

YAQUINA BAY SEDIMENT EVALUATION
APRIL 1990

Abstract

Based on previous and current studies, and according to CENPP Tiered Testing Guidelines, sediment from the Federal project channel at Yaquina Bay between RM -1.2 and 4.4 is considered acceptable for unconfined open water disposal.

Introduction

1. Yaquina Bay is the fifth largest estuary in Oregon. It is fed by the Yaquina River and its tributaries which drain an area of 253 square miles. Approximately 48,000 to 80,000 cubic yards (cy) of sediment per year are deposited in the bay.

2. The U.S. Army Corps of Engineers is responsible for maintaining a navigation channel in Yaquina Bay, Yaquina River and Depot Slough. In February 1990 public notice was issued describing proposed dredging of sediment from shoals in the federally authorized channel in Yaquina Bay and harbor between RM -1.2 and 4.4 (attachment 1). The authorized entrance channel to Yaquina Bay is 40 feet deep and 400 feet wide from River Mile (RM) -1.2 to 0.0, gradually reducing to a channel 30 feet deep and 300 feet wide from RM 0.0 to 2.0. From RM 2.0 to 2.4 the channel widens into a pear shaped turning basin 900 to 1,200 feet wide and 1,400 feet long. The project also includes a channel 18 feet deep and 200 feet wide from the turning basin to RM 4.4 at Yaquina, Oregon. About 400,000 cy per year is removed by hopper dredge or clamshell dredge and barge. The material is disposed in-water at an ODMDS. The dredging will normally occur between 1 April and 30 October.

3. Previous sediment evaluation studies were conducted in the area in June 1980 and July 1986. Sediments collected in the channel between Yaquina RM 0.0 and 2.8 were compact, had a low porosity, were subangular to subrounded, contained no silt or clay, and less than 1.5 percent volatile solids. Chemical measures of the sediments and elutriates revealed no unusual elevations of metals, pesticides, PCBs or PAHs. The sediment was determined to be acceptable for unconfined open water disposal.

4. Since ocean disposal at the Corps designated 103 site is proposed for the project sediment, the present study was initiated to sample and analyze the sediments from shoal areas of the project to satisfy provisions of section 404 of the Clean Water Act of 1977 and section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA) of 1972.

Methods

5. On 4 April 1990 ten sediment samples were taken with a stainless steel, modified Gray-O'Hare box core along the length of the project channel (attachment 2). All were tested for grain size and volatile solids content. Two samples, YQ-BC-9 and 10 were subjected to chemical analysis for metals, pesticides, PCBs, phenols, polycyclic aromatic hydrocarbons (PAHs), and Total Organic Carbon (TOC). These two samples were in the turning basin part of the project in a low energy area and were fine grained material with a higher organic content. The other eight samples were not tested chemically because they came from high energy areas and were sandy or gravelly material relatively free of fines and organic matter.

6. The physical analysis of samples was performed by CENPD Materials Lab in Troutdale, Oregon. Physical samples were placed in ziplock plastic bags. Chemical analysis of the sediments was performed by Battelle, Pacific Northwest Division, Marine Research Laboratory, Sequim, Washington. To prevent contamination samples were collected using stainless steel, acid rinsed spatulas and were stored in acid cleaned I-Chem glass jars with teflon lined lids. Samples were shipped on ice and cold stored until analysis was performed. Quality control checks were made to insure acceptable analyses.

7. Results of the current study and previously collected data were examined according to CENPP Tiered Testing Guidelines in order to make recommendations regarding disposal options for the material. The Clean Water Act, the Ocean dumping Act, EPA guidelines (40 CFR 230), and Portland District Corps of Engineers guidelines specify that sediment from dredge sites must be evaluated prior to dredging to determine if significant physical, chemical or biological impacts will result from dredging and disposal operations.

Results/Discussion

8. The physical and chemical results are shown in attachment 3. The sediment from the entry channel to the turning basin was composed of medium to coarse sand having a mean grain size of 0.216 mm and a low organic content as measured by a volatile solids of 0.60 % by weight (samples YQ-BC-1,2,3,5,6,7). Samples from within the turning basin were composed of fine sands having a mean grain size of 0.182 mm and a somewhat higher volatile solids of 1.8 % by weight (samples YQ-BC-8,9,10,11). These results are typical of clean sands. When compared to physical and chemical results from the 1980 and 1986 studies there is no reason to believe contamination exists in the sediment and it is acceptable for unconfined in-water disposal.

9. Two samples (YQ-BC-9,10) from within the turning basin underwent chemical analysis because the material was fine grained with a higher organic content. One sample, YQ-BC-9 was composed of 30.3 % silt and had volatile solids of 5.1 %, but the other samples in the turning basin were much lower in volatile solids (attachment 3). This sample was taken from a back water area just upstream from a ship loading dock on the northeast corner of the turning basin. The amount of material to be dredged from this area is small relative to the volume of the whole project. Chemical data from both turning basin samples shows that the concentrations of metals were under established levels of concern. Pesticides, phenols, PCBs were undetected in the two samples. PAHs were detected in one sample (YQ-BC-9) but the total value at 392 ppm was well below concern levels. Three of the "hits" for PAHs in this sample were actually below the detection limits and were estimates of amounts present in the sample.

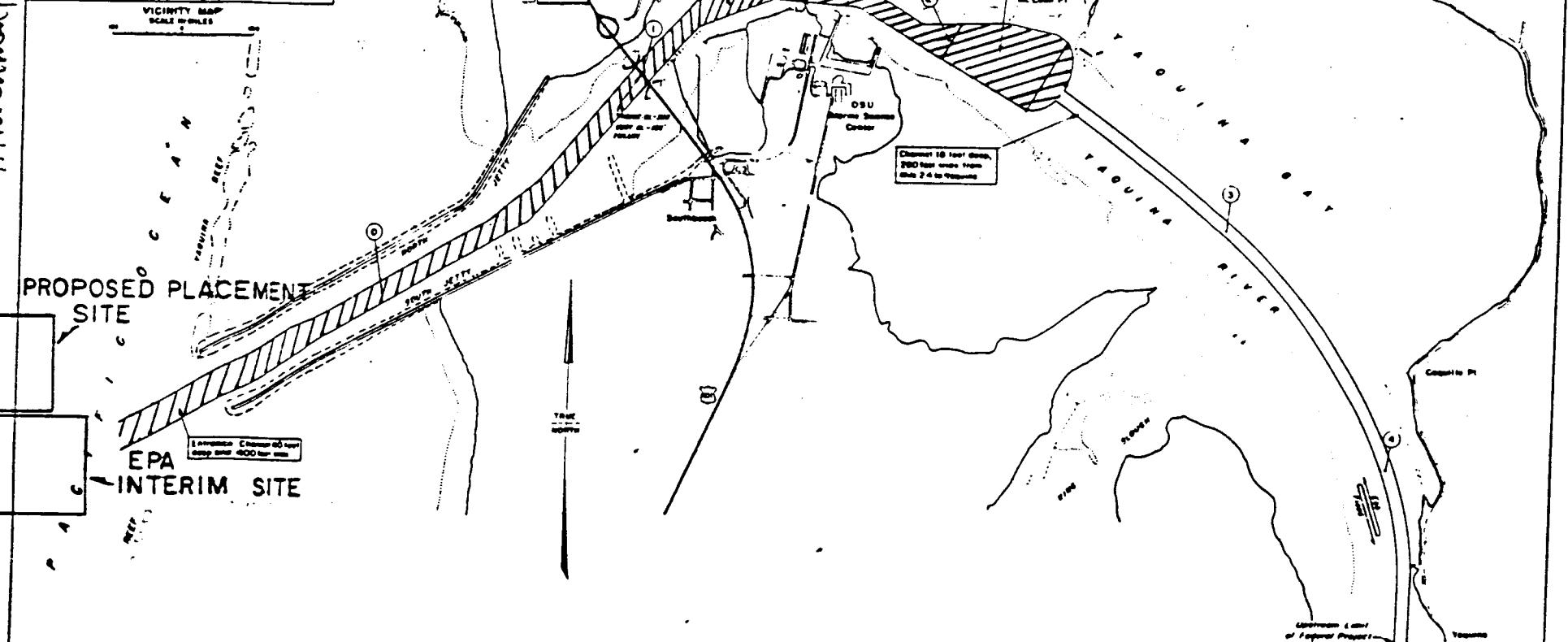
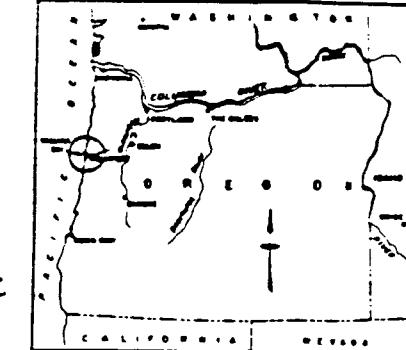
10. Based on the current study and two previous studies, the material within the project area is considered suitable for unconfined open water disposal.

11. This sediment evaluation was prepared by Jim Britton, CENPP-PL-CH, ext 6465. Comprehensive sediment analytical data will be provided upon request.

LEGEND:

**PROPOSED DREDGING
AREA**

1

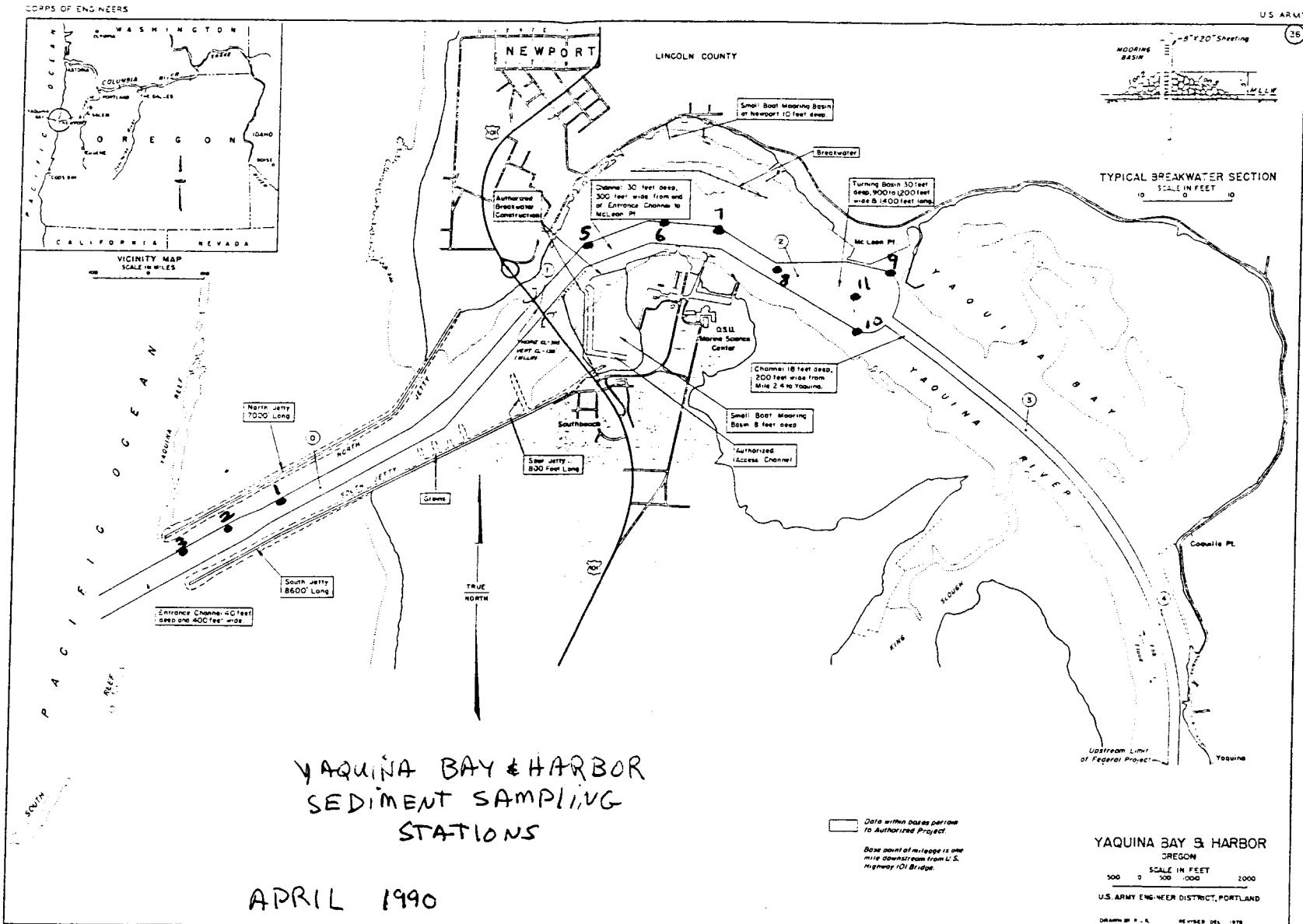


**YAQUINA BAY & HARBOR
PROPOSED MAINTENANCE
DREDGING
LINCOLN COUNTY, OREGON
SHEET 1 of 1**

*Dear Doctor or Senator or
any Congressman from U.S.
representing my State,*

YACQUINA BAY & HARBOR
OREGON

Attachment 2.





DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION MATERIALS LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

Attachment 3.

CENPD-EN-G-L (1110-1-8100c)

19 Apr 90

MEMORANDUM FOR: Commander, Portland District, ATTN: CENPP-PL-CH

SUBJECT: W.O.90-S-173, Report of Sediment Test Results

Project: YAQUINA BAY SEDIMENT

Intended Use: ---

Source of Material: Yaquina Bay, Oregon

Submitted by: CENPP-PL-CH (Slipola)

Date Sampled: --- Date Received: 6 Apr 90

Method of Test or Specification: ASTM, EM 1110-2-1906

Reference: a) DD Form 448, MIPR No. E86-90-0108, dated 9 Mar 90.
b) NPD Form 300, Sample Transmittal, dated 6 Apr 90.

1. Enclosed are:

a. Enclosure 1, one summary sheet, "Results of Dredge Test Analysis," with results for eight sediment samples.

b. Enclosure 2, a-f, fourteen gradation analysis summary sheets.

