	74%	72%	90%	76%
M -. 13 3	66%	68%	73%	70%	88%	77%
M -. 13 Bot.	73%	72%	74%	65%	86%	86%
M -. 14 Top	61%	67%	62%	59%	91%	83%
M -. 14 2	63%	66%	62%	65%	85%	81%
M -. 14 3	72%	73%	68%	67%	90%	87%
M -. 14 Bot.	69%	75%	64%	59%	85%	84%
M -. 15 Top	63%	62%	70%	75%	83%	81%
M -. 15 Mid.	68%	71%	60%	57%	85%	83%
M -. 15 Bot.	70%	77%	72%	77%	92%	86%
M -. 16AP	71%	69%	74%	77%	80%	76%
M -. 16A Top	72%	69%	77%	78%	88%	88%
M -. 16A Bottom	75%	76%	83%	90%	96%	87%
M -. 1P	57%	61%	55%	38%	69%	34%
M -. 3 P	74%	77%	78%	74%	94%	83%
M -. 4P	70%	69%	72%	74%	96%	81%
M -. 5P	70%	72%	65%	50%	77%	50%
M -. 6P	62%	64%	60%	51%	72%	44%
M -. 7P	72%	75%	68%	60%	90%	59%
M -. 8P	69%	71%	66%	47%	87%	51%
M -. 8PD	75%	73%	63%	52%	88%	50%
M -. 9P	72%	77%	72%	75%	100%	90%
M -. 10P	56%	58%	56%	69%	80%	76%
M -. 11P	67%	71%	69%	69%	90%	86%
M -. 12P	69%	69%	69%	77%	84%	83%
M -. 13P	71%	74%	63%	48%	81%	46%
M -. 14P	68%	69%	58%	56%	88%	56%
M -. 15P	71%	70%	65%	57%	93%	52%

TABLE C-3. RESULTS OF MATRIX SPIKE/MATRIX SPIKE DUPLICATE ANALYSES FOR SEMIVOLATILE ORGANICS ANALYSES ON MUSKEGON LAKE SEDIMENTS, OCTOBER 1999.

M -. 10 Bot.

Compound Name	Sample Conc. mg/kg	MS Spk Added mg/kg	MSD Spk Added mg/kg	MS Final mg/kg	MSD Final mg/kg	**MS % Rec**	**MSD % Rec**	**RPD**	QC Limits RPD	% Rec
2-Chlorophenol	0.00	4.4	4.4	3.5	3.4	**81**	**79**	**2.7**	18	41-99
Phenol	0.00	4.4	4.4	3.5	3.4	**79**	**77**	**2.7**	31	39-95
1,4-Dichlorobenzene	0.00	2.3	2.3	1.7	1.6	**74**	**70**	**5.5**	19	45-96
N-Nitroso-di-n-propylamine	0.00	2.3	2.3	1.8	1.8	**78**	**78**	**0.1**	21	47-105
1,2,4-trichlorobenzene	0.00	2.3	2.3	2.0	1.9	**90**	**86**	**4.6**	18	48-106
4-Chloro-3-methylphenol	0.00	4.4	4.4	3.4	3.3	**77**	**74**	**2.8**	19	37-111
Acenapthene	0.00	2.3	2.3	1.9	1.8	**82**	**78**	**5.0**	23	46-111
2,4-Dinitrotoluene	0.00	2.3	2.3	1.7	1.7	**74**	**74**	**0.1**	23	32-105
4-Nitrophenol	0.00	4.4	4.4	3.2	3.2	**73**	**72**	**0.1**	28	44-117
Pentachlorophenol	0.00	4.4	4.4	3.7	3.5	**85**	**81**	**5.0**	30	45-112
Pyrene	0.00	2.3	2.3	1.9	1.8	**82**	**78**	**5.0**	23	35-127

M -. 12 Top

Compound Name	Sample Conc. mg/kg	MS Spk Added mg/kg	MSD Spk Added mg/kg	MS Final mg/kg	MSD Final mg/kg	**MS % Rec**	**MSD % Rec**	**RPD**	QC Limits RPD	% Rec
2-Chlorophenol	0.00	4.2	4.2	3.3	3.2	**79**	**77**	**2.4**	18	41-99
Phenol	0.00	4.2	4.2	3.1	2.9	**73**	**69**	**5.5**	31	39-95
1,4-Dichlorobenzene	0.00	2.2	2.2	1.4	1.4	**66**	**63**	**5.9**	19	45-96
N-Nitroso-di-n-propylamine	0.00	2.2	2.2	1.6	1.6	**74**	**74**	**0.2**	21	47-105
1,2,4-trichlorobenzene	0.00	2.2	2.2	2.0	1.9	**90**	**86**	**4.2**	18	48-106
4-Chloro-3-methylphenol	0.00	4.2	4.2	3.5	3.4	**83**	**81**	**2.3**	19	37-111
Acenapthene	0.00	2.2	2.2	1.8	1.8	**82**	**82**	**0.2**	23	46-111
2,4-Dinitrotoluene	0.00	2.2	2.2	1.6	1.6	**74**	**74**	**0.2**	23	32-105
4-Nitrophenol	0.00	4.2	4.2	3.3	3.1	**79**	**73**	**7.8**	28	44-117
Pentachlorophenol	0.00	4.2	4.2	3.6	3.6	**85**	**85**	**0.2**	30	45-112
Pyrene	0.00	2.2	2.2	1.9	1.9	**86**	**86**	**0.2**	23	35-127

M -. 16A Bottom

Compound Name	Sample Conc. mg/kg	MS Spk Added mg/kg	MSD Spk Added mg/kg	MS Final mg/kg	MSD Final mg/kg	**MS % Rec**	**MSD % Rec**	**RPD**	QC Limits RPD	% Rec
2-Chlorophenol	0.00	4.1	4.1	3.2	3.4	**79**	**83**	**5.1**	18	41-99
Phenol	0.00	4.1	4.1	3.0	3.1	**73**	**77**	**5.5**	31	39-95
1,4-Dichlorobenzene	0.00	2.1	2.1	1.5	1.6	**70**	**74**	**5.5**	19	45-96
N-Nitroso-di-n-propylamine	0.00	2.1	2.1	1.6	1.7	**78**	**82**	**4.9**	21	47-105
1,2,4-trichlorobenzene	0.00	2.1	2.1	2.1	2.1	**98**	**98**	**0.1**	18	48-106
4-Chloro-3-methylphenol	0.00	4.1	4.1	3.5	3.5	**87**	**87**	**0.1**	19	37-111
Acenapthene	5.70	2.1	2.1	8.9	16.4	**152**	**510**	**108**	23	46-111
2,4-Dinitrotoluene	0.00	2.1	2.1	1.7	1.0	**82**	**47**	**54.5***	23	32-105
4-Nitrophenol	0.00	4.1	4.1	3.0	3.0	**75**	**75**	**0.1**	28	44-117
Pentachlorophenol	0.00	4.1	4.1	3.4	3.4	**83**	**83**	**0.1**	30	45-112
Pyrene	4.60	2.1	2.1	8.5	16.8	**186**	**581**	**103**	23	35-127

Appendix D.