2. Sample Nos. BC-5 and BC-6 consisted entirely of shells and were not tested.

3. This completes all work requested to date.

Enclosures

JAMES A. PAXTON
Director

Copy Furnished: CENPD-EN-G

YACQUINA BAY SEDIMENTS

Results of Dredge Test Analysis

CENPP Sample No.	Resuspended Density, gms/L	Void Ratio	Volatile Solids, %	Specific Gravity	Particle Roundness Grading
BC-1	1902	0.83	0.6	2.65	subangular to subround
BC-2	1923	0.80	0.7	2.66	subangular to subround
BC-3	1934	0.77	0.6	2.65	subangular to subround
BC-5		NO TESTS -	SAMPLE CONSISTED ENTIRELY OF SHELLS		
BC-6		NO TESTS -	SAMPLE CONSISTED ENTIRELY OF SHELLS		
BC-7	1912	0.84	0.5	2.68	subangular to subround
BC-8	1903	0.86	0.5	2.68	subangular to subround
BC-9	1518	2.15	5.1	2.63	subangular to subround
BC-10	1809	1.13	1.2	2.72	subangular to subround
BC-11	1922	0.86	0.4	2.72	subangular to subround

* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 1 Depth: -- Lab No.: 17101

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	77.90	0.0
No. 18	0.10	99.9
No. 35	0.70	99.1
No. 60	3.20	95.9
No. 120	28.00	64.1
No. 230	48.00	38.4
Pan	77.90	0.0

----- Hydrometer Analysis -----

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	25.6	0.0466	33.2
3	20.0	18.6	0.0282	24.3
10	20.0	14.1	0.0158	18.6
100	20.0	8.7	0.0067	11.7
200	20.0	7.7	0.0047	10.4

P.W. 1.2

D85: 0.19 D60: 0.11 D50: .089 D30: .039 D15: .011 mm

Gravel: 0.0%

Sand: 56.2%

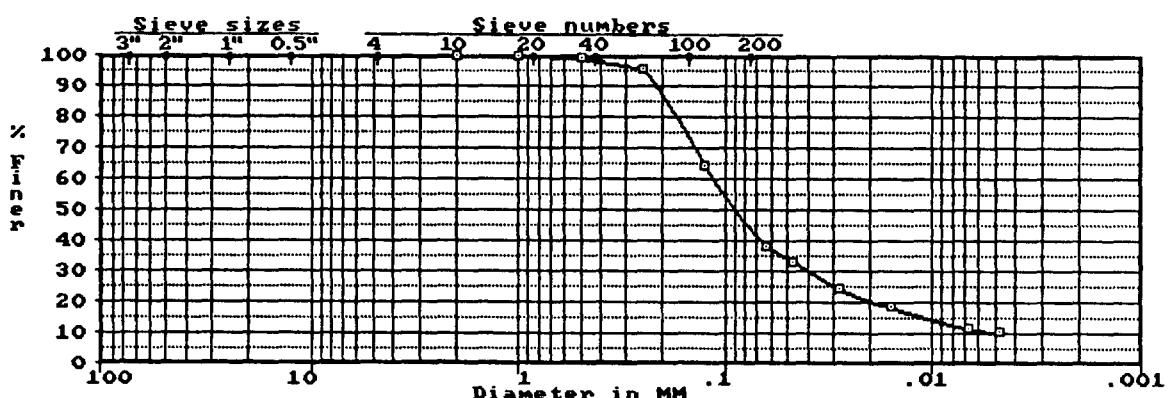
Fines: 43.8%

----- Comments -----

- VOLATILE SOLIDS = 9.6%

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 2 Depth: -- Lab No.: 17102

Sieve Analysis			Hydrometer Analysis				
Sieve	Cumulative Grams Retained	Percent Passing	Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0	1	20.0	25.6	0.0466	43.1
2.5 In.	0.00	100.0	3	20.0	20.1	0.0279	34.0
1.25 In.	0.00	100.0	10	20.0	14.1	0.0158	24.1
5/8 In.	0.00	100.0	100	20.0	7.7	0.0067	13.5
5/16 In.	0.00	100.0	200	20.0	6.7	0.0048	11.9
No. 5	0.00	100.0					
No. 10	0.00	100.0					
Pan	60.00	0.0					
No. 18	0.10	99.8					
No. 35	1.80	97.0					
No. 60	5.20	91.3					
No. 120	18.40	69.3					
No. 230	30.60	49.0					
Pan	60.00	0.0					

Rm 12

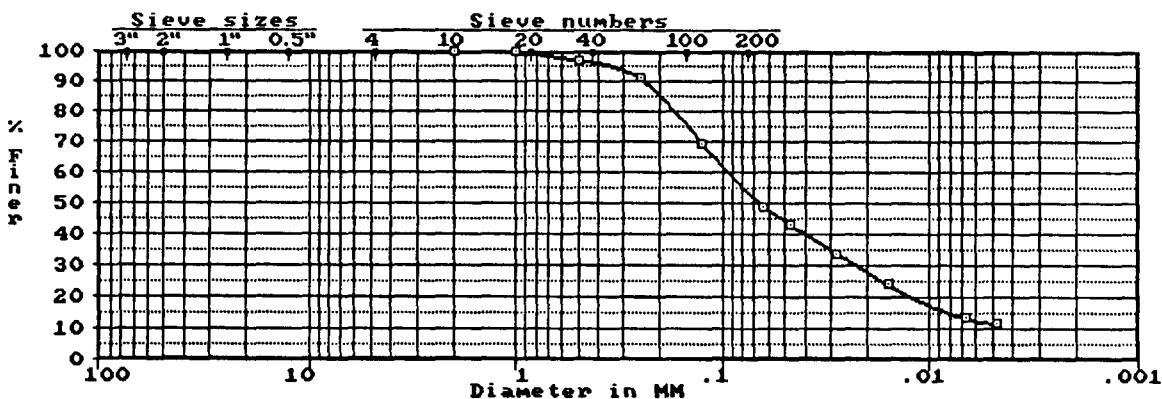
D85: 0.20 D60: .093 D50: .065 D30: .022 D15: .0079 mm
 Gravel: 0.0% Sand: 46.4% Fines: 53.6%

Comments

- VOLATILE SOLIDS - 17.0%

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 3 Depth: -- Lab No.: 17103

Sieve Analysis			Hydrometer Analysis					
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight: 80.4 gr.	Start Time: 0000	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0			1	20.0	19.6	0.0485 24.7
2.5 In.	0.00	100.0			3	20.0	17.1	0.0284 21.7
1.25 In.	0.00	100.0			10	20.0	13.1	0.0159 16.7
5/8 In.	0.00	100.0			100	20.0	7.7	0.0067 10.1
5/16 In.	0.00	100.0			200	20.0	5.7	0.0048 7.6
No. 5	0.00	100.0						
No. 10	0.00	100.0						
Pan	80.40	0.0						
No. 18	0.00	100.0						
No. 35	0.10	99.9						
No. 60	7.50	90.7						
No. 120	47.80	40.5						
No. 230	58.80	26.9						
Pan	80.40	0.0						

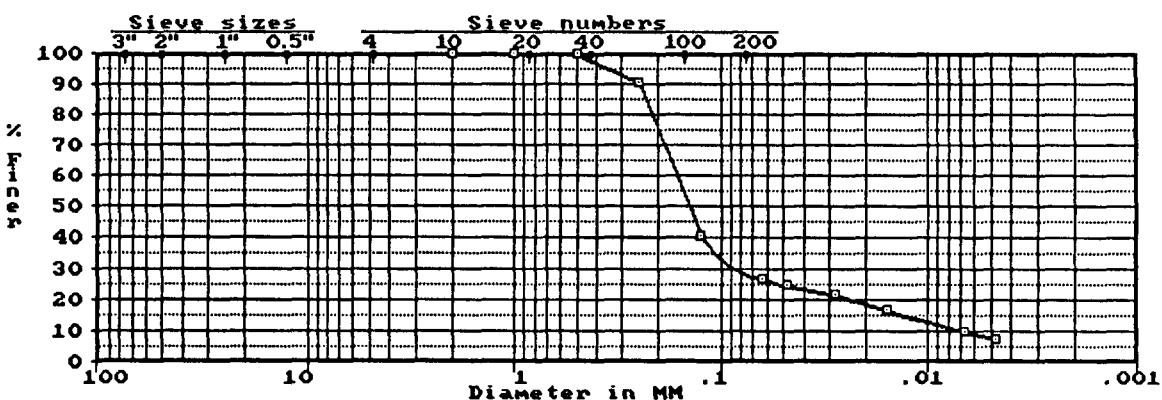
D85: 0.23 D60: 0.16 D50: 0.14 D30: .085 D15: .013 D10: .0066 mm
 Cu: 24.6 Cc: 6.74

Gravel: 0.0% Sand: 71.9% Fines: 28.1%

Comments

- VOLATILE SOLIDS - 3.2%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 4 Depth: -- Lab No.: 17104

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	91.40	0.0
No. 18	0.10	99.9
No. 35	0.20	99.8
No. 60	5.10	94.4
No. 120	71.80	21.4
No. 230	77.90	14.8
Pan	91.40	0.0

----- Hydrometer Analysis -----

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	12.9	0.0505	14.5
3	20.0	11.9	0.0293	13.4
10	20.0	9.9	0.0162	11.3
100	20.0	5.4	0.0068	6.4
200	20.0	4.5	0.0048	5.4

Hm 1.2

$\chi = 0.151$

D85: 0.23 D60: 0.18 D50: 0.16 D30: 0.14 D15: .064 D10: .013 mm
 Cu: 13.8 Cc: 7.84

Gravel: 0.0%

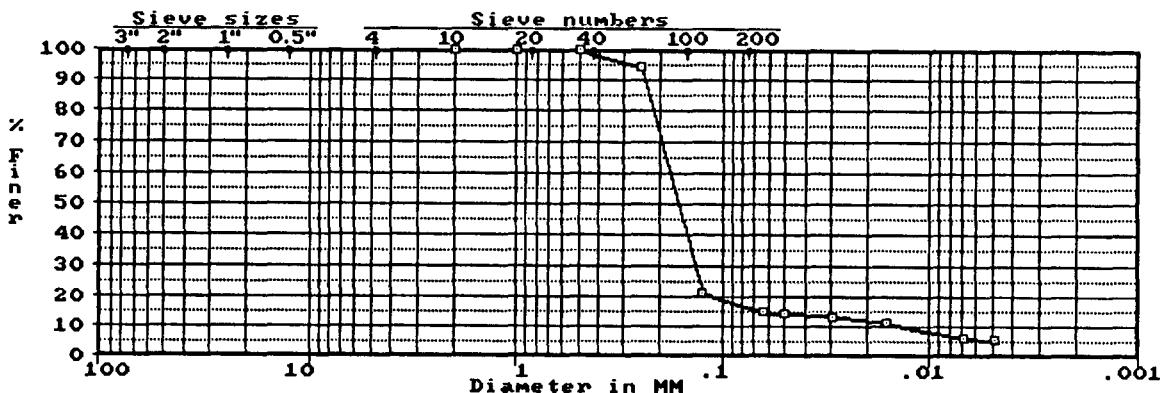
Sand: 83.5%

Fines: 16.5%

----- Comments -----

- VOLATILE SOLIDS - 2.4%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YACQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 5 Depth: -- Lab No.: 17105

----- Sieve Analysis -----

Sieve No.	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	81.00	0.0
No. 18	0.10	99.9
No. 35	0.40	99.5
No. 60	2.30	97.2
No. 120	52.20	35.6
No. 230	67.40	16.8
Pan	81.00	0.0

----- Hydrometer Analysis -----

Sample Weight: 81. gr.	Start Time: 0000			
Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	11.9	0.0508	15.2
3	20.0	9.4	0.0297	12.1
10	20.0	7.4	0.0165	9.7
100	20.0	4.9	0.0068	6.6
200	20.0	4.0	0.0048	5.5

Rm 1.6

X = 0.140

D85: 0.22 D60: 0.16 D50: 0.15 D30: 0.11 D15: .049 D10: .018 mm

Cu: 9.09 Cc: 4.21

Gravel: 0.0%

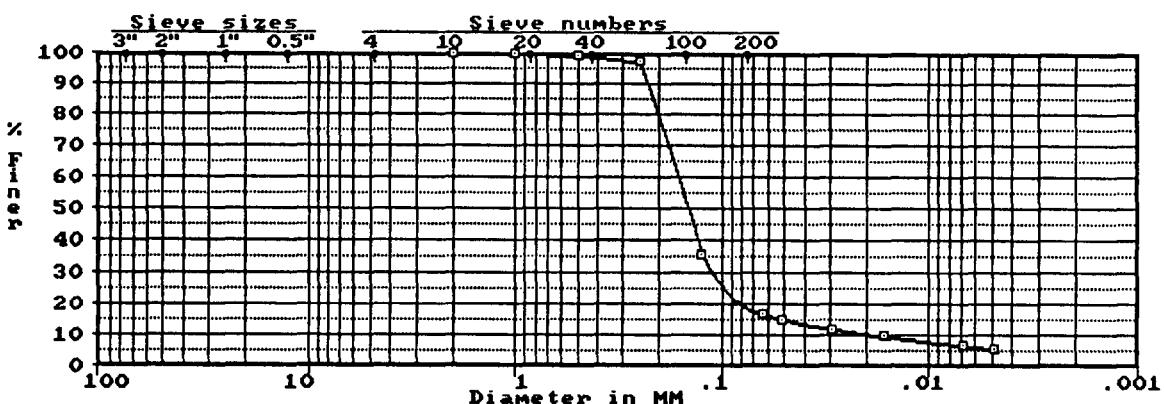
Sand: 81.4%

Fines: 18.6%

----- Comments -----

- VOLATILE SOLIDS = 2.8%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 6 Depth: -- Lab No.: 17106

----- Sieve Analysis -----

Sieve No.	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	72.60	0.0
No. 18	0.00	100.0
No. 35	0.20	99.7
No. 60	4.20	94.2
No. 120	47.50	34.6
No. 230	60.70	16.4
Pan	72.60	0.0

----- Hydrometer Analysis -----

Sample Weight: 72.6 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	10.4	0.0512	14.9
3	20.0	8.9	0.0298	12.8
10	20.0	6.9	0.0165	10.1
100	20.0	4.4	0.0068	6.7
200	20.0	3.0	0.0049	4.8

$$\bar{x} = 0.141$$

Rm 1.6

D85: 0.22 D60: 0.17 D50: 0.15 D30: 0.11 D15: .052 D10: .016 mm

Cu: 10.4 Cc: 4.78

Gravel: 0.0%

Sand: 81.9%

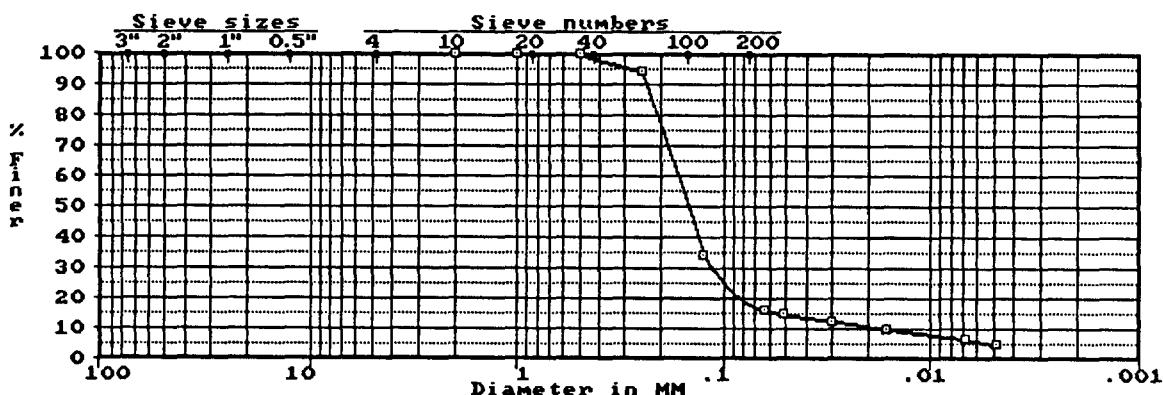
Fines: 18.1%

----- Comments -----

- VOLATILE SOLIDS = 3.4%

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 7 Depth: -- Lab No.: 17107

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	58.20	91.1	
5/16 In.	250.10	61.8	
No. 5	376.40	42.6	
No. 10	432.90	33.9	
Pan	655.40	0.0	W.M. 1.7
No. 18	6.80	31.8	
No. 35	18.20	28.3	
No. 60	53.10	17.5	
No. 120	95.40	4.3	
No. 230	99.70	3.0	
Pan	109.30	0.0	X- (433)

D85: 13.6 D60: 7.60 D50: 5.48 D30: 0.64 D15: 0.22 D10: 0.17 mm

Cu: 43.7 Cc: 0.31

Gravel: 53.6%

Sand: 43.1%

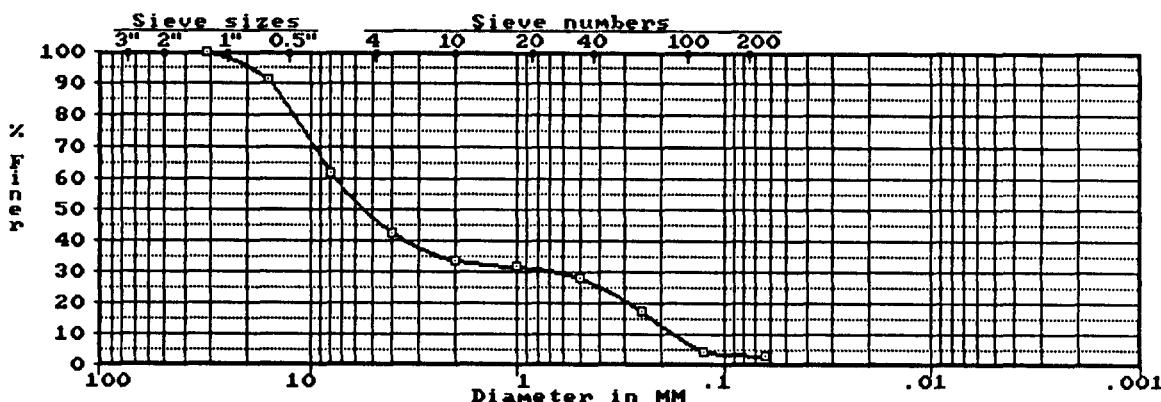
Fines: 3.3%

----- ASTM D 2487 Classification -----

GP Poorly graded GRAVEL with sand

----- Comments -----

- VOLATILE SOLIDS = 2.4%
- BOX CORE SAMPLE



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 8 Depth: -- Lab No.: 17108

Sieve Analysis			Hydrometer Analysis				
Sieve	Cumulative Grams Retained	Percent Passing	Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0	1	20.0	13.4	0.0503	20.2
2.5 In.	0.00	100.0	3	20.0	10.4	0.0296	15.8
1.25 In.	0.00	100.0	10	20.0	7.9	0.0164	12.2
5/8 In.	0.00	100.0	100	20.0	4.9	0.0068	7.9
5/16 In.	0.00	100.0	200	20.0	3.5	0.0049	5.8
No. 5	0.00	100.0					
No. 10	0.00	100.0					
Pan	68.10	0.0					
No. 18	0.00	100.0					
No. 35	0.10	99.9					
No. 60	2.90	95.7					
No. 120	38.40	43.6					
No. 230	53.30	21.7					
Pan	68.10	0.0					

D85: 0.21 D60: 0.15 D50: 0.14 D30: .091 Cu: 14.7 D15: .026 Cc: 5.18 D10: .010 mm

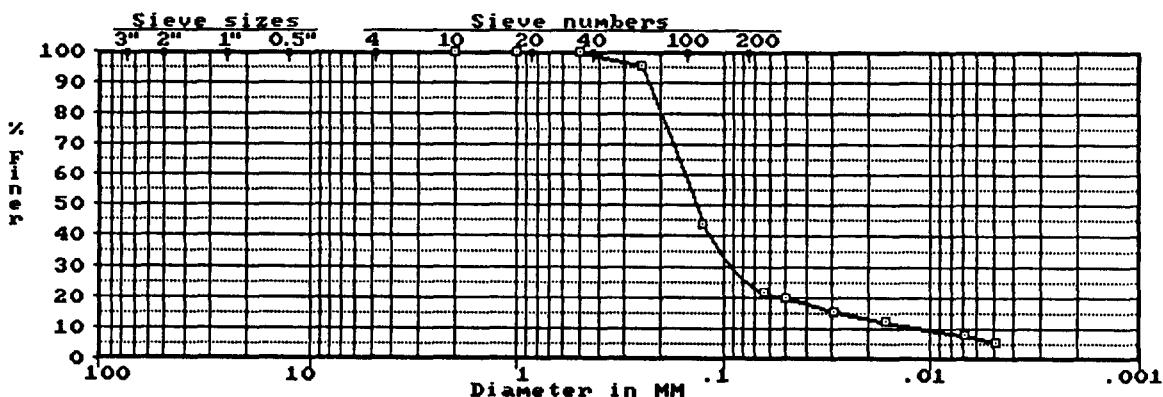
Gravel: 0.0% Sand: 75.4% Fines: 24.6%

Comments

- VOLATILE SOLIDS - 3.6%

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 9 Depth: -- Lab No.: 17109

Sieve Analysis			Hydrometer Analysis						
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight: 69.5 gr.	Start Time: 0000	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer	
5 In.	0.00	100.0			1	20.0	41.3	0.0414	59.5
2.5 In.	0.00	100.0			3	20.0	31.3	0.0259	45.3
1.25 In.	0.00	100.0			10	20.0	22.8	0.0150	33.2
5/8 In.	0.00	100.0			100	20.0	12.9	0.0065	19.1
5/16 In.	0.00	100.0			200	20.0	10.5	0.0047	15.7
No. 5	0.00	100.0							
No. 10	0.00	100.0							
Pan	69.50	0.0							Rm 2 ✓
No. 18	0.00	100.0							
No. 35	0.10	99.9							
No. 60	1.40	98.0							
No. 120	6.50	90.6							
No. 230	20.90	69.9							
Pan	69.50	0.0							

D85: 0.10 D60: .042 D50: .030 D30: .013 mm

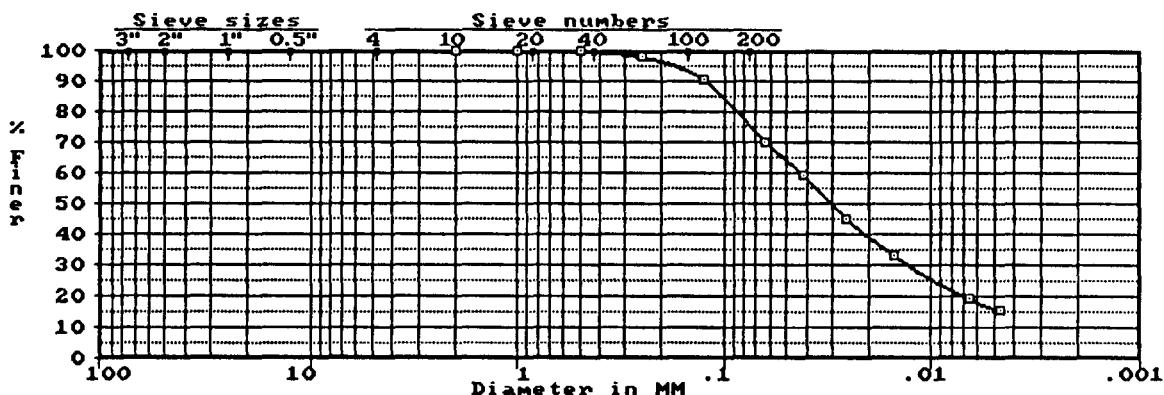
Gravel: 0.0% Sand: 24.4% Fines: 75.6%

Comments

- VOLATILE SOLIDS - 11.1%

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 10 Depth: -- Lab No.: 17110

Sieve Analysis			Hydrometer Analysis				
Sieve	Cumulative Grams Retained	Percent Passing	Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0	1	20.0	18.3	0.0489	18.2
2.5 In.	0.00	100.0	3	20.0	14.3	0.0289	14.3
1.25 In.	0.00	100.0	10	20.0	11.8	0.0161	11.9
5/8 In.	0.00	100.0	100	20.0	7.4	0.0067	7.7
5/16 In.	0.00	100.0	200	20.0	6.5	0.0048	6.8
No. 5	0.00	100.0					
No. 10	0.00	100.0					
Pan	102.20	0.0					
No. 18	0.10	99.9					
No. 35	0.50	99.5					
No. 60	2.10	97.9					
No. 120	56.60	44.6					
No. 230	81.60	20.2					
Pan	102.20	0.0					

$\bar{x} = 0.124$

Pn: Gr. 2

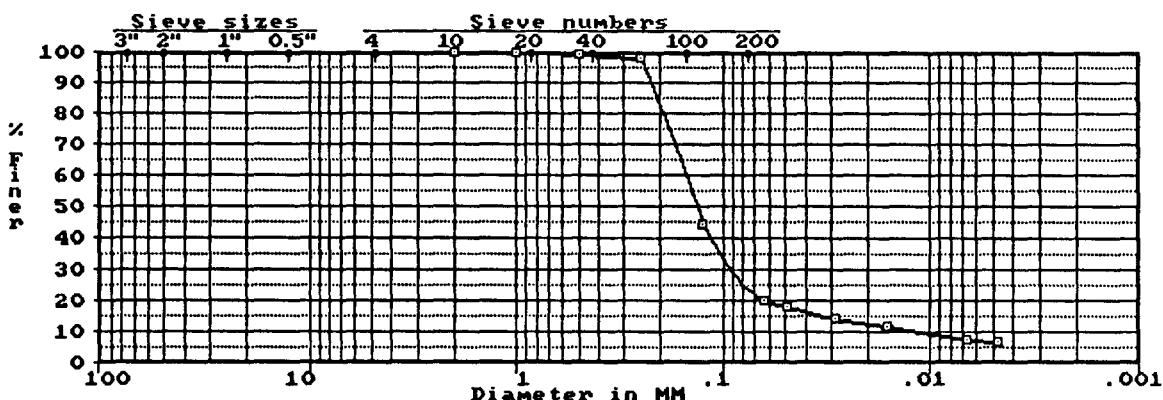
D85: 0.21 D60: 0.15 D50: 0.13 D30: .091 D15: .032 D10: .011 mm
Cu: 13.6 Cc: 5.00

Gravel: 0.0% Sand: 76.2% Fines: 23.8%

Comments

- VOLATILE SOLIDS = 4.0%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 11 Depth: -- Lab No.: 17111

----- Sieve Analysis -----

Cumulative

Sieve	Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	0.00	100.0	
5/16 In.	0.00	100.0	
No. 5	0.00	100.0	Rm 3.9
No. 10	0.00	100.0	
Pan	197.50	0.0	
No. 18	0.90	99.5	
No. 35	7.20	96.4	
No. 60	129.60	34.4	
No. 120	183.50	7.1	
No. 230	193.70	1.9	X = 0.30
Pan	197.50	0.0	

D85: 0.44 D60: 0.33 D50: 0.29 D30: 0.23 D15: 0.17 D10: 0.14 mm

Cu: 2.31 Cc: 1.15

Gravel: 0.0%

Sand: 96.8%

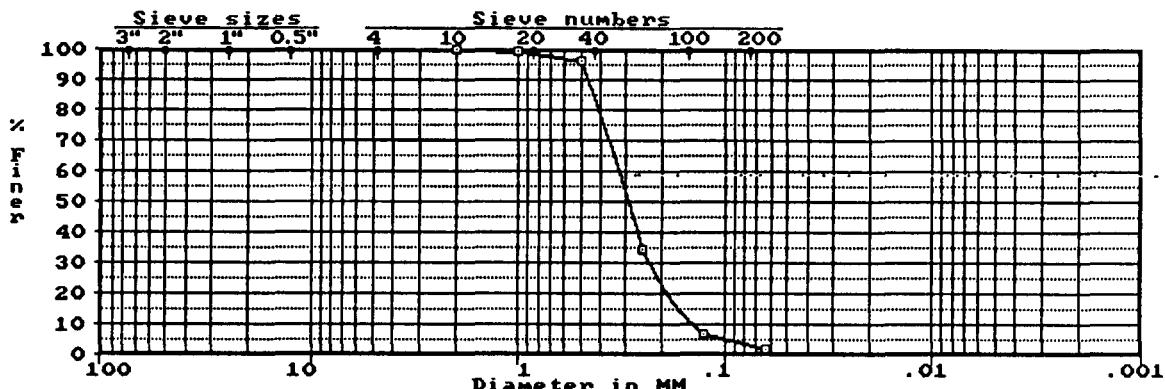
Fines: 3.2%

----- ASTM D 2487 Classification -----

SP Poorly graded SAND

----- Comments -----

- VOLATILE SOLIDS = 2.4%
- BOX CORE SAMPLE



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 12 Depth: -- Lab No.: 17112

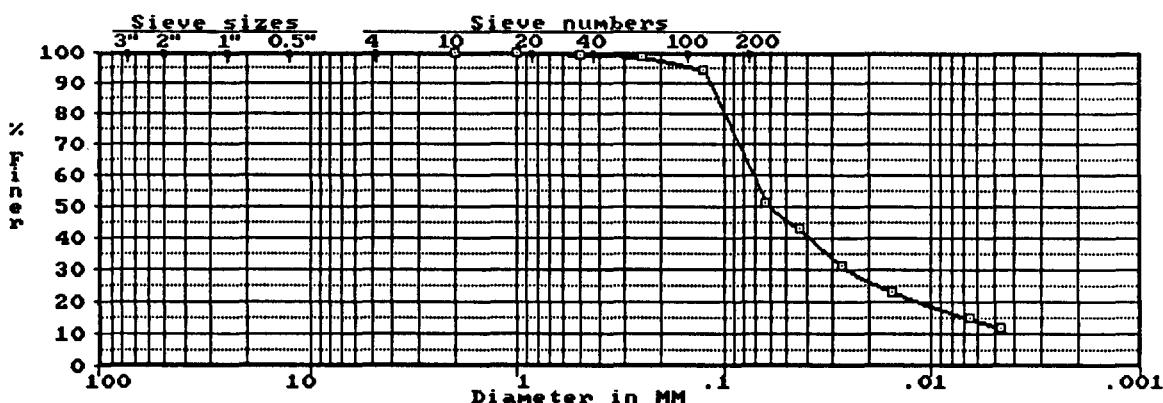
Sieve Analysis			Hydrometer Analysis					
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight: 82.3 gr.	Start Time: 0000	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0			1	20.0	35.4	0.0434
2.5 In.	0.00	100.0			3	20.0	25.4	0.0270
1.25 In.	0.00	100.0			10	20.0	18.9	0.0154
5/8 In.	0.00	100.0			100	20.0	11.9	0.0066
5/16 In.	0.00	100.0			200	20.0	9.5	0.0047
No. 5	0.00	100.0						43.2
No. 10	0.00	100.0						31.2
Pan	82.30	0.0						
No. 18	0.10	99.9						
No. 35	0.30	99.6						
No. 60	1.00	98.8						
No. 120	4.50	94.5						
No. 230	39.90	51.5						
Pan	82.30	0.0						

D85: 0.11 D60: .072 D50: .060 D30: .025 D15: .0066 mm
 Gravel: 0.0% Sand: 37.4% Fines: 62.6%

Comments

- VOLATILE SOLIDS - 7.2%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 13 Depth: -- Lab No.: 17113

Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	0.00	100.0	
5/16 In.	0.00	100.0	
No. 5	0.00	100.0	
No. 10	0.00	100.0	
Pan	124.30	0.0	R
No. 18	0.10	99.9	
No. 35	0.60	99.5	
No. 60	17.90	85.6	
No. 120	96.90	22.0	
No. 230	111.90	10.0	
Pan	124.30	0.0	$\bar{x} = 0.168$

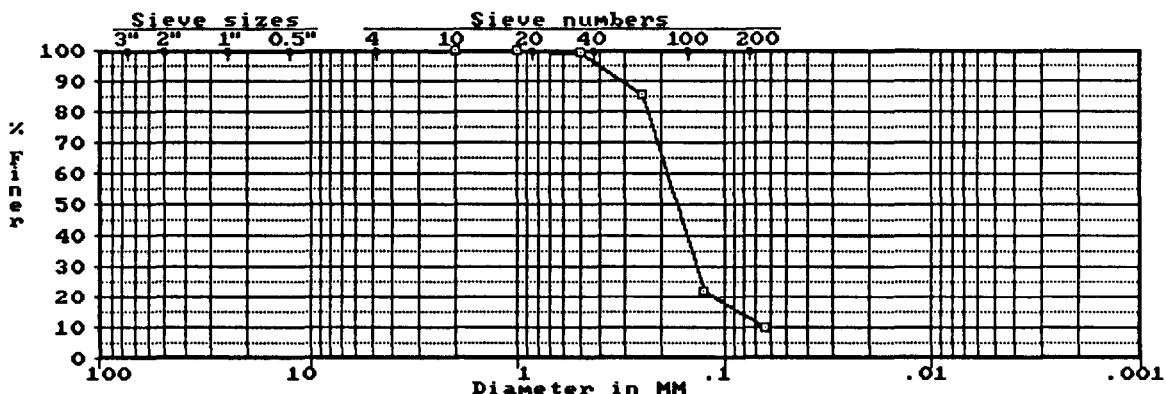
D85: .25 D60: .19 D50: .17 D30: .14 D15: .084 D10: .063 mm
Cu: 3.01 Cc: 1.56

Gravel: 0.0% Sand: 86.9% Fines: 13.1%

Comments

- VOLATILE SOLIDS - 2.0%
 - BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: EPA 14 Depth: -- Lab No.: 17114

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	51.30	0.0
No. 18	0.00	100.0
No. 35	0.30	99.4
No. 60	1.30	97.5
No. 120	15.10	70.6
No. 230	32.20	37.2
Pan	51.30	0.0

----- Hydrometer Analysis -----

Time	Sample Weight: 51.3 gr.	Start Time: 0000		
(C)	Temp	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	16.4	0.0494	32.6
3	20.0	12.4	0.0292	24.9
10	20.0	9.4	0.0163	19.1
100	20.0	5.6	0.0068	11.8
200	20.0	5.0	0.0048	10.6

Rm 2.6

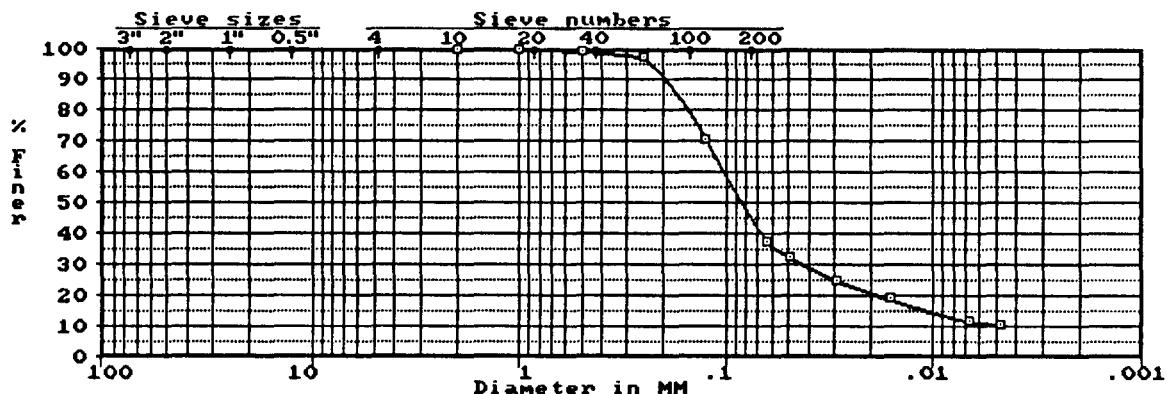
X = 0.368

D85: 0.17 D60: 0.10 D50: .084 D30: .042 D15: .011 mm
Gravel: 0.0% Sand: 55.4% Fines: 44.6%

----- Comments -----

- VOLATILE SOLIDS - 6.6%
- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-1 Depth: -- Lab No.: 17115

----- Sieve Analysis -----

Cumulative

Sieve	Grams Retained	Percent Passing
5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	0.00	100.0
No. 5	0.00	100.0
No. 10	0.00	100.0
Pan	66.00	0.0
No. 18	0.00	100.0
No. 35	0.10	99.8
No. 60	4.50	93.2
No. 120	65.50	0.8
No. 230	66.00	0.0
Pan	66.00	0.0

No hydrometer analysis.