Results Of Metals Analyses For Muskegon Lake Sediments, October 1999.

TABLE D-1. RESULTS OF METALS ANALYSES IN MUSKEGON LAKE SEDIMENT, OCTOBER 1999.

	Metals (mg/kg)									
Sample ID	Total Arsenic mg/kg	Total Barium mg/kg	Total Cadmium mg/kg	Total Chromium mg/kg	Total Copper mg/kg	Total Nickel mg/kg	Total Lead mg/kg	Total Zinc mg/kg	Total Mercury mg/kg	Total Selenium mg/kg
M 1 Top	15	150	12	440	85	27	150	360	0.65	0.24
M 1 Middle	7.8	94	3.4	160	31	15	62	140	0.29	<0.10
M 1 Bottom	10	18	0.11	8.4	2.2	3.1	5.1	23	<0.10	<0.10
M 3 Top	12	130	3.7	130	65	24	120	270	0.39	0.50
M 3 Middle	10	140	11	420	90	29	170	380	0.69	0.55
M 3 3-4	14	150	10	230	87	24	170	300	1.2	0.58
M 3 4-5	2.7	36	0.21	11	6.0	6.4	6.8	27	<0.10	<0.10
M 4 Top	5.4	45	0.88	38	21	8.8	42	82	0.12	0.29
M 4 Bottom	7.9	32	1.4	48	16	6.4	35	71	0.11	<0.10
M 8 Top	7.3	140	11	290	100	33	180	420	0.82	0.45
M 8 2	9.1	130	20	78	150	29	160	290	1.8	0.49
M 8 3	8.7	85	0.76	25	17	17	19	77	0.23	0.30
M 8 4	7.3	38	0.13	7.5	3.5	5.0	2.6	20	<0.10	<0.10
M 9 Top	1.2	10	0.66	8.2	7.0	2.5	7.5	21	<0.10	<0.10
M 9 Bottom	4.4	28	0.35	8.0	4.5	4.1	10	26	<0.10	<0.10
M 10 Top	10	100	5.5	110	68	24	110	240	0.41	<0.10
M 10 Middle	12	65	2.8	27	19	7.3	45	87	0.19	<0.10
M 10 Bottom	5.5	16	0.12	2.8	1.5	1.2	1.9	9.8	<0.10	<0.10
M 11 Top	7.6	110	2.7	63	50	20	68	170	0.26	0.41
M 11 2	10	130	5.3	160	81	38	120	300	0.37	0.45
M 11 3	7.6	150	12	150	100	34	160	270	0.58	0.44
M 11 Bottom	6.7	92	1.6	27	25	17	51	99	0.26	0.31
M 11D Top	6.1	100	2.8	66	50	20	71	170	0.28	0.42
M 11D 2	8.9	130	5.4	170	81	39	130	320	0.40	0.46
M 11D 3	7.3	140	9.5	240	94	36	140	300	0.54	0.43
M 11D Bottom	9.0	130	10	86	82	25	150	220	0.59	0.38
M 12 Top	0.90	9.5	0.17	4.8	9.4	2.3	12	18	<0.10	<0.10
M 12 Middle	5.1	45	1.5	28	34	8.7	73	120	0.32	<0.10
M 12 Bottom	11	140	8.5	210	130	31	320	450	0.84	0.52
M 13 Top	6.8	99	5.0	140	40	21	77	200	0.30	0.40
M 13 2	5.9	110	7.6	160	49	20	70	200	0.41	0.41
M 13 3	7.5	94	4.0	42	31	16	110	120	0.37	0.36
M 13 Bottom	5.1	59	0.24	18	9.9	12	10	44	<0.10	<0.10
M 14 Top	7.4	88	1.0	34	32	16	42	110	0.14	0.39
M 14 2	5.8	66	2.4	69	26	15	70	140	0.19	0.31
M 14 3	5.5	58	1.1	18	17	11	100	62	0.15	0.28
M 14 Bottom	6.7	87	0.42	24	16	19	16	71	<0.10	0.33
M 15 Top	8.3	140	10	190	72	26	160	300	0.60	0.82
M 15 Middle	5.8	120	1.4	33	24	20	48	110	0.26	0.47
M 15 Bottom	5.0	12	<0.10	3.8	<0.10	1.8	1.5	14	<0.10	<0.10
M 16A Top	8.4	90	7.4	47	58	16	140	180	0.72	0.46
M 16A Bottom	1.8	13	0.15	4.0	1.5	2.1	4.6	12	<0.10	<0.10
M 9P	5.6	20	0.38	9.6	6.8	3.4	12	30	<0.10	<0.10
M 10P	6.2	110	2.9	77	58	22	89	200	0.34	0.58
M 11P	6.8	110	2.3	61	49	20	67	160	0.26	0.59
M 12P	5.2	10	0.1	2.8	3.4	2.6	6.2	14	<0.10	<0.10
M 1P	10	130	3.9	250	63	24	120	260	0.38	0.72
M 3P	6.1	130	2.0	71	52	19	83	190	0.20	0.44
M 4P	5.2	14	0.13	4.8	4.0	2.0	5.8	13	<0.10	<0.10
M 5P	11	180	12	210	260	38	270	600	1.7	0.49
M 6P	9.5	180	7.9	160	260	38	280	640	1.7	0.53
M 71P	11	120	4.2	120	100	29	140	290	0.56	0.48
M 8P	12	120	4.2	95	78	24	120	240	0.50	0.54
M 8PD	5.1	140	4.6	120	89	27	130	270	0.55	0.83
M 9P	5.6	20	0.38	9.6	6.8	3.4	12	30	<0.10	<0.10
M 10P	6.2	110	2.9	77	58	22	89	200	0.34	0.58
M 11P	6.8	110	2.3	61	49	20	67	160	0.26	0.59
M 12P	5.2	10	0.1	2.8	3.4	2.6	6.2	14	<0.10	<0.10
M 13P	10	97	3.1	80	39	19	63	160	0.25	0.38
M 14P	5.2	88	1.1	30	33	14	31	100	0.14	0.38
M 15P	5.8	120	2.5	68	46	19	64	160	0.26	0.42
M 16AP	3.7	33	1.3	20	16	6.8	31	67	0.14	<0.10

TABLE D-2. RESULTS OF QUALITY CONTROL ANALYSES FOR METALS IN MUSKEGON LAKE SEDIMENT, OCTOBER 1999.

LCS

Analyte	Method Blank Result mg/kg	Spk. Added mg/kg	LCS Results mg/kg	LCSD Results mg/kg	**LCS %Rec**	**LCSD %Rec**	RPD limit	%Rec limit	Method
Arsenic	U	100	106	114	**106**	**114**	20	80 - 120	6010
Arsenic	U	1.00	0.95	0.96	**95**	**96**	17	76 - 123	7060
Barium	U	40.0	42.7	41.2	**107**	**103**	20	80 - 120	6010
Cadmium	U	40.0	43.2	43.6	**108**	**109**	20	80 - 120	6010
Cadmium	0.012*	0.10	0.10	0.10	**102**	**103**	16	75 - 131	7131
Chromium	U	40.0	43.0	44.2	**108**	**111**	20	80 - 120	6010
Copper	U	40.0	37.7	38.5	**94**	**96**	20	80 - 120	6010
Lead	U	40.0	41.3	40.7	**103**	**102**	20	80 - 120	6010
Lead	U	1.00	1.05	1.00	**105**	**100**	15	79 - 124	7421
Mercury	U	0.11	0.09	0.09	**87**	**85**	16	75 - 123	7471
Nickel	U	40.0	42.4	44.9	**106**	**112**	20	80 - 120	6010
Selenium	U	1.00	0.97	1.01	**97**	**101**	20	73 - 130	7740
Zinc	U	40.0	41.6	43.5	**104**	**109**	20	80 - 120	6010

Cadmium	*Cadmium was present in the method blank at a level 10x below the reporting limit.

M - 1 Bottom

Analyte	Sample Conc. mg/kg	MS Spk Added mg/kg	MSD Spk Added mg/kg	MS Results mg/kg	MSD Results mg/kg	**MS %Rec**	**MSD %Rec**	RPD limit	%Rec limit	Method
Arsenic	10.19	1.00	1.00	5.89	8.20	**0** *	**0** *	31	50 - 138	7060
Barium	18.4	40.0	40.0	59.8	58.3	**104**	**100**	20	75 - 125	6010
Cadmium	0.11	0.10	0.10	0.21	0.20	**104**	**97**	37	54 - 137	7131
Chromium	8.41	40.0	40.0	49.7	49.2	**103**	**102**	20	75 - 125	6010
Copper	2.22	40.0	40.0	40.3	40.4	**95**	**95**	20	75 - 125	6010
Lead	5.10	40.0	40.0	43.2	43.0	**95**	**95**	20	75 - 125	6010
Mercury	0.02	0.11	0.11	0.11	0.12	**86**	**93**	23	65 - 131	7471
Nickel	3.07	40.0	40.0	43.7	43.0	**102**	**100**	20	75 - 125	6010
Selenium	U	1.00	1.00	0.59	0.66	**59**	**66**	31	39 - 117	7740
Zinc	22.8	40.0	40.0	65.5	65.5	**107**	**107**	20	75 - 125	6010

Arsenic	*The matrix spike and matrix spike duplicate recoveries were out of control low. Because the sample background concentration was greater than four times the spiked concentration, no qualification of data is necessary.

TABLE D-2 (CONTINUED). RESULTS OF QUALITY CONTROL ANALYSES FOR METALS IN MUSKEGON LAKE SEDIMENT, OCTOBER 1999.

LCS

Analyte	Method Blank Result mg/kg	Spk. Added mg/kg	LCS Results mg/kg	LCSD Results mg/kg	**LCS %Rec**	**LCSD %Rec**	RPD limit	%Rec limit	Method
Arsenic	U	100	114	108	**114**	**108**	20	80 - 120	6010
Arsenic	U	1.00	1.04	1.01	**104**	**101**	17	76 - 123	7060
Barium	U	40.0	41.2	40.2	**103**	**101**	20	80 - 120	6010
Cadmium	U	40.0	44.3	40.5	**111**	**101**	20	80 - 120	6010
Cadmium	U	0.10	0.11	0.10	**106**	**96**	16	75 - 131	7131
Chromium	U	40.0	43.0	42.6	**108**	**107**	20	80 - 120	6010
Copper	U	40.0	38.0	37.7	**95**	**94**	20	80 - 120	6010
Lead	U	40.0	40.7	42.0	**102**	**105**	20	80 - 120	6010
Mercury	U	0.11	0.10	0.10	**94**	**91**	16	75 - 123	7471
Nickel	U	40.0	43.0	42.6	**108**	**107**	20	80 - 120	6010
Selenium	U	1.00	0.96	0.96	**96**	**96**	20	73 - 130	7740
Zinc	U	40.0	42.6	42.4	**107**	**106**	20	80 - 120	6010

M - 12 Top

Analyte	Sample Conc. mg/kg	MS Spk Added mg/kg	MSD Spk Added mg/kg	MS Results mg/kg	MSD Results mg/kg	**MS %Rec**	**MSD %Rec**	RPD limit	%Rec limit	Method
Arsenic	0.9022	1.00	1.00	1.78	1.72	**88**	**82**	31	50 - 138	7060
Barium	9.48	39.60	40.0	50.8	50.8	**104**	**103**	20	75 - 125	6010
Cadmium	0.17	0.10	0.10	0.26	0.25	**95**	**87**	37	54 - 137	7131
Chromium	4.75	39.60	40.0	44.2	45.5	**100**	**102**	20	75 - 125	6010
Copper	9.39	39.60	40.0	39.7	40.9	**77**	**79**	20	75 - 125	6010
Lead	12.0	39.60	40.0	42.8	43.5	**78**	**79**	20	75 - 125	6010
Mercury	0.04	0.11	0.11	0.14	0.15	**90**	**99**	23	65 - 131	7471
Nickel	2.30	39.60	40.0	41.0	42.2	**98**	**100**	20	75 - 125	6010
Selenium	U	1.00	1.00	0.56	0.57	**56**	**57**	31	39 - 117	7740
Zinc	18.2	39.60	40.0	52.6	53.1	**87**	**87**	20	75 - 125	6010

TABLE D-2 (CONTINUED). RESULTS OF QUALITY CONTROL ANALYSES FOR METALS IN MUSKEGON LAKE SEDIMENT, OCTOBER 1999.