Rn. O.1

X-2487

D85: 0.24 D60: 0.20 D50: 0.18 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.46 Cc: 0.93

Gravel: 0.0%

Sand: 99.8%

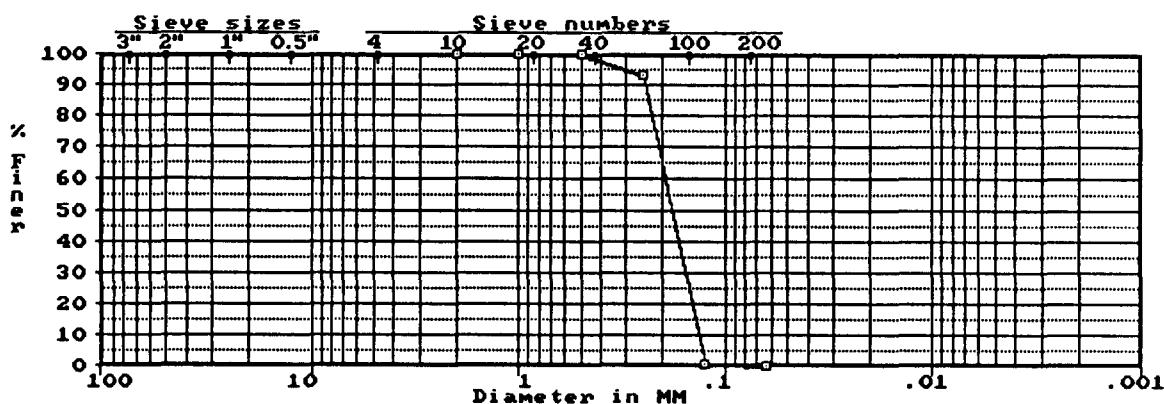
Fines: 0.2%

----- ASTM D 2487 Classification -----

SP Poorly graded SAND

----- Comments -----

- BOX CORE SAMPLE



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-2 Depth: -- Lab No.: 17116

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Cumulative Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	0.00	100.0	
5/16 In.	0.00	100.0	
No. 5	0.00	100.0	
No. 10	0.00	100.0	
Pan	107.90	0.0	Rm = 0.1
No. 18	0.10	99.9	
No. 35	0.70	99.4	
No. 60	8.20	92.4	
No. 120	107.10	0.7	X = 0.187
No. 230	107.80	0.1	
Pan	107.90	0.0	

D85: 0.24 D60: 0.20 D50: 0.18 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.46 Cc: 0.93

Gravel: 0.0%

Sand: 99.7%

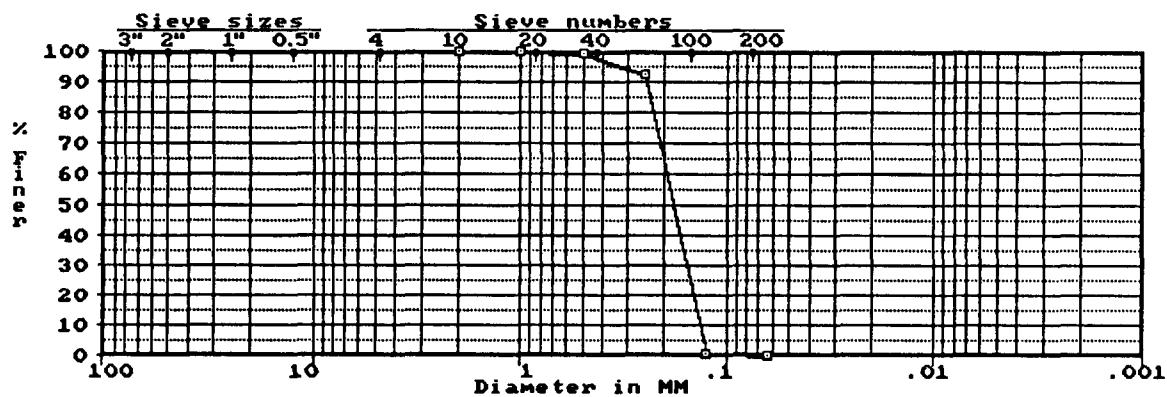
Fines: 0.3%

----- ASTM D 2487 Classification -----

SP Poorly graded SAND

----- Comments -----

- BOX CORE SAMPLE



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-3 Depth: -- Lab No.: 17117

----- Sieve Analysis -----

Cumulative

Sieve	Grams Retained	Percent Passing
.5 In.	0.00	100.0
2.5 In.	0.00	100.0
1.25 In.	0.00	100.0
5/8 In.	0.00	100.0
5/16 In.	1.60	99.8
No. 5	3.90	99.6
No. 10	7.80	99.2
Pan	991.20	0.0
No. 18	2.60	97.2
No. 35	10.20	91.2
No. 60	63.90	49.0
No. 120	122.80	2.7
No. 230	126.20	0.1
Pan	126.30	0.0

No hydrometer analysis.

Rm = 0.2

$$\bar{X} = 0.283$$

D85: 0.44 D60: 0.29 D50: 0.25 D30: 0.19 D15: 0.16 D10: 0.14 mm

Cu: 2.04 Cc: 0.91

Gravel: 0.3%

Sand: 98.9%

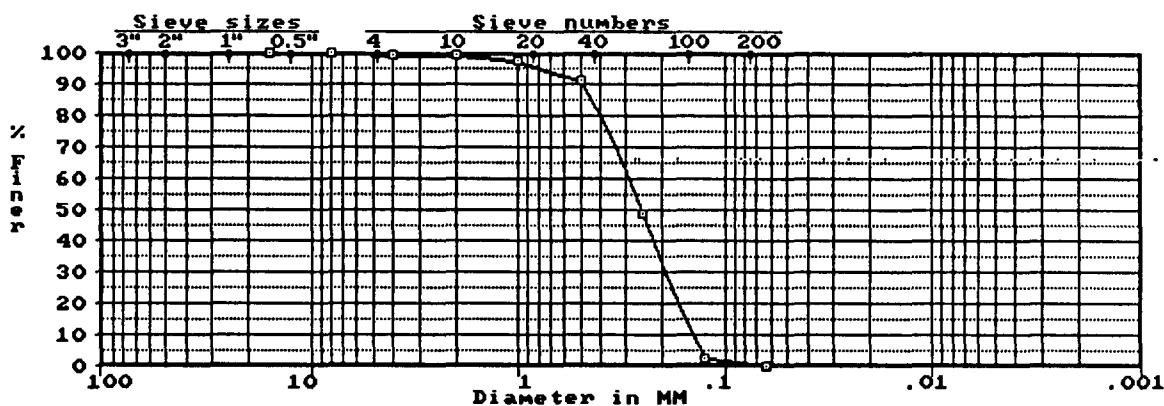
Fines: 0.8%

----- ASTM D 2487 Classification -----

SP Poorly graded SAND

----- Comments -----

- BOX CORE SAMPLE



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-5 Depth: -- Lab No.: 17118

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	0.0	
2.5 In.	0.00	0.0	
1.25 In.	0.00	0.0	
5/8 In.	0.00	0.0	
5/16 In.	0.00	0.0	
No. 5	0.00	0.0	Rm 1.3
No. 10	0.00	0.0	
Pan	0.00	0.0	
No. 18	0.00	0.0	
No. 35	0.00	0.0	
No. 60	0.00	0.0	
No. 120	0.00	0.0	
No. 230	0.00	0.0	
Pan	0.00	0.0	

----- Gravel: 0.0

----- Comments -----

- SAMPLE CONSISTED ENTIRELY OF 502 GRAMS OF SHELLS - NO SEDIMENT

-

No sieve analysis, cumulative weight retained for final pan is 0

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YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-6 Depth: -- Lab No.: 17119

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Cumulative Percent Passing	No hydrometer analysis.
5 In.	0.00	0.0	
2.5 In.	0.00	0.0	
1.25 In.	0.00	0.0	
5/8 In.	0.00	0.0	
5/16 In.	0.00	0.0	
No. 5	0.00	0.0	
No. 10	0.00	0.0	
Pan	0.00	0.0	
No. 18	0.00	0.0	
No. 35	0.00	0.0	
No. 60	0.00	0.0	
No. 120	0.00	0.0	
No. 230	0.00	0.0	
Pan	0.00	0.0	

----- Gravel: 0.0

----- Comments -----

- SAMPLE CONSISTED ENTIRELY OF 518 GRAMS OF SHELLS - NO SEDIMENT

-

-

No sieve analysis, cumulative weight retained for final pan is 0

Rm / S

* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-7 Depth: -- Lab No.: 17120

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	0.00	100.0	
5/16 In.	0.00	100.0	
No. 5	0.00	100.0	
No. 10	0.00	100.0	
Pan	132.00	0.0	
No. 18	2.00	98.5	
No. 35	5.70	95.7	
No. 60	41.30	68.7	
No. 120	124.70	5.5	
No. 230	131.60	0.3	
Pan	132.00	0.0	X = 0.23

D85: 0.34 D60: 0.23 D50: 0.21 D30: 0.17 D15: 0.14 D10: 0.13 mm

Cu: 1.73 Cc: 0.91

Gravel: 0.0%

Sand: 98.4%

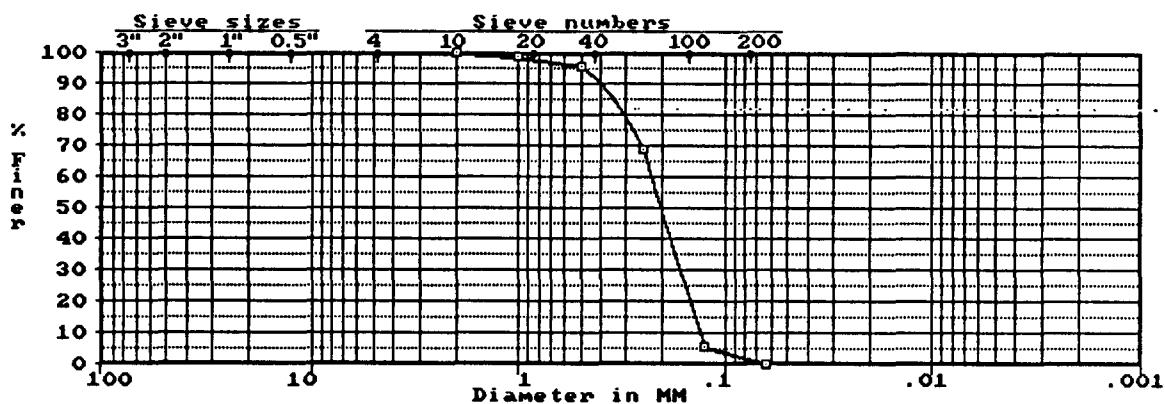
Fines: 1.6%

----- ASTM D 2487 Classification -----

SP Poorly graded SAND

----- Comments -----

- BOX CORE SAMPLE



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-8 Depth: -- Lab No.: 17121

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	0.00	100.0	
5/16 In.	0.00	100.0	
No. 5	0.00	100.0	
No. 10	0.00	100.0	
Pan	129.30	0.0	Xn 2.0
No. 18	0.30	99.8	
No. 35	1.30	99.0	
No. 60	36.80	71.5	
No. 120	121.40	6.1	
No. 230	128.90	0.3	X = 0.22
Pan	129.30	0.0	

D85: 0.32 D60: 0.22 D50: 0.20 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.71 Cc: 0.91

Gravel: 0.0%

Sand: 98.2%

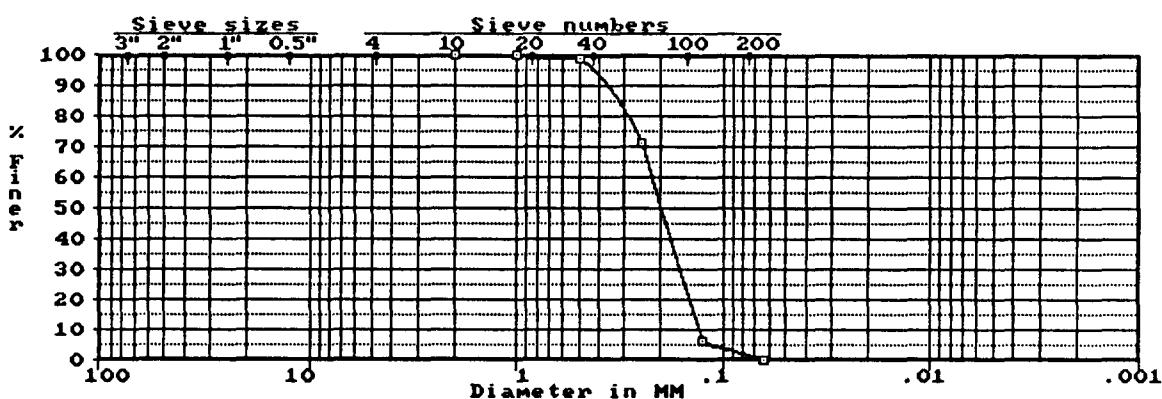
Fines: 1.8%

----- ASTM D 2487 Classification -----

SP Poorly graded SAND

----- Comments -----

- BOX CORE SAMPLE



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

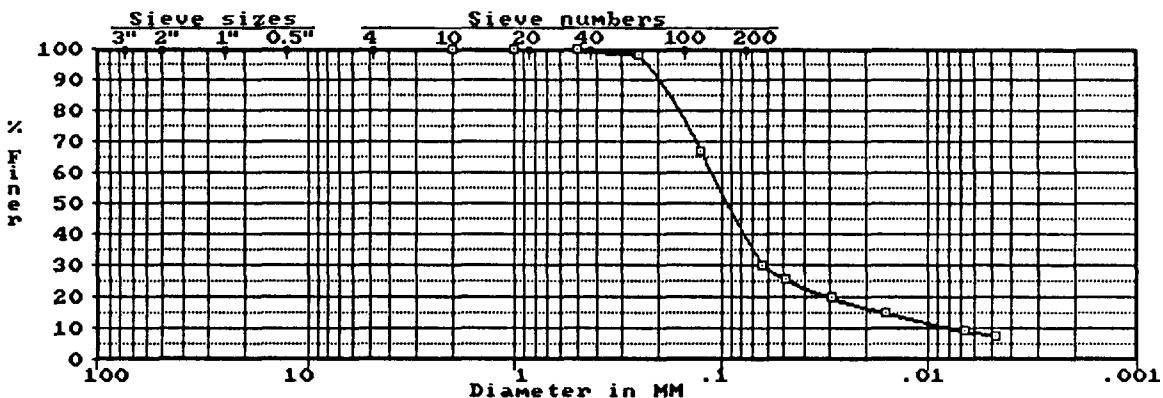
Boring: -- Sample: BC-9 Depth: -- Lab No.: 17122