LCS

Analyte	Method Blank Result mg/kg	Spk. Added mg/kg	LCS Results mg/kg	LCSD Results mg/kg	**LCS %Rec**	**LCSD %Rec**	RPD limit	%Rec limit	Method
Arsenic	U	100	114	110	**114**	**110**	20	80 - 120	6010
Arsenic	U	1.00	1.01	1.02	**101**	**102**	17	76 - 123	7060
Barium	U	40.0	39.7	38.9	**99**	**97**	20	80 - 120	6010
Cadmium	U	40.0	44.6	44.2	**112**	**111**	20	80 - 120	6010
Cadmium	U	0.10	0.10	0.10	**102**	**97**	16	75 - 131	7131
Chromium	U	40.0	43.4	42.9	**109**	**107**	20	80 - 120	6010
Copper	U	40.0	38.0	37.7	**95**	**94**	20	80 - 120	6010
Lead	U	40.0	41.4	42.5	**104**	**106**	20	80 - 120	6010
Lead	U	1.00	0.99	0.97	**99**	**97**	15	79 - 124	7421
Mercury	U	0.11	0.10	0.09	**90**	**86**	16	75 - 123	7471
Nickel	U	40.0	42.6	42.4	**107**	**106**	20	80 - 120	6010
Selenium	U	1.00	0.90	0.92	**90**	**92**	20	73 - 130	7740
Zinc	U	40.0	42.2	41.8	**106**	**105**	20	80 - 120	6010

M - 4P

Analyte	Sample Conc. mg/kg	MS Spk Added mg/kg	MSD Spk Added mg/kg	MS Results mg/kg	MSD Results mg/kg	**MS %Rec**	**MSD %Rec**	RPD limit	%Rec limit	Method
Arsenic	5.21	97.09	100	107	109	**105**	**104**	20	75 - 125	6010
Barium	13.7	38.83	40.0	50.8	50.8	**96**	**93**	20	75 - 125	6010
Cadmium	0.13	0.10	0.10	0.22	0.23	**88**	**96**	37	54 - 137	7131
Chromium	4.78	38.83	40.0	44.2	45.5	**102**	**102**	20	75 - 125	6010
Copper	3.97	38.83	40.0	39.7	40.9	**92**	**92**	20	75 - 125	6010
Lead	5.79	38.83	40.0	42.8	43.5	**95**	**94**	20	75 - 125	6010
Mercury	0.02	0.11	0.11	0.12	0.12	**94**	**97**	23	65 - 131	7471
Nickel	2.04	38.83	40.0	41.0	42.2	**100**	**100**	20	75 - 125	6010
Selenium	U	1.00	1.00	0.66	0.65	**66**	**65**	31	39 - 117	7740
Zinc	13.1	38.83	40.0	52.6	53.1	**102**	**100**	20	75 - 125	6010

TABLE D-3. RESULTS OF STANDARD REFERENCE MATERIAL ANALYSES FOR METALS (RESULTS IN MG/KG EXCEPT WHERE NOTED).

Sample ID	As	Hg	Cd	Cr	Cu	Pb	Ni	Zn
ERA-1	190	1.8	120	180	90	72	71	200
% RSD	95%	90%	86%	95%	82%	80%	89%	89%
ERA-2	160	1.8	110	150	76	58	60	170
% RSD	80%	90%	79%	79%	69%	64%	75%	76%
ERA-3	200	1.6	120	180	89	72	70	200
% RSD	100%	80%	86%	95%	81%	80%	88%	89%

Appendix E.

Summary Of Chemical Measurements For The Toxicity Test With Sediments From Muskegon Lake, October 1999.

Table E-1. Summary of Initial and Final Chemical Measurements for *Hyalella azteca* in Muskegon Lake Sediments

Sample	Parameter	Day 0	Day 10	Difference (%)
M-1	pH	8.43	8.10	4
	Conductivity (umhos/cm)	683	742	9
	Alkalinity (mg/l $CaCO_3$)	210	222	5
	Hardness (mg/l $CaCO_3$)	154	161	4
	Ammonia (mg/l NH_3)	6.03	0.31	95
M-3	pH	8.48	7.96	6
	Conductivity (umhos/cm)	683	742	9
	Alkalinity (mg/l $CaCO_3$)	165	178	8
	Hardness (mg/l $CaCO_3$)	170	167	2
	Ammonia (mg/l NH_3)	2.18	0.34	84
M-4	pH	8.16	8.44	3
	Conductivity (umhos/cm)	740	754	2
	Alkalinity (mg/l $CaCO_3$)	194	212	9
	Hardness (mg/l $CaCO_3$)	146	163	11
	Ammonia (mg/l NH_3)	3.26	0.46	86
M-5	pH	8.27	7.92	4
	Conductivity (umhos/cm)	692	742	7
	Alkalinity (mg/l $CaCO_3$)	172	185	7
	Hardness (mg/l $CaCO_3$)	146	163	11
	Ammonia (mg/l NH_3)	8.81	0.26	97
M-6	pH	8.35	8.16	2
	Conductivity (umhos/cm)	760	763	0
	Alkalinity (mg/l $CaCO_3$)	182	190	4
	Hardness (mg/l $CaCO_3$)	150	163	8
	Ammonia (mg/l NH_3)	7.77	0.12	98
M-7	pH	8.44	7.98	5
	Conductivity (umhos/cm)	732	780	7
	Alkalinity (mg/l $CaCO_3$)	178	191	7
	Hardness (mg/l $CaCO_3$)	160	161	0
	Ammonia (mg/l NH_3)	7.06	0.23	97
M-8	pH	8.35	7.97	5
	Conductivity (umhos/cm)	679	729	7
	Alkalinity (mg/l $CaCO_3$)	171	185	8
	Hardness (mg/l $CaCO_3$)	156	161	3
	Ammonia (mg/l NH_3)	4.46	0.63	86
M-8 Dup	pH	8.09	7.96	2
	Conductivity (umhos/cm)	757	751	1
	Alkalinity (mg/l $CaCO_3$)	192	203	6
	Hardness (mg/l $CaCO_3$)	150	150	0
	Ammonia (mg/l NH_3)	5.42	0.41	92

Table E-1. (Cont.) Summary of Initial and Final Chemical Measurements for *Hyalella azteca* in Muskegon Lake Sediments

Sample	Parameter	Day 0	Day 10	Difference (%)
M-9	pH	8.16	8.24	1
	Conductivity (umhos/cm)	771	662	14
	Alkalinity (mg/l $CaCO_3$)	182	191	5
	Hardness (mg/l $CaCO_3$)	153	150	2
	Ammonia (mg/l NH_3)	5.37	0.14	97
M-10	pH	8.35	7.97	5
	Conductivity (umhos/cm)	665	729	10
	Alkalinity (mg/l $CaCO_3$)	161	190	18
	Hardness (mg/l $CaCO_3$)	130	159	22
	Ammonia (mg/l NH_3)	5.04	0.14	97
M-11	pH	8.18	8.32	2
	Conductivity (umhos/cm)	719	714	1
	Alkalinity (mg/l $CaCO_3$)	188	202	7
	Hardness (mg/l $CaCO_3$)	163	152	7
	Ammonia (mg/l NH_3)	4.86	0.10	98
M-12	pH	8.22	8.27	1
	Conductivity (umhos/cm)	689	705	2
	Alkalinity (mg/l $CaCO_3$)	183	190	4
	Hardness (mg/l $CaCO_3$)	147	156	6
	Ammonia (mg/l NH_3)	4.23	0.12	97
M-13	pH	8.05	8.34	4
	Conductivity (umhos/cm)	726	678	7
	Alkalinity (mg/l $CaCO_3$)	190	191	1
	Hardness (mg/l $CaCO_3$)	155	154	1
	Ammonia (mg/l NH_3)	8.35	0.10	99
M-14	pH	8.18	7.94	3
	Conductivity (umhos/cm)	683	747	9
	Alkalinity (mg/l $CaCO_3$)	162	194	20
	Hardness (mg/l $CaCO_3$)	142	159	12
	Ammonia (mg/l NH_3)	7.72	0.16	98
M-15	pH	8.10	7.98	1
	Conductivity (umhos/cm)	665	696	5
	Alkalinity (mg/l $CaCO_3$)	163	214	31
	Hardness (mg/l $CaCO_3$)	118	148	26
	Ammonia (mg/l NH_3)	6.75	0.93	86
M-16A	pH	8.22	8.10	1
	Conductivity (umhos/cm)	665	780	17
	Alkalinity (mg/l $CaCO_3$)	161	196	22
	Hardness (mg/l $CaCO_3$)	114	155	36
	Ammonia (mg/l NH_3)	8.85	0.99	89

Table E-2. Summary Of Daily Temperature And Dissolved Oxygen Measurements For *Hyalella azteca* In The Solid Phase Toxicity Tests For Muskegon Lake Sediments

Sample:	Day																					
M-1	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.3	93.70	22.1	80.40	22.3	61.20	22.2	71.30	22.0	71.50	22.4	75.60	22.1	71.30	22.7	72.70	22.0	64.30	22.1	74.10	22.6	59.50

Sample:	Day																					
M-3	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.0	98.20	22.0	86.50	22.9	63.10	22.9	76.60	22.9	68.60	22.2	75.90	22.1	81.00	22.8	78.70	22.2	79.30	22.1	83.20	22.1	61.80

Sample:	Day																					
M-4	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	23.0	78.50	22.7	76.50	22.0	67.20	24.0	73.70	23.7	74.00	23.7	94.40	24.3	83.40	24.2	79.50	23.3	75.70	23.5	94.70	22.8	72.10

Sample:	Day																					
M-5	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.6	92.30	22.9	91.70	23.3	81.40	22.6	80.10	22.2	72.50	22.8	74.70	22.7	77.60	23.1	75.10	22.9	58.50	22.6	84.90	22.2	61.50

Sample:	Day																					
M-6	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	23.8	96.60	22.4	86.80	23.5	66.00	24.0	73.50	24.2	70.00	24.8	81.30	23.4	76.30	23.7	75.60	23.1	71.90	23.8	82.40	22.0	75.60

Table E-2. (Cont). Summary Of Daily Temperature And Dissolved Oxygen Measurements For *Hyalella azteca* In The Solid Phase Toxicity Tests For Muskegon Lake Sediments

Sample:	Day																					
M-7	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.9	97.20	22.8	85.20	23.0	68.00	23.3	73.40	22.7	74.10	23.6	79.70	23.0	83.90	22.7	78.90	22.6	78.70	22.8	82.20	22.8	67.20

Sample:	Day																					
M-8	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.0	97.70	20.9	81.90	22.1	62.40	22.1	73.70	22.0	72.20	22.2	78.90	22.9	84.80	22.2	80.10	22.4	70.10	22.6	77.10	22.7	60.90

Sample:	Day																					
M-8 Dup	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	20.8	85.00	20.8	73.40	22.8	63.50	22.9	71.10	22.9	65.60	22.3	76.30	22.7	82.30	22.1	72.30	22.5	68.40	22.8	77.20	22.8	51.50

Sample:	Day																					
M-9	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.2	94.00	22.3	83.10	23.5	66.70	23.2	77.70	22.4	76.60	23.6	82.10	23.4	88.90	22.1	80.20	22.1	71.50	22.3	73.80	22.5	65.00

Sample:	Day																					
M-10	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.6	99.40	22.0	83.10	22.9	73.50	22.1	76.00	22.3	60.10	22.1	72.10	22.1	66.50	22.2	69.50	22.6	52.50	22.0	54.10	22.1	51.10

Table E-2. (Cont). Summary Of Daily Temperature And Dissolved Oxygen Measurements For *Hyalella azteca* In The Solid Phase Toxicity Tests For Muskegon Lake Sediments

Sample:	Day																					
M-11	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.7	96.60	22.6	84.50	22.7	60.50	22.7	70.20	22.2	70.90	22.8	72.50	22.7	77.70	22.1	72.00	22.7	80.30	22.6	61.30	22.2	56.60
Sample:	Day																					
M-12	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.5	91.50	22.0	85.20	22.0	80.20	22.4	76.70	22.1	72.30	22.1	78.20	22.0	70.30	22.3	66.60	22.7	62.30	22.6	67.50	22.5	51.30
Sample:	Day																					
M-13	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.0	94.20	22.1	89.90	22.6	80.00	22.5	77.20	22.3	68.70	22.0	73.30	22.0	69.40	22.5	75.80	22.8	63.40	22.4	78.50	22.0	48.80
Sample:	Day																					
M-14	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.8	88.70	22.0	86.10	22.3	76.90	22.3	79.70	22.2	76.10	22.2	78.20	22.0	73.80	22.5	69.10	22.5	64.60	22.2	56.30	22.1	56.10
Sample:	Day																					
M-15	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.7	97.40	22.8	81.60	23.0	71.00	22.6	73.20	22.1	71.20	22.9	82.60	23.0	79.60	22.6	72.50	22.4	81.90	22.2	72.10	22.1	56.80
Sample:	Day																					
M-16A	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l	°C	mg/l
	21.1	98.40	21.1	85.50	22.2	56.90	22.0	76.20	21.8	69.30	22.3	80.00	22.1	82.30	22.0	69.70	22.2	66.40	22.2	80.10	22.0	49.70

Table E-3. Summary Of Initial And Final Chemical Measurements For *Chironomus tentans* In Muskegon Lake Sediments