Sieve Analysis			Hydrometer Analysis					
Sieve	Cumulative Grams Retained	Percent Passing	Sample Weight: 66.3 gr.	Start Time: 0000	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
5 In.	0.00	100.0		1	20.0	16.7	0.0493	25.7
2.5 In.	0.00	100.0		3	20.0	12.7	0.0292	19.7
1.25 In.	0.00	100.0		10	20.0	9.7	0.0163	15.2
5/8 In.	0.00	100.0		100	20.0	5.7	0.0068	9.3
5/16 In.	0.00	100.0		200	20.0	4.7	0.0048	7.8
No. 5	0.00	100.0						
No. 10	0.00	100.0						
Pan	66.30	0.0						
No. 18	0.00	100.0						
No. 35	0.20	99.7						
No. 60	1.10	98.3						
No. 120	22.10	66.7						
No. 230	46.20	30.3						
Pan	66.30	0.0	X = 0.097					
D85: 0.18	D60: 0.11	D50: .094	D30: .062	D15: .016	D10: .0077 mm			
		Cu: 14.7	Cc: 4.51					
Gravel: 0.0%		Sand: 61.8%		Fines: 38.2%				

Comments

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-10 Depth: -- Lab No.: 17123

----- Sieve Analysis -----

Sieve	Cumulative Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	0.00	100.0	
5/16 In.	0.00	100.0	
No. 5	0.40	100.0	
No. 10	5.50	99.4	Rm 1.4
Pan	896.40	0.0	X = 0.28
No. 18	1.30	98.1	
No. 35	3.70	95.8	
No. 60	30.30	69.7	
No. 120	91.50	9.9	
No. 230	98.00	3.5	
Pan	101.60	0.0	

D85: 0.34 D60: 0.23 D50: 0.20 D30: 0.16 D15: 0.13 D10: 0.13 mm

Cu: 1.80 Cc: 0.91

Gravel: 0.0%

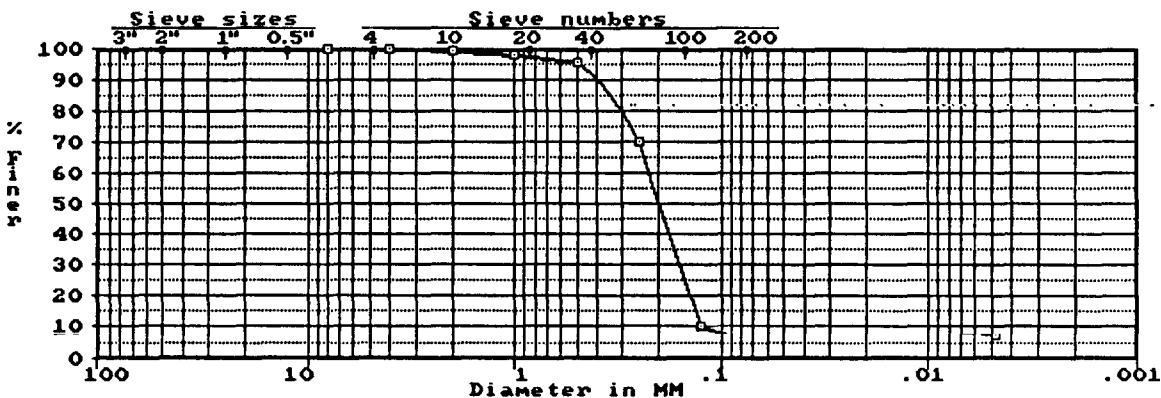
Sand: 94.9%

Fines: 5.1%

----- Comments -----

- BOX CORE SAMPLE

Cannot classify soil without knowing type of fines.



* * * Corps of Engineers - North Pacific Division Materials Laboratory * * *

YAQUINA BAY SEDIMENTS (90-S-171)

Boring: -- Sample: BC-11 Depth: -- Lab No.: 17124

----- Sieve Analysis -----

Cumulative

Sieve	Grams Retained	Percent Passing	No hydrometer analysis.
5 In.	0.00	100.0	
2.5 In.	0.00	100.0	
1.25 In.	0.00	100.0	
5/8 In.	0.00	100.0	
5/16 In.	0.00	100.0	
No. 5	0.00	100.0	
No. 10	0.00	100.0	
Pan	112.80	0.0	
No. 18	0.10	99.9	
No. 35	0.40	99.6	
No. 60	11.80	89.5	
No. 120	108.80	3.5	
No. 230	112.60	0.2	
Pan	112.80	0.0	

$\bar{x} = 0.187$

D85: 0.24 D60: 0.20 D50: 0.18 D30: 0.16 D15: 0.14 D10: 0.13 mm

Cu: 1.50 Cc: 0.92

Gravel: 0.0%

Sand: 99.0%

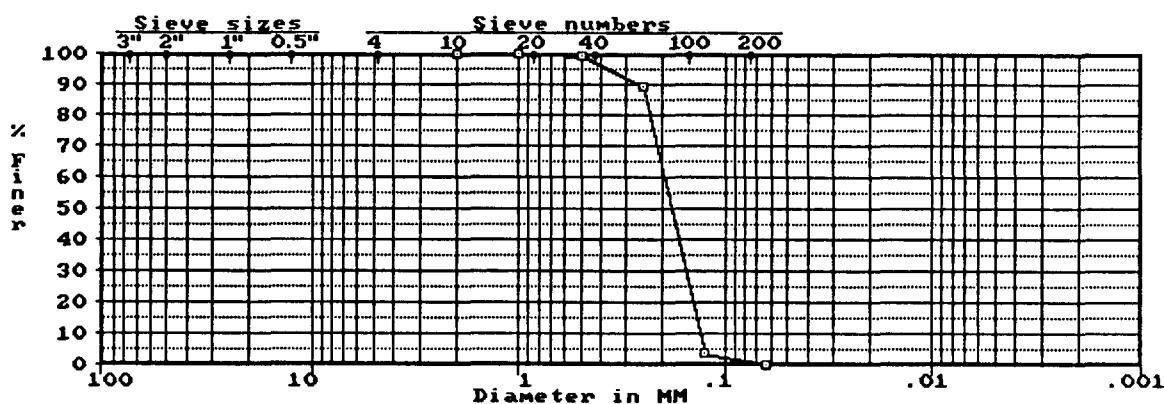
Fines: 1.0%

----- ASTM D 2487 Classification -----

SP Poorly graded SAND

----- Comments -----

- BOX CORE SAMPLE



TOC data for samples submitted by
Battelle Pacific N.W.

----- TOC* (weight %) -----

2.18	G-2	5011-1*	3.47	3.16	3.08	3.00
2.80	G-3 Comp	5011-2*	2.64	2.95	2.78	2.83
2.83	G-6	5011-3*	2.67	2.35	2.18	2.55
2.75	YQ-BC 10	5011-4*	0.26	0.24	0.26	
	YQ-BC 9	5011-5*	2.37	2.43	3.10	2.19

2.57

Yataguana Bay

1-2-9

Organotin Results

Butyltin Studies - *SEDIMENT* Samples

Sample Submittal Date or Group Code Number

COE

Date 5/7/70

Technician Tom Fortner

ACID VOLATILE SULFIDE RESULTS
Portland COE

<u>Sample ID</u>	<u>Sulfide Concentration (micromoles/gram)</u>
YQ EPA 2	70.32±1.63
YQ EPA 3	24.96±1.46
YQ EPA 6	2.96
YQ EPA 8	12.25
YQ EPA 9	13.27
YQ BC 9	4.09
YQ EPA 10	0.06
YQ BC 10	1.30
YQ EPA 11	0.84
YQ EPA 12	1.48
YQ EPA 13	1.10
YQ EPA 14	2.65
ANALYTICAL BLANK	ND
DETECTION LIMIT	0.03

μM/g

ANALYSIS COMPLETED 5/18/90

ID number: YQ-BC 9
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	9.4 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.135 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	41.0 mg/kg-dry		SWN	ICP
7440-50-8	Copper	14.1 mg/kg-dry		SWN	ICP
7439-92-1	Lead	4.4 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.05 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	29 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	55.6 mg/kg-dry		SWN	ICP

Lab Sample ID: 6130 A
Matrix: Soil

Sample No.: YQ-BC9

Consultants

333 Ninth Ave. North
Seattle, WA 98109-5187
(206) 621-6490
(206) 621-7523 (FAX)

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10

BOA-37PR-121909&PR121910

VTSR: 04/18/90

Date Extracted: 04/27/90

GPC Cleanup: No

Date Analyzed: 05/10/90

Alumina Cleanup: Yes

Conc/Dil Factor: 1:20

Sulfur Cleanup: No

Dry Weight: 17.9 grams

CAS Number**µg/kg**

319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

*** Pesticide Surrogate Recovery**

Dibutylchloroendate	76%
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Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET**Semi-volatiles by Methods 625/8270**

Lab ID: 6130A
 Matrix: Soils/Sediments

Sample No: YQ-BC9

Chemists &
Consultants

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

333 Ninth Ave. North
 Seattle, WA 98109-5187
 (206) 821-8490
 (206) 821-7523 (FAX)

Date Release Authorized:

Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 17.9 gm (Dry Weight)

Percent Moisture: 40.8%

pH: 8.0

Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number	µg/Kg	
108-95-2	Phenol	220U	83-32-9	Acenaphthene	110U
111-44-4	bis(2-Chloroethyl)Ether	110U	51-28-5	2,4-Dinitrophenol	1100U
95-57-8	2-Chlorophenol	110U	100-02-7	4-Nitrophenol	560U
541-73-1	1,3-Dichlorobenzene	110U	132-64-9	Dibenzofuran	110U
106-46-7	1,4-Dichlorobenzene	110U	121-14-2	2,4-Dinitrotoluene	560U
100-51-6	Benzyl Alcohol	560U	606-20-2	2,6-Dinitrotoluene	560U
95-50-1	1,2-Dichlorobenzene	110U	84-66-2	Diethylphthalate	110U
95-48-7	2-Methylphenol	110U	7005-72-3	4-Chlorophenyl-phenylether	110U
108-60-1	bis(2-chloroisopropyl)Ether	110U	86-73-7	Fluorene	110U
106-44-5	4-Methylphenol	110U	100-01-6	4-Nitroaniline	560U
54-7	N-Nitroso-Di-n-Propylamine	110U	534-52-1	4,6-Dinitro-2-Methylphenol	1100U
77-1	Hexachloroethane	220U	86-30-6	N-Nitrosodiphenylamine(1)	110U
75-3	Nitrobenzene	110U	101-55-3	4-Bromophenyl-phenylether	110U
78-59-1	Isophorone	110U	118-74-1	Hexachlorobenzene	110U
86-75-5	2-Nitrophenol	560U	87-86-5	Pentachlorophenol	560U
105-67-9	2,4-Dimethylphenol	220U	85-01-8	Phenanthrene	130
65-85-0	Benzoic Acid	1100U	120-12-7	Anthracene	110U
111-91-1	bis(2-Chloroethoxy)Methane	110U	84-74-2	Di-n-Butylphthalate	110U
120-83-2	2,4-Dichlorophenol	340U	206-44-0	Fluoranthene	100J
120-82-1	1,2,4-Trichlorobenzene	110U	129-00-0	Pyrene	67J
91-20-3	Naphthalene	110U	85-68-7	Butylbenzylphthalate	110U
106-47-8	4-Chloroaniline	340U	91-94-1	3,3'-Dichlorobenzidine	560U
87-68-3	Hexachlorobutadiene	220U	56-55-3	Benzo(a)Anthracene	110U
59-50-7	4-Chloro-3-Methylphenol	220U	117-81-7	bis(2-Ethylhexyl)Phthalate	110U
91-57-6	2-Methylnaphthalene	110U	218-01-9	Chrysene	95J
77-47-4	Hexachlorocyclopentadiene	560U	117-84-0	Di-n-Octyl Phthalate	110U
88-06-2	2,4,6-Trichlorophenol	560U	206-99-2	Benzo(b)Fluoranthene	110U
95-95-4	2,4,5-Trichlorophenol	560U	207-08-9	Benzo(k)Fluoranthene	110U
91-58-7	2-Chloronaphthalene	110U	50-32-8	Benzo(a)Pyrene	110U
88-74-4	2-Nitroaniline	560U	193-39-5	Indeno(1,2,3-cd)Pyrene	110U
131-11-3	Dimethyl Phthalate	110U	53-70-3	Dibenz(a,h)Anthracene	110U
208-96-8	Acenaphthylene	110U	191-24-2	Benzo(ghi)Perylene	110U
99-09-2	3-Nitroaniline	560U	(1) Cannot be separated from diphenylamine		

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	53.8%
2-Fluorobiphenyl	75.1%
d14-p-Terphenyl	73.1%

***Acid surrogate recoveries**

d5-Phenol	67.9%
2-Fluorophenol	60.9%
2,4,6-Tribromo-	67.9%

ID number: YQ-BC 10
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	6.1 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.07 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	16.8 mg/kg-dry		SWN	ICP
7440-50-8	Copper	4.3 mg/kg-dry		SWN	ICP
7439-92-1	Lead	1.57 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry	U	SOM	CVA
7440-02-0	Nickel	11 mg/kg-dry		SW	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	22.1 mg/kg-dry		SWN	ICP

Consultant

Lab Sample ID: 6130B
 Matrix: Soil

Sample No.: YQ-BC10

333 Ninth Ave. North
 Seattle, WA 98109-5167
 (206) 621-6490
 (206) 621-7523 (FAX)

Data Release Authorized: *Pete M. Kyle*
 DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
 Project: Batch No. 9&10
 BOA-37PR-121909&PR121910
 VTSR: 04/18/90

Date Extracted: 04/27/90
 Date Analyzed: 05/10/90
 Conc/Dil Factor: 1:20
 Dry Weight: 24.4 grams

GPC Cleanup: No
 Alumina Cleanup: Yes
 Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchloroendate	65%
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Data Qualifiers

- U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 61308

Matrix: Soils/Sediments

Chemists & Consultants

300 Ninth Ave. North
Seattle, WA 98109-5187
(206) 521-8490
(206) 521-7523 (FAX)Date Release Authorized: John W. Lammel
Report prepared 05/17/90 MAC:8

Sample No: YQ-BC10

QC Report No: 6130 - Battelle
Project No: Batch No 9 & 10
VTSR: 04/18/90Date extracted: 04/27/90
Analyzed (FINN 2): 05/15/90
GPC Clean-up: NO (1 or 2)Sample Wt: 24.4 gm (Dry Weight)
Percent Moisture: 24.0%
pH: 8.0
Conc/Dilution: 1 to 1

CAS Number

μg/Kg CAS Number

μg/Kg

108-95-2	Phenol	160U
111-44-4	bis(2-Chloroethyl)Ether	82U
95-57-8	2-Chlorophenol	82U
541-73-1	1,3-Dichlorobenzene	82U
106-46-7	1,4-Dichlorobenzene	82U
100-51-6	Benzyl Alcohol	410U
95-50-1	1,2-DichloroBenzene	82U
95-48-7	2-Methoxyphenol	82U
111-00-1	bis(2-chloroisopropyl)Ether	82U
106-44-5	4-Methylphenol	82U
621-64-7	N-Nitroso-Di-n-Propylamine	82U
67-72-1	Hexachloroethane	-
98-95-3	Nitrobenzene	82U
78-59-1	isophorone	82U
88-75-5	2-Nitrophenol	410U
106-67-9	2,4-Dimethylphenol	160U
65-85-0	Benzoic Acid	820U
111-91-1	bis(2-Chloroethyl)ether	82U
120-83-2	2,4-Dichlorophenol	250U
120-82-1	1,2,4-Trichlorobenzene	82U
91-20-3	Naphthalene	82U
106-47-8	4-Chloroaniline	250U
87-68-3	Hexachlorobutadiene	160U
59-50-7	4-Chloro-3-Methylphenol	160U
91-57-6	2-Methylnaphthalene	82U
77-47-4	Hexachlorocyclopentadiene	410U
88-06-2	2,4,6-Trichlorophenol	410U
95-95-4	2,4,5-Trichlorophenol	410U
91-58-7	2-Chloronaphthalene	82U
88-74-4	2-Nitroaniline	410U
131-11-3	Dimethyl Phthalate	82U
208-96-8	Acenaphthylene	82U
99-09-2	3-Nitroaniline	410U

83-32-9	Acenaphthene	82U
51-28-5	2,4-Dinitrophenol	820U
100-02-7	4-Nitrophenol	410U
132-64-9	Dibenzofuran	82U
121-14-2	2,4-Dinitrotoluene	410U
606-20-2	2,6-Dinitrotoluene	410U
84-66-2	Diethylphthalate	82U
7005-72-3	4-Chlorophenyl-phenylether	82U
86-73-7	Fluorene	82U
100-01-6	4-Nitroaniline	410U
534-52-1	4,6-Dinitro-2-Methylphenol	320U
86-30-6	N-Nitrosodiphenylamine(1)	82U
101-55-3	4-Bromophenyl-phenylether	82U
118-74-1	Hexachlorobenzene	82U
87-86-5	Pentachlorophenol	410U
85-01-8	Phenanthrene	32U
120-12-7	Anthracene	32U
84-74-2	Di-n-Butylphthalate	82U
206-44-0	Fluoranthene	82U
129-00-0	Pyrene	82U
85-68-7	Butylbenzyl Phthalate	82U
91-94-1	3,3'-Dichloro-aziridine	410U
56-55-3	Benzo(a)Anthracene	82U
117-81-7	bis(2-Ethylhexyl)Phthalate	82U
218-01-9	Chrysene	32U
111-84-0	Di-n-Octyl Phthalate	82U
205-99-2	Benzo(b)Fluoranthene	82U
207-08-9	Benzo(k)Fluoranthene	82U
50-32-8	Benzo(a)Perylene	82U
193-39-5	Indeno(1,2,3-cd)Perylene	82U
53-70-3	Dibenz(a,h)Anthracene	82U
191-24-2	Benzo(ghi)Perylene	82U

(1) Cannot be separated from alphenyls.