Sample	Parameter	Day 0	Day 10	Difference (%)
M-1	pH	8.13	7.93	2
	Conductivity (umhos/cm)	698	685	2
	Alkalinity (mg/l $CaCO_3$)	196	182	7
	Hardness (mg/l $CaCO_3$)	120	140	17
	Ammonia (mg/l NH_3)	0.15	0.17	13
M-3	pH	8.1	8.0	2
	Conductivity (umhos/cm)	734	685	7
	Alkalinity (mg/l $CaCO_3$)	176	187	6
	Hardness (mg/l $CaCO_3$)	162	165	2
	Ammonia (mg/l NH_3)	4.10	0.15	96
M-4	pH	8.07	8.00	1
	Conductivity (umhos/cm)	663	742	12
	Alkalinity (mg/l $CaCO_3$)	191	187	2
	Hardness (mg/l $CaCO_3$)	168	152	9
	Ammonia (mg/l NH_3)	11.56	0.33	97
M-5	pH	7.9	8.0	1
	Conductivity (umhos/cm)	785	689	12
	Alkalinity (mg/l $CaCO_3$)	184	181	2
	Hardness (mg/l $CaCO_3$)	152	148	2
	Ammonia (mg/l NH_3)	0.64	0.30	53
M-6	pH	8.01	8.04	0
	Conductivity (umhos/cm)	782	734	6
	Alkalinity (mg/l $CaCO_3$)	156	192	23
	Hardness (mg/l $CaCO_3$)	160	148	7
	Ammonia (mg/l NH_3)	8.00	0.21	97
M-7	pH	7.99	7.97	0
	Conductivity (umhos/cm)	782	704	10
	Alkalinity (mg/l $CaCO_3$)	161	187	16
	Hardness (mg/l $CaCO_3$)	190	157	18
	Ammonia (mg/l NH_3)	7.19	0.13	98
M-8	pH	8.06	7.97	1
	Conductivity (umhos/cm)	690	678	2
	Alkalinity (mg/l $CaCO_3$)	171	192	12
	Hardness (mg/l $CaCO_3$)	186	163	13
	Ammonia (mg/l NH_3)	4.14	0.20	95
M-8 Dup	pH	8.17	7.90	3
	Conductivity (umhos/cm)	782	678	13
	Alkalinity (mg/l $CaCO_3$)	176	192	9
	Hardness (mg/l $CaCO_3$)	182	148	19
	Ammonia (mg/l NH_3)	6.11	0.25	96

Table E-3. (Cont). Summary Of Initial And Final Chemical Measurements For *Chironomus tentans* In Muskegon Lake Sediments

Sample	Parameter	Day 0	Day 10	Difference (%)
M-9	pH	7.94	7.93	0
	Conductivity (umhos/cm)	734	688	6
	Alkalinity (mg/l $CaCO_3$)	181	187	3
	Hardness (mg/l $CaCO_3$)	160	148	7
	Ammonia (mg/l NH_3)	5.11	0.26	95
M-10	pH	7.93	8.01	1
	Conductivity (umhos/cm)	679	654	4
	Alkalinity (mg/l $CaCO_3$)	161	190	18
	Hardness (mg/l $CaCO_3$)	146	159	9
	Ammonia (mg/l NH_3)	6.75	0.31	95
M-11	pH	8.15	8.03	1
	Conductivity (umhos/cm)	693	699	1
	Alkalinity (mg/l $CaCO_3$)	186	201	8
	Hardness (mg/l $CaCO_3$)	154	159	3
	Ammonia (mg/l NH_3)	5.07	0.38	93
M-12	pH	7.94	8.06	2
	Conductivity (umhos/cm)	714	710	1
	Alkalinity (mg/l $CaCO_3$)	176	196	12
	Hardness (mg/l $CaCO_3$)	146	157	7
	Ammonia (mg/l NH_3)	11.20	0.26	98
M-13	pH	8.21	8.02	2
	Conductivity (umhos/cm)	755	796	5
	Alkalinity (mg/l $CaCO_3$)	166	192	15
	Hardness (mg/l $CaCO_3$)	228	167	27
	Ammonia (mg/l NH_3)	7.21	0.23	97
M-14	pH	8.37	8.00	4
	Conductivity (umhos/cm)	674	742	10
	Alkalinity (mg/l $CaCO_3$)	176	192	9
	Hardness (mg/l $CaCO_3$)	156	150	4
	Ammonia (mg/l NH_3)	8.68	0.20	98
M-15	pH	8.14	7.90	3
	Conductivity (umhos/cm)	643	684	6
	Alkalinity (mg/l $CaCO_3$)	176	197	12
	Hardness (mg/l $CaCO_3$)	126	141	12
	Ammonia (mg/l NH_3)	5.10	0.38	93
M-16A	pH	8.20	7.97	3
	Conductivity (umhos/cm)	674	778	15
	Alkalinity (mg/l $CaCO_3$)	181	181	0
	Hardness (mg/l $CaCO_3$)	140	150	7
	Ammonia (mg/l NH_3)	9.32	0.37	96

Table E-4. Summary of Daily Temperature and Dissolved Oxygen Measurements for *Chironomus tentans* in the Solid Phase Toxicity Tests for Muskegon Lake Sediments

Sample:	Day																					
M-1	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.6	85.50	22.4	78.50	22.1	60.20	22.6	73.10	22.0	49.20	22.2	71.80	22.3	48.60	22.2	55.70	18.8	61.90	22.9	55.90	22.6	42.20

Sample:	Day																					
M-3	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.4	90.40	22.3	81.10	22.1	64.80	22.4	71.90	22.0	57.30	22.0	69.00	22.3	42.30	22.0	68.10	18.4	58.50	22.8	45.00	22.9	48.70

Sample:	Day																					
M-4	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.0	78.90	23.4	75.90	23.0	64.40	23.1	77.70	22.0.5	56.60	22.1	65.50	22.0	47.90	22.9	58.00	19.0	51.70	22.5	48.80	22.1	48.20

Sample:	Day																					
M-5	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	23.2	79.10	22.0	76.30	22.0	54.10	22.2	67.80	22.8	49.50	22.1	69.00	22.7	64.10	23.4	67.40	19.3	56.00	22.5	49.10	22.3	52.20

Sample:	Day																					
M-6	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.2	86.20	22.0	81.40	22.2	59.00	22.0	80.20	22.0	58.80	22.1	72.40	22.3	60.20	22.6	68.20	19.2	55.60	22.0	50.40	22.8	42.30

Table E-4. (Cont). Summary of Daily Temperature and Dissolved Oxygen Measurements for *Chironomus tentans* in the Solid Phase Toxicity Tests for Muskegon Lake Sediments

Sample:	Day																					
M-7	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.0	84.80	22.0.9	80.40	22.2	66.80	22.2	81.80	22.0	60.00	22.0.7	67.00	22.0	43.60	22.3	68.80	18.9	61.10	22.4	58.40	22.2	60.20

Sample:	Day																					
M-8	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.7	89.10	22.4	74.00	22.2	54.40	22.6	82.50	22.0	54.10	22.0.7	68.60	22.0	40.00	23.0	55.70	18.6	54.70	22.0	42.40	23.4	52.10

Sample:	Day																					
M-8 Dup	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.4	83.00	22.2	80.30	22.3	57.50	22.8	71.30	22.0.9	50.40	22.0	66.70	22.0.5	38.60	22.8	60.40	19.0	56.80	22.8	43.00	22.0.9	35.30

Sample:	Day																					
M-9	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.1	81.60	22.4	77.40	22.0	61.70	22.7	73.10	22.3	53.60	22.0	63.50	22.0.4	35.80	22.2	42.10	19.1	52.40	22.6	51.30	22.0.9	51.70

Sample:	Day																					
M-10	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.5	86.50	22.1	81.00	22.2	62.00	22.2	71.90	22.0	59.20	22.0.8	67.50	22.0.4	50.20	22.7	59.60	19.1	48.10	22.2	46.40	22.7	42.50

Table E-4. (Cont). Summary of Daily Temperature and Dissolved Oxygen Measurements for *Chironomus tentans* in the Solid Phase Toxicity Tests for Muskegon Lake Sediments

Sample:	Day																					
M-11	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.5	86.50	22.1	81.00	22.2	62.00	22.2	71.90	22.0	59.20	22.0.8	67.50	22.0.4	50.20	22.7	59.60	19.1	48.10	22.2	46.40	22.7	42.50
Sample:	Day																					
M-12	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	23.5	85.40	22.7	80.10	22.7	49.80	22.7	61.80	22.7	41.40	22.8	55.00	22.8	42.30	22.9	47.50	22.2	42.00	22.2	64.40	23.6	50.80
Sample:	Day																					
M-13	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	23.8	89.40	22.7	81.20	22.6	50.20	22.7	51.30	22.6	42.50	22.5	53.50	22.5	66.40	22.8	52.80	22.5	47.00	22.0	44.10	23.5	42.10
Sample:	Day																					
M-14	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.2	82.20	22.7	75.20	22.7	57.90	22.4	73.00	22.5	43.60	22.5	68.40	22.7	33.10	22.8	40.10	22.0	42.90	22.2	54.40	23.5	46.50
Sample:	Day																					
M-15	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.8	78.40	23.5	75.80	23.0	61.70	23.3	75.90	22.5	51.20	22.2	70.70	22.5	42.20	23.6	56.60	18.9	60.30	22.2	54.10	22.1	53.40
Sample:	Day																					
M-16	0		1		2		3		4		5		6		7		8		9		10	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO	Temp	DO
	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%	°C	%
	22.3	91.90	22.5	82.20	22.5	42.70	22.3	62.10	22.3	52.70	22.0	59.30	22.7	49.10	22.9	62.60	19.2	55.20	22.1	50.90	23.4	31.70

Appendix F.

Summary Of Benthic Macroinvertebrate Results For Muskegon Lake, October 1999

TABLE F-1. BENTHIC MACROINVERTEBRATE RESULTS FOR MUSKEGON LAKE, OCTOBER 1999

Taxa	M-1 A	M-1 B	M-1C	M-3 A	M-3B	M-3 C	M-4 A	M-5 A	M-5B	M-5C	M-6 A	M-6B	M-6C	M-7 A	M-7B	M-7C	M-8 A	M-8B	M-8C	M-9 A	M-9B	M-9C
Turbellaria	43	0	0	43	0	0	43	172	129	129	129	43	86	0	129	43	0	43	172	129	301	3315
Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stylodrilus heringianus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0
Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arcteonais lomondi	0	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0
Dero digitata	215	172	388	0	0	43	0	43	0	0	0	0	0	43	0	0	0	0	0	0	0	517
Dero flabelliger	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0
Piguetiella michiganensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salvina appendulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	344
Tubificidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aulodrilus americanus	0	0	0	0	0	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	0	358
Aulodrilus limnobius	242	111	282	0	0	110	83	0	0	48	0	0	183	332	0	62	0	0	0	0	0	179
Aulodrilus pigueti	182	387	705	1093	646	1431	568	388	1335	678	172	1974	1924	930	301	369	769	696	151	443	653	6538
Aulodrilus pluriseta	1212	885	1834	0	0	0	4631	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ilyodrilus templetoni	0	55	0	0	359	110	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isocheatides freyi	0	111	188	0	0	0	83	0	0	0	0	0	0	66	0	0	0	0	0	0	0	0
Limnodrilus cervix variant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnodrilus hoffmeisteri	1421	1421	1507	1179	5081	3143	0	1206	431	1378	517	990	1679	0	0	0	2713	2583	2024	1033	1981	4349
Limnodrilus maumeensis	0	0	0	1134	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnodrilus udekemianus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potamothrix moldaviensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quistadrilus multisetosus	0	0	47	328	1435	1321	175	0	0	48	0	49	0	266	0	0	307	595	452	246	251	3717
Polychaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manayunkia speciosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hirudinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glossiphoniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Helobdella stagnalis	43	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Helobdella elongata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amnicola sp.	0	0	0	129	0	43	0	43	86	43	0	129	172	0	129	172	0	43	43	86	344	0
Bithynia sp.	0	0	0	0	0	0	0	43	0	0	0	43	0	0	0	0	0	0	0	0	0	86
Valvata tricarinata	0	0	0	0	0	0	0	129	215	86	43	258	258	172	215	43	43	86	43	0	0	129
Valvata sincera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE F-1 (CONTINUED). BENTHIC MACROINVERTEBRATE RESULTS FOR MUSKEGON LAKE, OCTOBER 1999

Taxa	M-1 A	M-1 B	M-1C	M-3 A	M-3B	M-3 C	M-4 A	M-5 A	M-5B	M-5C	M-6 A	M-6B	M-6C	M-7 A	M-7B	M-7C	M-8 A	M-8B	M-8C	M-9 A	M-9B	M-9C
Bivalvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pisidium sp.	0	0	0	86	0	172	0	1550	1163	1938	646	689	603	904	474	560	517	474	301	86	215	474
Sphaerium sp.	0	0	0	0	43	43	0	86	0	43	0	0	0	258	258	215	301	258	43	43	0	129
Musculium sp.	0	0	0	0	0	0	0	43	0	0	0	0	0	0	43	0	0	0	0	0	0	43
Dreissena polymorpha	0	0	0	0	43	43	0	388	43	646	172	215	560	560	215	172	0	43	0	43	43	47189
Isopoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caecidotea sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	86	0	0	43	43	43	0	43	431
Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus sp.	0	0	43	172	172	86	1206	258	86	388	388	388	215	0	43	43	86	86	0	43	0	129
Hyalella sp.	43	0	43	0	0	0	43	0	0	129	86	0	0	0	0	0	0	0	0	43	0	215
Echinogammarus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	129
Diptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratopogonidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	43	0	0	0	0	0
Chaoboridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaoborus sp.	86	215	43	129	0	258	0	43	43	0	0	43	129	0	86	86	129	215	129	43	215	0
Chironomidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironominae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironomus sp.	474	388	474	904	1550	1033	474	0	0	43	0	0	0	129	0	43	215	344	129	172	86	86
Cladopelma sp.	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus sp.	0	0	0	0	86	86	43	258	0	86	43	129	258	129	172	215	129	215	0	172	172	86
Cryptochironomus digitatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicrotendipes sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Paratanytarsus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanytarsus sp.	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthocladiinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius oliveri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ablabesmyia annulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0
Coelotanypus concinnus	0	0	0	0	0	43	0	1206	1679	43	258	474	689	172	172	344	86	129	215	301	301	43
Conchapelopia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Procladius sp.	258	172	129	172	43	258	43	172	172	86	0	0	215	43	172	86	215	172	86	258	86	215
Total Chironomids	**775**	**560**	**603**	**1076**	**1679**	**1421**	**646**	**1636**	**1851**	**258**	**301**	**603**	**1163**	**474**	**517**	**689**	**646**	**861**	**431**	**904**	**689**	**517**
Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caenis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tricoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ocetis sp.	0	0	0	0	0	0	0	43	0	0	0	43	0	86	0	0	0	0	0	0	0	0
Neureclipsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43