*Base/neutral surrogate recoveries

d5-Nitrobenzene	51.3%
2-Fluorobiphenyl	65.5%
d14-p-Terphenyl	74.1%

*Acid surrogate recoveries

d5-Phenol	60.4%
2-Fluorophenol	57.1%
2,4,6-Tribromo	65.7%

Entered 9-6-89
in Lab

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 2
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	21.8 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.702 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	49.2 mg/kg-dry		SWN	ICP
7440-50-8	Copper	23.8 mg/kg-dry		SWN	ICP
7439-92-1	Lead	14.7 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	36 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.6 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	81.7 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130F
 Matrix: Soil

Sample No.: YQ-EPA-2

Data Release Authorized: *Derek Kyle*
 DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
 Project: Batch No. 9&10
 BOA-37PR-121909&PR121910
 VTSR: 04/18/90

Date Extracted: 04/27/90
 Date Analyzed: 05/10/90
 Conc/Dil Factor: 1:20
 Dry Weight: 12.9 grams

GPC Cleanup: No
 Alumina Cleanup: Yes
 Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	6.0U
319-85-7	Beta-BHC	6.0U
319-86-8	Delta-BHC	9.0U
58-89-9	Gamma-BHC (Lindane)	6.0U
76-44-8	Heptachlor	6.0U
309-00-2	Aldrin	6.0U
1024-57-3	Heptachlor Epoxide	6.0U
959-98-8	Endosulfan I	6.0U
60-57-1	Dieldrin	12U
72-55-9	4,4'-DDE	12U
72-20-8	Endrin	12U
33212-65-9	Endosulfan II	12U
72-54-8	4,4'-DDD	12U
1031-07-8	Endosulfan Sulfate	24U
50-29-3	4,4'-DDT	12U
72-43-5	Methoxychlor	24U
53494-70-5	Endrin Ketone	18U
5103-74-2	Gamma-Chlordane	9.0U
5103-71-9	Alpha-Chlordane	9.0U
8001-35-2	Toxaphene	900U
-	Aroclor-1242/1016	120U
12672-29-6	Aroclor-1248	120U
11097-69-1	Aroclor-1254	120U
11096-82-5	Aroclor-1260	120U

* Pesticide Surrogate Recovery

Dibutylchlorendate	78%
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Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130F
Matrix: Soils/Sediments

Sample No: YQ - EPA2

QC Report No: 6130 - Battelle
Project No: Batch No 9 & 10
VTSR: 04/18/90

Date Release Authorized: John P. Reiter
Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
Analyzed (FINN 2): 05/16/90
GPC Clean-up: YES (1 of 2)

Sample Wt: 12.9 gm (Dry Weight)

Percent Moisture: 61.7%

pH: 8.0

Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number		µg/Kg	
108-95-2	Phenol	480	83-32-9	Acenaphthene	160U	
111-44-4	bis(2-Chloroethyl)Ether	160U	51-28-5	2,4-Dinitrophenol	1600U	
95-57-8	2-Chlorophenol	160U	100-02-7	4-Nitrophenol	780U	
541-73-1	1,3-Dichlorobenzene	160U	132-64-9	Dibenzofuran	160U	
106-46-7	1,4-Dichlorobenzene	160U	121-14-2	2,4-Dinitrotoluene	780U	
100-51-6	Benzyl Alcohol	780U	606-20-2	2,6-Dinitrotoluene	780U	
95-50-1	1,2-Dichlorobenzene	160U	84-66-2	Diethylphthalate	160U	
95-48-7	2-Methylphenol	160U	7005-72-3	4-Chlorophenyl-phenylether	160U	
108-60-1	bis(2-chloroisopropyl)Ether	160U	86-73-7	Fluorene	160U	
106-44-5	4-Methylphenol	170	100-01-6	4-Nitroaniline	780U	
521-64-7	N-Nitroso-Di-n-Propylamine	160U	534-52-1	4,6-Dinitro-2-Methylphenol	1600U	
7-72-1	Hexachloroethane	310U	86-30-6	N-Nitrosodiphenylamine(1)	160U	
98-95-3	Nitrobenzene	160U	101-55-3	4-Bromophenyl-phenylether	160U	
78-59-1	Isophorone	160U	118-74-1	Hexachlorobenzene	160U	
88-75-5	2-Nitrophenol	780U	87-86-5	Pentachlorophenol	780U	
105-67-9	2,4-Dimethylphenol	310U	85-01-8	Phenanthrene	160U	
65-85-0	Benzoic Acid	1600U	120-12-7	Anthracene	160U	
111-91-1	bis(2-Chloroethoxy)Methane	160U	84-74-2	Di-n-Butylphthalate	160U	
120-83-2	2,4-Dichlorophenol	470U	206-44-0	Fluoranthene	270	
120-82-1	1,2,4-Trichlorobenzene	160U	129-00-0	Pyrene	170	
91-20-3	Naphthalene	160U	85-68-7	Butylbenzylphthalate	160U	
106-47-8	4-Chloroaniline	470U	91-94-1	3,3'-Dichlorobenzidine	780U	
87-68-3	Hexachlorobutadiene	310U	56-55-3	Benzo(a)Anthracene	160U	
59-50-7	4-Chloro-3-Methylphenol	310U	117-81-7	bis(2-Ethylhexyl)Phthalate	750	
91-57-6	2-Methylnaphthalene	160U	218-01-9	Chrysene	120J	
77-47-4	Hexachlorocyclopentadiene	780U	117-84-0	Di-n-Octyl Phthalate	160U	
88-06-2	2,4,6-Trichlorophenol	780U	205-99-2	Benzo(b)Fluoranthene	160U	
95-95-4	2,4,5-Trichlorophenol	780U	207-08-9	Benzo(k)Fluoranthene	160U	
91-58-7	2-Chloronaphthalene	160U	50-32-8	Benzo(a)Pyrene	160U	
88-74-4	2-Nitroaniline	780U	193-39-5	Indeno(1,2,3-cd)Pyrene	160U	
131-11-3	Dimethyl Phthalate	160U	53-70-3	Dibenz(a,h)Anthracene	160U	
208-96-8	Acenaphthylene	160U	191-24-2	Benzo(ghi)Perylene	160U	
99-09-2	3-Nitroaniline	780U	(1) Cannot be separated from diphenylamine			

*Base/neutral surrogate recoveries

d5-Nitrobenzene	69.0%
2-Fluorobiphenyl	83.4%
d14-p-Terphenyl	81.5%

*Acid surrogate recoveries

d5-Phenol	76.2%
2-Fluorophenol	76.4%
2,4,6-Tribromophenol	82.0%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 3
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	8.7 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.456 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	32.0 mg/kg-dry		SWN	ICP
7440-50-8	Copper	14.0 mg/kg-dry		SWN	ICP
7439-92-1	Lead	6.73 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.03 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	22 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	52.1 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130G
 Matrix: Soil

Sample No.: TQ-EPA 3

Data Release Authorized: *[Signature]*
 DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
 Project: Batch No. 9&10
 BOA-37PR-121909&PR121910
 VTSR: 04/18/90

Date Extracted: 04/27/90
 Date Analyzed: 05/10/90
 Conc/Dil Factor: 1:20
 Dry Weight: 19.1 grams

GPC Cleanup: No
 Alumina Cleanup: Yes
 Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchlorendate	76%
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Data Qualifiers

- U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130G
 Matrix: Soils/Sediments

Sample No: YQ - EPA3

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: John T. Reber
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 19.1 gm (Dry Weight)
 Percent Moisture: 38.6%
 pH: 7.7
 Conc/Dilution: 1 to 1

CAS Number

µg/Kg

CAS Number

µg/Kg

108-95-2	Phenol	120 M
111-44-4	bis(2-Chloroethyl)Ether	100 U
95-57-8	2-Chlorophenol	100 U
541-73-1	1,3-Dichlorobenzene	100 U
106-46-7	1,4-Dichlorobenzene	100 U
100-51-6	Benzyl Alcohol	520 U
95-50-1	1,2-Dichlorobenzene	100 U
95-48-7	2-Methylphenol	100 U
108-60-1	bis(2-chloroisopropyl)Ether	100 U
106-44-5	4-Methylphenol	100 U
521-64-7	N-Nitroso-Di-n-Propylamine	100 U
7-72-1	Hexachloroethane	210 U
98-95-3	Nitrobenzene	100 U
78-59-1	Isophorone	100 U
88-75-5	2-Nitrophenol	520 U
105-67-9	2,4-Dimethylphenol	210 U
65-85-0	Benzoic Acid	1000 U
111-91-1	bis(2-Chloroethoxy)Methane	100 U
120-83-2	2,4-Dichlorophenol	310 U
120-82-1	1,2,4-Trichlorobenzene	100 U
91-20-3	Naphthalene	100 U
106-47-8	4-Chloroaniline	310 U
87-68-3	Hexachlorobutadiene	210 U
59-50-7	4-Chloro-3-Methylphenol	210 U
91-57-6	2-Methylnaphthalene	100 U
77-47-4	Hexachlorocyclopentadiene	520 U
88-06-2	2,4,6-Trichlorophenol	520 U
95-95-4	2,4,5-Trichlorophenol	520 U
91-58-7	2-Chloronaphthalene	100 U
88-74-4	2-Nitroaniline	520 U
131-11-3	Dimethyl Phthalate	100 U
208-96-8	Acenaphthylene	100 U
99-09-2	3-Nitroaniline	520 U

83-32-9	Acenaphthene	100 U
51-28-5	2,4-Dinitrophenol	1000 U
100-02-7	4-Nitrophenol	520 U
132-64-9	Dibenzofuran	100 U
121-14-2	2,4-Dinitrotoluene	520 U
606-20-2	2,6-Dinitrotoluene	520 U
84-66-2	Diethylphthalate	100 U
7005-72-3	4-Chlorophenyl-phenylether	100 U
86-73-7	Fluorene	100 U
100-01-6	4-Nitroaniline	520 U
534-52-1	4,6-Dinitro-2-Methylphenol	1000 U
86-30-6	N-Nitrosodiphenylamine(1)	100 U
101-55-3	4-Bromophenyl-phenylether	100 U
118-74-1	Hexachlorobenzene	100 U
87-86-5	Pentachlorophenol	520 U
85-01-8	Phenanthrene	100 U
120-12-7	Anthracene	100 U
84-74-2	Di-n-Butylphthalate	100 U
206-44-0	Fluoranthene	130
129-00-0	Pyrene	94
85-68-7	Butylbenzylphthalate	100 U
91-94-1	3,3'-Dichlorobenzidine	520 U
56-55-3	Benzo(a)Anthracene	100 U
117-81-7	bis(2-Ethylhexyl)Phthalate	340
218-01-9	Chrysene	44 J
117-84-0	Di-n-Octyl Phthalate	100 U
205-99-2	Benzo(b)Fluoranthene	100 U
207-08-9	Benzo(k)Fluoranthene	100 U
50-32-8	Benzo(a)Pyrene	100 U
193-39-5	Indeno(1,2,3-cd)Pyrene	100 U
53-70-3	Dibenz(a,h)Anthracene	100 U
191-24-2	Benzo(ghi)Perylene	100 U

(1) Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	53.0%
2-Fluorobiphenyl	75.3%
d14-p-Terphenyl	73.3%

*Acid surrogate recoveries

d5-Phenol	69.1%
2-Fluorophenol	59.0%
2,4,6-Tribromophenol	70.7%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 6
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	8.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.171 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	26.0 mg/kg-dry		SWN	ICP
7440-50-8	Copper	7.9 mg/kg-dry		SWN	ICP
7439-92-1	Lead	3.65 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	17 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	33.7 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130H
 Matrix: Soil

Sample No.: YQ-EPA-6

Data Release Authorized: *Pete Wyle*
 DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
 Project: Batch No. 9&10
 BOA-37PR-121909&PR121910
 VTSR: 04/18/90

Date Extracted: 04/27/90
 Date Analyzed: 05/10/90
 Conc/Dil Factor: 1:20
 Dry Weight: 21.5 grams

GPC Cleanup: No
 Alumina Cleanup: Yes
 Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchloroendate	67%
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Data Qualifiers

- U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130H
 Matrix: Soils/Sediments

Sample No: YQ - EPA6

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: *Brian M. Parker*
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 21.5 gm (Dry Weight)
 Percent Moisture: 30.2%
 pH: 7.7
 Conc/Dilution: 1 to 1

CAS Number

µg/Kg CAS Number

µg/Kg

108-95-2	Phenol	83 M
111-44-4	bis(2-Chloroethyl)Ether	93U
95-57-8	2-Chlorophenol	93U
541-73-1	1,3-Dichlorobenzene	93U
106-46-7	1,4-Dichlorobenzene	93U
100-51-6	Benzyl Alcohol	470U
95-50-1	1,2-Dichlorobenzene	93U
95-48-7	2-Methylphenol	93U
108-60-1	bis(2-chloroisopropyl)Ether	93U
106-44-5	4-Methylphenol	93U
121-64-7	N-Nitroso-Di-n-Propylamine	93U
7-72-1	Hexachloroethane	190U
98-95-3	Nitrobenzene	93U
78-59-1	Isophorone	93U
88-75-5	2-Nitrophenol	470U
105-67-9	2,4-Dimethylphenol	190U
65-85-0	Benzoic Acid	930U
111-91-1	bis(2-Chloroethoxy)Methane	93U
120-83-2	2,4-Dichlorophenol	280U
120-82-1	1,2,4-Trichlorobenzene	93U
91-20-3	Naphthalene	93U
106-47-8	4-Chloroaniline	280U
87-68-3	Hexachlorobutadiene	190U
59-50-7	4-Chloro-3-Methylphenol	190U
91-57-6	2-Methylnaphthalene	93U
77-47-4	Hexachlorocyclopentadiene	470U
88-06-2	2,4,6-Trichlorophenol	470U
95-95-4	2,4,5-Trichlorophenol	470U
91-58-7	2-Chloronaphthalene	93U
88-74-4	2-Nitroaniline	470U
131-11-3	Dimethyl Phthalate	93U
208-96-8	Acenaphthylene	93U
99-09-2	3-Nitroaniline	470U

83-32-9	Acenaphthene	93U
51-28-5	2,4-Dinitrophenol	930U
100-02-7	4-Nitrophenol	470U
132-64-9	Dibenzofuran	93U
121-14-2	2,4-Dinitrotoluene	470U
606-20-2	2,6-Dinitrotoluene	470U
84-66-2	Diethylphthalate	93U
7005-72-3	4-Chlorophenyl-phenylether	93U
86-73-7	Fluorene	93U
100-01-6	4-Nitroaniline	470U
534-52-1	4,6-Dinitro-2-Methylphenol	930U
86-30-6	N-Nitrosodiphenylamine(1)	93U
101-55-3	4-Bromophenyl-phenylether	93U
118-74-1	Hexachlorobenzene	93U
87-86-5	Pentachlorophenol	470U
85-01-8	Phenanthrene	93U
120-12-7	Anthracene	93U
84-74-2	Di-n-Butylphthalate	93U
206-44-0	Fluoranthene	93U
129-00-0	Pyrene	93U
85-68-7	Butylbenzylphthalate	93U
91-94-1	3,3'-Dichlorobenzidine	470U
56-55-3	Benzo(a)Anthracene	93U
117-81-7	bis(2-Ethylhexyl)Phthalate	77J
218-01-9	Chrysene	93U
117-84-0	Di-n-Octyl Phthalate	93U
205-99-2	Benzo(b)Fluoranthene	93U
207-08-9	Benzo(k)Fluoranthene	93U
50-32-8	Benzo(a)Pyrene	93U
193-39-5	Indeno(1,2,3-cd)Pyrene	93U
53-70-3	Dibenz(a,h)Anthracene	93U
191-24-2	Benzo(ghi)Perylene	93U

(1) Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	60.2%
2-Fluorobiphenyl	76.6%
d14-p-Terphenyl	79.3%

*Acid surrogate recoveries

d5-Phenol	70.2%
2-Fluorophenol	65.8%
2,4,6-Tribromophenol	69.4%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 8
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	11.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.332 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	32.3 mg/kg-dry		SWN	ICP
7440-50-8	Copper	12.7 mg/kg-dry		SWN	ICP
7439-92-1	Lead	4.46 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.03 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	23 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	58.7 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 61301

Matrix: Soil

Sample No.: YQ-EPA-8

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle

Project: Batch No. 9&10

BOA-37PR-121909&PR121910

VTSR: 04/18/90

Date Extracted: 04/27/90

GPC Cleanup: No

Date Analyzed: 05/10/90

Alumina Cleanup: Yes

Conc/Dil Factor: 1:20

Sulfur Cleanup: No

Dry Weight: 19.1 grams

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

*** Pesticide Surrogate Recovery**

Dibutylchlorendate	66%
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Data Qualifiers

- U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

 Lab ID: 61301
 Matrix: Soils/Sediments

Sample No: YQ - EPA8

 QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

 Date Release Authorized: J. Dunn
 Report prepared 05/17/90 MAC:B

 Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

 Sample Wt: 19.1 gm (Dry Weight)
 Percent Moisture: 38.0%
 pH: 7.8
 Conc/Dilution: 1 to 1

CAS Number

µg/Kg

CAS Number

µg/Kg

108-95-2	Phenol	310
111-44-4	bis(2-Chloroethyl)Ether	100U
95-57-8	2-Chlorophenol	100U
541-73-1	1,3-Dichlorobenzene	100U
106-46-7	1,4-Dichlorobenzene	100U
100-51-6	Benzyl Alcohol	520U
95-50-1	1,2-Dichlorobenzene	100U
95-48-7	2-Methylphenol	100U
108-60-1	bis(2-chloroisopropyl)Ether	100U
106-44-5	4-Methylphenol	190
21-64-7	N-Nitroso-Di-n-Propylamine	100U
7-72-1	Hexachloroethane	210U
98-95-3	Nitrobenzene	100U
78-59-1	Isophorone	100U
88-75-5	2-Nitrophenol	520U
105-67-9	2,4-Dimethylphenol	210U
65-85-0	Benzoic Acid	1000U
111-91-1	bis(2-Chloroethoxy)Methane	100U
120-83-2	2,4-Dichlorophenol	310U
120-82-1	1,2,4-Trichlorobenzene	100U
91-20-3	Naphthalene	100U
106-47-8	4-Chloroaniline	310U
87-68-3	Hexachlorobutadiene	210U
59-50-7	4-Chloro-3-Methylphenol	210U
91-57-6	2-Methylnaphthalene	100U
77-47-4	Hexachlorocyclopentadiene	520U
88-06-2	2,4,6-Trichlorophenol	520U
95-95-4	2,4,5-Trichlorophenol	520U
91-58-7	2-Chloronaphthalene	100U
88-74-4	2-Nitroaniline	520U
131-11-3	Dimethyl Phthalate	100U
208-96-8	Acenaphthylene	100U
99-09-2	3-Nitroaniline	520U

83-32-9	Acenaphthene	100U
51-28-5	2,4-Dinitrophenol	1000U
100-02-7	4-Nitrophenol	520U
132-64-9	Dibenzofuran	100U
121-14-2	2,4-Dinitrotoluene	520U
606-20-2	2,6-Dinitrotoluene	520U
84-66-2	Diethylphthalate	100U
7005-72-3	4-Chlorophenyl-phenylether	100U
86-73-7	Fluorene	100U
100-01-6	4-Nitroaniline	520U
534-52-1	4,6-Dinitro-2-Methylphenol	1000U
86-30-6	N-Nitrosodiphenylamine(1)	100U
101-55-3	4-Bromophenyl-phenylether	100U
118-74-1	Hexachlorobenzene	100U
87-86-5	Pentachlorophenol	520U
85-01-8	Phenanthrene	76J
120-12-7	Anthracene	100U
84-74-2	Di-n-Butylphthalate	100U
206-44-0	Fluoranthene	230
129-00-0	Pyrene	150
85-68-7	Butylbenzylphthalate	100U
91-94-1	3,3'-Dichlorobenzidine	520U
56-55-3	Benzo(a)Anthracene	100U
117-81-7	bis(2-Ethylhexyl)Phthalate	150
218-01-9	Chrysene	76J
117-84-0	Di-n-Octyl Phthalate	100U
205-99-2	Benzo(b)Fluoranthene	100U
207-08-9	Benzo(k)Fluoranthene	100U
50-32-8	Benzo(a)Pyrene	100U
193-39-5	Indeno(1,2,3-cd)Pyrene	100U
53-70-3	Dibenz(a,h)Anthracene	100U
191-24-2	Benzo(ghi)Perylene	100U

(1) Cannot be separated from diphenylamine

***Base/neutral surrogate recoveries**

d5-Nitrobenzene	65.9%
2-Fluorobiphenyl	98.0%
d14-p-Terphenyl	97.3%

***Acid surrogate recoveries**

d5-Phenol	87.8%
2-Fluorophenol	73.5%
2,4,6-Tribromophenol	97.7%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 9
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	18.9 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.240 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	56.7 mg/kg-dry		SWN	ICP
7440-50-8	Copper	23.8 mg/kg-dry		SWN	ICP
7439-92-1	Lead	12.7 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	40 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.5 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	79.1 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130J

Matrix: Soil

Sample No.: YQ-EPA-9

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle

Project: Batch No. 9&10

BOA-37PR-121909&PR121910

VTSR: 04/18/90

Date Extracted: 04/27/90

GPC Cleanup: No

Date Analyzed: 05/10/90

Alumina Cleanup: Yes

Conc/Dil Factor: 1:20

Sulfur Cleanup: No

Dry Weight: 14.0 grams

CAS Number		µg/kg
319-84-6	Alpha-BHC	6.0U
319-85-7	Beta-BHC	6.0U
319-86-8	Delta-BHC	9.0U
58-89-9	Gamma-BHC (Lindane)	6.0U
76-44-8	Heptachlor	6.0U
309-00-2	Aldrin	6.0U
1024-57-3	Heptachlor Epoxide	6.0U
959-98-8	Endosulfan I	6.0U
60-57-1	Dieldrin	12U
72-55-9	4,4'-DDE	12U
72-20-8	Endrin	12U
33212-65-9	Endosulfan II	12U
72-54-8	4,4'-DDD	12U
1031-07-8	Endosulfan Sulfate	24U
50-29-3	4,4'-DDT	12U
72-43-5	Methoxychlor	24U
53494-70-5	Endrin Ketone	18U
5103-74-2	Gamma-Chlordane	9.0U
5103-71-9	Alpha-Chlordane	9.0U
8001-35-2	Toxaphene	900U
-	Aroclor-1242/1016	120U
12672-29-6	Aroclor-1248	120U
11097-69-1	Aroclor-1254	120U
11096-82-5	Aroclor-1260	120U

* Pesticide Surrogate Recovery

Dibutylchlorendate	73%
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Data Qualifiers

- U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130
 Matrix: Soils/Sediments

Sample No: YQ - EPA9

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: *Brian N. Johnson*
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 14.0 gm (Dry Weight)
 Percent Moisture: 58.0%
 pH: 7.8
 Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number	µg/Kg
108-95-2	Phenol	170 M	83-32-9	Acenaphthene
111-44-4	bis(2-Chloroethyl)Ether	140U	51-28-5	2,4-Dinitrophenol
95-57-8	2-Chlorophenol	140U	100-02-7	4-Nitrophenol
541-73-1	1,3-Dichlorobenzene	140U	132-64-9	Dibenzofuran
106-46-7	1,4-Dichlorobenzene	140U	121-14-2	2,4-Dinitrotoluene
100-51-6	Benzyl Alcohol	710U	606-20-2	2,6-Dinitrotoluene
95-50-1	1,2-Dichlorobenzene	140U	84-66-2	Diethylphthalate
95-48-7	2-Methylphenol	140U	7005-72-3	4-Chlorophenyl-phenylether
108-60-1	bis(2-chloroisopropyl)Ether	140U	86-73-7	Fluorene
106-44-5	4-Methylphenol	140U	100-01-6	4-Nitroaniline
521-64-7	N-Nitroso-Di-n-Propylamine	140U	534-52-1	4,6-Dinitro-2-Methylphenol
7-72-1	Hexachloroethane	290U	86-30-6	N-Nitrosodiphenylamine(1)
98-95-3	Nitrobenzene	140U	101-55-3	4-Bromophenyl-phenylether
78-59-1	Isophorone	140U	118-74-1	Hexachlorobenzene
88-75-5	2-Nitrophenol	710U	87-86-5	Pentachlorophenol
105-67-9	2,4-Dimethylphenol	290U	85-01-8	Phenanthrene
65-85-0	Benzoic Acid	1400U	120-12-7	Anthracene
111-91-1	bis(2-Chloroethoxy)Methane	140U	84-74-2	Di-n-Butylphthalate
120-83-2	2,4-Dichlorophenol	430U	206-44-0	Fluoranthene
120-82-1	1,2,4-Trichlorobenzene	140U	129-00-0	Pyrene
91-20-3	Naphthalene	140U	85-68-7	Butylbenzylphthalate
106-47-8	4-Chloroaniline	430U	91-94-1	3,3'-Dichlorobenzidine
87-68-3	Hexachlorobutadiene	290U	56-55-3	Benzo(a)Anthracene
59-50-7	4-Chloro-3-Methylphenol	290U	117-81-7	bis(2-Ethylhexyl)Phthalate
91-57-6	2-Methylnaphthalene	140U	218-01-9	Chrysene
77-47-4	Hexachlorocyclopentadiene	710U	117-84-0	Di-n-Octyl Phthalate
88-06-2	2,4,6-Trichlorophenol	710U	205-99-2	Benzo(b)Fluoranthene
95-95-4	2,4,5-Trichlorophenol	710U	207-08-9	Benzo(k)Fluoranthene
91-58-7	2-Chloronaphthalene	140U	50-32-8	Benzo(a)Pyrene
88-74-4	2-Nitroaniline	710U	193-39-5	Indeno(1,2,3-cd)Pyrene
131-11-3	Dimethyl Phthalate	140U	53-70-3	Dibenz(a,h)Anthracene
208-96-8	Acenaphthylene	140U	191-24-2	Benzo(ghi)Perylene
99-09-2	3-Nitroaniline	710U		(1) Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	46.4%
2-Fluorobiphenyl	75.2%
d14-p-Terphenyl	74.9%

*Acid surrogate recoveries

d5-Phenol	61.2%
2-Fluorophenol	51.2%
2,4,6-Tribromophenol	63.4%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 10
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	8.1 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.140 mg/kg-dry	U	SWN	GFA
7440-47-3	Chromium	29.4 mg/kg-dry		SWN	ICP
7440-50-8	Copper	9.4 mg/kg-dry		SWN	ICP
7439-92-1	Lead	5.23 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	20 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	44.2 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 K
 Matrix: Soil

Sample No.: YQ-EPA-10

Data Release Authorized: *Debra K. Higgin*
 DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle

Project: Batch No. 9&10

BOA-37PR-121909&PR121910

VTSR: 04/18/90

Date Extracted: 04/27/90

GPC Cleanup: No

Date Analyzed: 05/10/90

Alumina Cleanup: Yes

Conc/Dil Factor: 1:20

Sulfur Cleanup: No

Dry Weight: 22.0 grams

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchlorendate	69%
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Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 K Dupl.
Matrix: Soil

Sample No.: YQ-EPA-10 Dupl.

Data Release Authorized: *Dale M. Hepler*
DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910
VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 21.2 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchlorendate	61%
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Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130KDUP
 Matrix: Soils/Sediments

Date Release Authorized: *M. J. Dumanus*
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample No: YQ - EPA10

Duplicate

QC Report No: 6130 - Battelle

Project No: Batch No 9 & 10

VTSR: 04/18/90

Sample Wt: 21.2 gm (Dry Weight)
 Percent Moisture: 34.0%
 pH: 7.9
 Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number	µg/Kg
108-95-2	Phenol	190U	83-32-9	Acenaphthene
111-44-4	bis(2-Chloroethyl)Ether	94U	51-28-5	2,4-Dinitrophenol
95-57-8	2-Chlorophenol	94U	100-02-7	4-Nitrophenol
541-73-1	1,3-Dichlorobenzene	94U	132-64-9	Dibenzofuran
106-46-7	1,4-Dichlorobenzene	94U	121-14-2	2,4-Dinitrotoluene
100-51-6	Benzyl Alcohol	470U	606-20-2	2,6-Dinitrotoluene
95-50-1	1,2-Dichlorobenzene	94U	84-66-2	Diethylphthalate
95-48-7	2-Methylphenol	94U	7005-72-3	4-Chlorophenyl-phenylether
108-60-1	bis(2-chloroisopropyl)Ether	94U	86-73-7	Fluorene
106-44-5	4-Methylphenol	94U	100-01-6	4-Nitroaniline
521-64-7	N-Nitroso-Di-n-Propylamine	94U	534-52-1	4,6-Dinitro-2-Methylphenol
7-72-1	Hexachloroethane	190U	86-30-6	N-Nitrosodiphenylamine(1)
98-95-3	Nitrobenzene	94U	101-55-3	4-Bromophenyl-phenylether
78-59-1	Isophorone	94U	118-74-1	Hexachlorobenzene
88-75-5	2-Nitrophenol	470U	87-86-5	Pentachlorophenol
105-67-9	2,4-Dimethylphenol	190U	85-01-8	Phenanthrene
65-85-0	Benzoic Acid	94U	120-12-7	Anthracene
111-91-1	bis(2-Chloroethoxy)Methane	94U	84-74-2	Di-n-Butylphthalate
120-83-2	2,4-Dichlorophenol	280U	206-44-0	Fluoranthene
120-82-1	1,2,4-Trichlorobenzene	94U	129-00-0	Pyrene
91-20-3	Naphthalene	94U	85-68-7	Butylbenzylphthalate
106-47-8	4-Chloroaniline	280U	91-94-1	3,3'-Dichlorobenzidine
87-68-3	Hexachlorobutadiene	190U	56-55-3	Benzo(a)Anthracene
59-50-7	4-Chloro-3-Methylphenol	190U	117-81-7	bis(2-Ethylhexyl)Phthalate
91-57-6	2-Methylnaphthalene	94U	218-01-9	Chrysene
77-47-4	Hexachlorocyclopentadiene	470U	117-84-0	Di-n-Octyl Phthalate
88-06-2	2,4,6-Trichlorophenol	470U	205-99-2	Benzo(b)Fluoranthene
95-95-4	2,4,5-Trichlorophenol	470U	207-08-9	Benzo(k)Fluoranthene
91-58-7	2-Chloronaphthalene	94U	50-32-8	Benzo(a)Pyrene
88-74-4	2-Nitroaniline	470U	193-39-5	Indeno(1,2,3-cd)Pyrene
131-11-3	Dimethyl Phthalate	94U	53-70-3	Dibenz(a,h)Anthracene
208-96-8	Acenaphthylene	94U	191-24-2	Benzo(ghi)Perylene
99-09-2	3-Nitroaniline	470U	(1) Cannot be separated from diphenylamine	