TABLE F-1 (CONTINUED). BENTHIC MACROINVERTEBRATE RESULTS FOR MUSKEGON LAKE, OCTOBER 1999

Taxa	M-10 A	M-10B	M-10C	M-11 A	M-11B	M-11C	M-12 A	M-12B	M-12C	M-13 A	M-13B	M-13C	M-14 A	M-14B	M-14C	M-15 A	M-15B	M-15C	M-16 A	M-16B	M-16C
Turbellaria	215	86	172	43	0	43	43	474	646	0	0	0	517	215	258	0	43	0	86	215	301
Oligochaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbriculidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stylodrilus heringianus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arcteonais lomondi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	0
Dero digitata	43	0	43	0	86	172	388	0	86	43	0	0	0	0	0	0	172	301	0	0	0
Dero flabelliger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Piguetiella michiganensis	0	0	0	0	0	0	0	0	301	0	0	0	0	0	0	0	0	0	0	0	0
Salvina appendulata	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tubificidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aulodrilus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	384	437
Aulodrilus limnobius	57	0	0	264	0	0	107	0	0	0	0	0	127	0	0	0	464	1939	298	0	97
Aulodrilus pigueti	793	470	965	560	853	0	1093	710	1162	0	1125	1120	2545	1116	739	3703	1335	12925	1142	4377	1553
Aulodrilus pluriseta	0	0	0	0	271	867	0	47	0	118	321	0	0	0	0	0	232	3877	0	0	0
Ilyodrilus templetoni	0	0	0	0	0	0	0	95	0	0	0	0	0	0	0	0	0	0	0	0	0
Isocheatides freyi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	223	0	0	0	0
Limnodrilus cervix variant	0	0	0	0	0	77	0	0	0	0	0	1923	0	0	2304	0	0	0	0	0	0
Limnodrilus hoffmeisteri	1808	474	2282	7664	6157	5726	5511	2799	5899	2669	4736	3846	8224	6454	2304	0	0	0	0	0	0
Limnodrilus maumeensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limnodrilus udekemianus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3444	2583	6544
Potamothrix moldaviensis	0	0	0	0	0	0	0	47	0	0	0	0	0	0	0	0	0	0	0	0	0
Quistadrilus multisetosus	227	564	241	1539	853	1929	0	47	0	355	321	0	1591	1339	554	0	580	3877	397	154	194
Limnodrilus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4865	5382	10592	0	0	0
Total Oligochaetes	**2971**	**1508**	**3532**	**10027**	**8220**	**8772**	**7098**	**3746**	**7448**	**3186**	**6503**	**6890**	**12487**	**8909**	**5900**	**8568**	**8389**	**33511**	**5382**	**7583**	**8826**
Polychaeta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manayunkia speciosa	0	43	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0	0
Hirudinea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glossiphoniidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Helobdella stagnalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Helobdella elongata	0	0	0	0	0	129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mollusca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gastropoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amnicola sp.	172	301	43	0	0	0	86	129	129	0	0	0	0	0	0	0	0	0	86	732	344
Bithynia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0
Valvata tricarinata	43	0	86	0	0	0	0	43	43	0	0	0	0	0	0	0	0	86	129	43	43
Valvata sincera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	43	0

TABLE F-1 (CONTINUED). BENTHIC MACROINVERTEBRATE RESULTS FOR MUSKEGON LAKE, OCTOBER 1999

Bivalvia	M-10 A	M-10B	M-10C	M-11 A	M-11B	M-11C	M-12 A	M-12B	M-12C	M-13 A	M-13B	M-13C	M-14 A	M-14B	M-14C	M-15 A	M-15B	M-15C	M-16 A	M-16B	M-16C
Pisidium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	43	0
Sphaerium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Musculium sp.	947	1119	1292	344	172	172	431	215	732	258	0	172	947	215	172	258	775	388	172	388	603
Dreissena polymorpha	646	388	172	258	43	172	86	258	344	215	0	86	861	172	258	0	0	215	43	86	43
Isopoda	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0	0
Caecidotea sp.	129	258	0	43	0	0	15629	63895	43056	0	0	0	0	0	43	0	43	0	9085	3832	3961
Amphipoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0
Hyalella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinogammarus sp.	0	43	86	43	86	0	560	215	732	0	0	0	129	43	0	172	129	215	0	0	0
Diptera	0	0	0	0	0	0	0	0	43	0	0	0	0	0	86	0	0	0	43	0	0
Ceratopogonidae	0	0	0	0	0	0	129	86	86	0	0	0	0	0	0	0	0	0	0	0	0
Probezzia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaoboridae	0	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0
Chaoborus sp.	0	0	43	0	0	0	0	0	0	86	0	43	172	0	0	0	0	0	0	0	0
Chironomidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chironominae	258	344	43	43	86	43	0	0	0	215	0	344	86	0	43	0	172	129	129	0	43
Chironomus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladopelma sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cryptochironomus sp.	0	43	0	215	215	344	86	0	43	344	215	172	172	86	43	689	258	344	431	301	129
Cryptochironomus digitatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicrotendipes sp.	0	0	43	172	172	86	43	43	0	43	86	0	129	172	129	129	0	86	43	43	43
Paratanytarsus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0
Polypedilum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanytarsus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0
Orthocladiinae	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0
Heterotrissocladius oliveri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanypodinae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ablabesmyia annulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0
Coelotanypus concinnus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conchapelopia sp.	0	0	43	0	0	0	0	0	0	43	43	0	43	43	86	0	0	0	0	0	0
Procladius sp.	215	904	301	129	301	129	0	0	0	86	0	43	129	86	43	129	0	0	0	0	0
Total Chironomids	**215**	**947**	**517**	**818**	**990**	**689**	**129**	**172**	**517**	**818**	**431**	**646**	**947**	**517**	**431**	**1033**	**474**	**474**	**517**	**431**	**258**
Ephemeroptera	0	0	129	301	301	129	0	129	388	301	86	431	474	129	129	43	215	0	0	86	86
Caenis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tricoptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ocetis sp.	0	0	0	0	0	0	0	0	86	0	0	0	0	0	0	0	0	0	0	0	0
Neureclipsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0	86	0	43
Pisidium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0