*Base/neutral surrogate recoveries

d5-Nitrobenzene	46.0%
2-Fluorobiphenyl	69.6%
d14-p-Terphenyl	72.8%

*Acid surrogate recoveries

d5-Phenol	58.3%
2-Fluorophenol	51.2%
2,4,6-Tribromophenol	61.0%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 11
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	9.8 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.05 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	14.4 mg/kg-dry		SWN	ICP
7440-50-8	Copper	2.6 mg/kg-dry		SWN	ICP
7439-92-1	Lead	3.18 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.03 mg/kg-dry	U	SCM	CVA
7440-02-0	Nickel	9 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	31.9 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130L

Matrix: Soil

Sample No.: YQ-EPA-11

Data Release Authorized:

DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle

Project: Batch No. 9&10

BOA-37PR-121909&PR121910

VTSR: 04/18/90

Date Extracted: 04/27/90

GPC Cleanup: No

Date Analyzed: 05/10/90

Alumina Cleanup: Yes

Conc/Dil Factor: 1:20

Sulfur Cleanup: No

Dry Weight: 22.7 grams

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchloroendate	68%
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Data Qualifiers

- U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 L MS
 Matrix: Soil

Sample No.: YQ-EPA-11
Matrix Spike

Data Release Authorized: *Peter M. Higley*
 DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
 Project: Batch No. 9&10
 BOA-37PR-121909&PR121910
 VTSR: 04/18/90

Date Extracted: 04/27/90
 Date Analyzed: 05/10/90
 Conc/Dil Factor: 1:20
 Dry Weight: 22.9 grams

GPC Cleanup: No
 Alumina Cleanup: Yes
 Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	-
76-44-8	Heptachlor	-
309-00-2	Aldrin	-
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	-
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	-
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	-
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchlorendate	74%
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Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

SOIL PESTICIDE MATRIX SPIKE RECOVERY

ARI Job No: 6130 L
Sample No: YQ-EPA-11

Client: Battelle
Project: BOA-37PR-121909

COMPOUND	SPIKE ADDED ($\mu\text{g}/\text{kg}$)	SAMPLE CONC. ($\mu\text{g}/\text{kg}$)	MS CONC. ($\mu\text{g}/\text{kg}$)	MS % REC	QC LIMITS REC
Lindane	17.5	0	15.1	86	46-127
Heptachlor	17.5	0	15.4	88	35-130
Aldrin	17.5	0	11.0	63	34-132
Dieldrin	43.7	0	31.9	73	31-134
Endrin	43.7	0	35.8	82	42-139
4,4'-DDT	43.7	0	28.4	65	23-134

Spike Recovery: 0 out of 6 outside limits

Asterisked values outside QC Limits

Comments:

FORM III PEST-1

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130L
 Matrix: Soils/Sediments

Sample No: YQ - EPA11

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: Don T. Loper
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 22.6 gm (Dry Weight)
 Percent Moisture: 27.6%
 pH: 7.2
 Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number	µg/Kg
108-95-2	Phenol	180U	83-32-9	Acenaphthene
111-44-4	bis(2-Chloroethyl)Ether	89U	51-28-5	2,4-Dinitrophenol
95-57-8	2-Chlorophenol	89U	100-02-7	4-Nitrophenol
541-73-1	1,3-Dichlorobenzene	89U	132-64-9	Dibenzofuran
106-46-7	1,4-Dichlorobenzene	89U	121-14-2	2,4-Dinitrotoluene
100-51-6	Benzyl Alcohol	440U	606-20-2	2,6-Dinitrotoluene
95-50-1	1,2-Dichlorobenzene	89U	84-66-2	Diethylphthalate
95-48-7	2-Methylphenol	89U	7005-72-3	4-Chlorophenyl-phenylether
108-60-1	bis(2-chloroisopropyl)Ether	89U	86-73-7	Fluorene
106-44-5	4-Methylphenol	89U	100-01-6	4-Nitroaniline
421-64-7	N-Nitroso-Di-n-Propylamine	89U	534-52-1	4,6-Dinitro-2-Methylphenol
7-72-1	Hexachloroethane	180U	86-30-6	N-Nitrosodiphenylamine(1)
98-95-3	Nitrobenzene	89U	101-55-3	4-Bromophenyl-phenylether
78-59-1	Isophorone	89U	118-74-1	Hexachlorobenzene
88-75-5	2-Nitrophenol	440U	87-86-5	Pentachlorophenol
105-67-9	2,4-Dimethylphenol	180U	85-01-8	Phenanthrone
65-85-0	Benzoic Acid	880U	120-12-7	Anthracene
111-91-1	bis(2-Chloroethoxy)Methane	89U	84-74-2	Di-n-Butylphthalate
120-83-2	2,4-Dichlorophenol	270U	206-44-0	Fluoranthene
120-82-1	1,2,4-Trichlorobenzene	89U	129-00-0	Pyrene
91-20-3	Naphthalene	89U	85-68-7	Butylbenzylphthalate
106-47-8	4-Chloroaniline	270U	91-94-1	3,3'-Dichlorobenzidine
87-68-3	Hexachlorobutadiene	180U	56-55-3	Benzo(a)Anthracene
59-50-7	4-Chloro-3-Methylphenol	180U	117-81-7	bis(2-Ethylhexyl)Phthalate
91-57-6	2-Methylnaphthalene	89U	218-01-9	Chrysene
77-47-4	Hexachlorocyclopentadiene	440U	117-84-0	Di-n-Octyl Phthalate
88-06-2	2,4,6-Trichlorophenol	440U	205-99-2	Benzo(b)Fluoranthene
95-95-4	2,4,5-Trichlorophenol	440U	207-08-9	Benzo(k)Fluoranthene
91-58-7	2-Chloronaphthalene	89U	50-32-8	Benzo(a)Pyrene
88-74-4	2-Nitroaniline	440U	193-39-5	Indeno(1,2,3-cd)Pyrene
131-11-3	Dimethyl Phthalate	89U	53-70-3	Dibenz(a,h)Anthracene
208-96-8	Acenaphthylene	89U	191-24-2	Benzo(ghi)Perylene
99-09-2	3-Nitroaniline	440U		(1) Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	54.9%
2-Fluorobiphenyl	69.4%
d14-p-Terphenyl	74.8%

*Acid surrogate recoveries

d5-Phenol	61.7%
2-Fluorophenol	57.5%
2,4,6-Tribromophenol	68.4%

ORGANICS ANALYSIS DATA SHEET
Semivolatiles by Methods 625/8270

Lab ID: 6130LMS
 Matrix: Soils/Sediments

Sample No: YQ - EPA11
Matrix Spike
 QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: *John Amodeo*
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 22.9 gm (Dry Weight)
 Percent Moisture: 27.6%
 pH: 7.2
 Conc/Dilution: 1 to 1

CAS Number		µg/Kg
108-95-2	Phenol	-
111-44-4	bis(2-Chloroethyl)Ether	87U
95-57-8	2-Chlorophenol	-
541-73-1	1,3-Dichlorobenzene	87U
106-46-7	1,4-Dichlorobenzene	-
100-51-6	Benzyl Alcohol	440U
95-50-1	1,2-Dichlorobenzene	87U
95-48-7	2-Methylphenol	87U
108-60-1	bis(2-chloroisopropyl)Ether	87U
106-44-5	4-Methylphenol	87U
'1-64-7	N-Nitroso-Di-n-Propylamine	-
-72-1	Hexachloroethane	170U
98-95-3	Nitrobenzene	87U
78-59-1	Isophorone	87U
88-75-5	2-Nitrophenol	440U
105-67-9	2,4-Dimethylphenol	170U
65-85-0	Benzoic Acid	870U
111-91-1	bis(2-Chloroethoxy)Methane	87U
120-83-2	2,4-Dichlorophenol	260U
120-82-1	1,2,4-Trichlorobenzene	-
91-20-3	Naphthalene	87U
106-47-8	4-Chloroaniline	260U
87-68-3	Hexachlorobutadiene	170U
59-50-7	4-Chloro-3-Methylphenol	-
91-57-6	2-Methylnaphthalene	87U
77-47-4	Hexachlorocyclopentadiene	440U
88-06-2	2,4,6-Trichlorophenol	440U
95-95-4	2,4,5-Trichlorophenol	440U
91-58-7	2-Chloronaphthalene	87U
88-74-4	2-Nitroaniline	440U
131-11-3	Dimethyl Phthalate	87U
208-96-8	Acenaphthylene	87U
99-09-2	3-Nitroaniline	440U

CAS Number		µg/Kg
83-32-9	Acenaphthene	-
51-28-5	2,4-Dinitrophenol	870U
100-02-7	4-Nitrophenol	-
132-64-9	Dibenzofuran	87U
121-14-2	2,4-Dinitrotoluene	-
606-20-2	2,6-Dinitrotoluene	440U
84-66-2	Diethylphthalate	87U
7005-72-3	4-Chlorophenyl-phenylether	87U
86-73-7	Fluorene	87U
100-01-6	4-Nitroaniline	440U
534-52-1	4,6-Dinitro-2-Methylphenol	870U
86-30-6	N-Nitrosodiphenylamine(1)	87U
101-55-3	4-Bromophenyl-phenylether	87U
118-74-1	Hexachlorobenzene	87U
87-86-5	Pentachlorophenol	-
85-01-8	Phenanthrene	87U
120-12-7	Anthracene	87U
84-74-2	Di-n-Butylphthalate	87U
206-44-0	Fluoranthene	87U
129-00-0	Pyrene	-
85-68-7	Butylbenzylphthalate	87U
91-94-1	3,3'-Dichlorobenzidine	440U
56-55-3	Benzo(a)Anthracene	87U
117-81-7	bis(2-Ethylhexyl)Phthalate	87U
218-01-9	Chrysene	87U
117-84-0	Di-n-Octyl Phthalate	87U
205-99-2	Benzo(b)Fluoranthene	87U
207-08-9	Benzo(k)Fluoranthene	87U
50-32-8	Benzo(a)Pyrene	87U
193-39-5	Indeno(1,2,3-cd)Pyrene	87U
53-70-3	Dibenz(a,h)Anthracene	87U
191-24-2	Benzo(ghi)Perylene	87U

(1) Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	67.5%
2-Fluorobiphenyl	82.5%
d14-p-Terphenyl	83.4%

*Acid surrogate recoveries

d5-Phenol	73.3%
2-Fluorophenol	67.0%
2,4,6-Tribromophenol	81.8%

SOIL SEMIVOLATILE MATRIX SPIKE RECOVERY

ARI Job No: 6130

Client: Battelle
Project: Batch 9&10

Sample No: YQ-EPA11

COMPOUND	SPIKE ADDED ($\mu\text{g}/\text{Kg}$)	SAMPLE CONC ($\mu\text{g}/\text{Kg}$)	MS CONC ($\mu\text{g}/\text{Kg}$)	MS % REC	QC LIMITS REC
Phenol	8700	0	6100	70.1	26-90
2-Chlorophenol	8700	0	6500	74.7	25-102
1,4-Dichlorobenzene	4400	0	2200	50.0	28-104
N-Nitroso-Di-n-Propylamine	4400	0	2500	56.8	41-126
1,2,4-Trichlorobenzene	4400	0	2900	65.9	38-107
4-Chloro-3-Methylphenol	8700	0	7700	88.5	26-103
Acenaphthene	4400	0	3600	81.8	31-137
4-Nitrophenol	8700	0	7500	86.2	11-114
2,4-Dinitrotoluene	4400	0	3900	88.6	28-89
Pentachlorophenol	8700	0	1900	21.8	17-109
Pyrene	4400	0	3900	88.6	35-142

Spike Recovery: 0 out of 11 outside limits

Asterisked values outside QC Limits

Comments: 22.9 gm dry weight sample size

FORM III SV-2

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 12
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	27.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.195 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	44.9 mg/kg-dry		SWN	ICP
7440-50-8	Copper	20.3 mg/kg-dry		SWN	ICP
7439-92-1	Lead	14.7 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	30 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	76.0 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCBLab Sample ID: 6130 M
Matrix: Soil**Sample No.: YQ-EPA-12**Data Release Authorized:
Peter M. Kehler
DATA PREPARED: MAC:C (05/14/90) cpgQC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910
VTSR: 04/18/90Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 16.4 gramsGPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	5.0U
319-85-7	Beta-BHC	5.0U
319-86-8	Delta-BHC	7.0U
58-89-9	Gamma-BHC (Lindane)	5.0U
76-44-8	Heptachlor	5.0U
309-00-2	Aldrin	5.0U
1024-57-3	Heptachlor Epoxide	5.0U
959-98-8	Endosulfan I	5.0U
60-57-1	Dieldrin	10U
72-55-9	4,4'-DDE	10U
72-20-8	Endrin	10U
33212-65-9	Endosulfan II	10U
72-54-8	4,4'-DDD	10U
1031-07-8	Endosulfan Sulfate	20U
50-29-3	4,4'-DDT	10U
72-43-5	Methoxychlor	20U
53494-70-5	Endrin Ketone	15U
5103-74-2	Gamma-Chlordane	7.0U
5103-71-9	Alpha-Chlordane	7.0U
8001-35-2	Toxaphene	750U
-	Aroclor-1242/1016	100U
12672-29-6	Aroclor-1248	100U
11097-69-1	Aroclor-1254	100U
11096-82-5	Aroclor-1260	100U

*** Pesticide Surrogate Recovery**

Dibutylchloroendate	75%
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Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130M
 Matrix: Soils/Sediments

Sample No: YQ - EPA12

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: J. W. Umiker
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/15/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 16.4 gm (Dry Weight)
 Percent Moisture: 47.3%
 pH: 7.5
 Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number	µg/Kg
108-95-2	Phenol	240U	83-32-9	Acenaphthene
111-44-4	bis(2-Chloroethyl)Ether	120U	51-28-5	2,4-Dinitrophenol
95-57-8	2-Chlorophenol	120U	100-02-7	4-Nitrophenol
541-73-1	1,3-Dichlorobenzene	120U	132-64-9	Dibenzofuran
106-46-7	1,4-Dichlorobenzene	120U	121-14-2	2,4-Dinitrotoluene
100-51-6	Benzyl Alcohol	610U	606-20-2	2,6-Dinitrotoluene
95-50-1	1,2-Dichlorobenzene	120U	84-66-2	Diethylphthalate
95-48-7	2-Methylphenol	120U	7005-72-3	4-Chlorophenyl-phenylether
108-60-1	bis(2-chloroisopropyl)Ether	120U	86-73-7	Fluorene
106-44-5	4-Methylphenol	120U	100-01-6	4-Nitroaniline
421-64-7	N-Nitroso-Di-n-Propylamine	120U	534-52-1	4,6-Dinitro-2-Methylphenol
7-72-1	Hexachloroethane	240U	86-30-6	N-Nitrosodiphenylamine(1)
98-95-3	Nitrobenzene	120U	101-55-3	4-Bromophenyl-phenylether
78-59-1	Isophorone	120U	118-74-1	Hexachlorobenzene
88-75-5	2-Nitrophenol	610U	87-86-5	Pentachlorophenol
105-67-9	2,4-Dimethylphenol	240U	85-01-8	Phenanthrene
65-85-0	Benzoic Acid	1200U	120-12-7	Anthracene
111-91-1	bis(2-Chloroethoxy)Methane	120U	84-74-2	Di-n-Butylphthalate
120-83-2	2,4-Dichlorophenol	370U	206-44-0	Fluoranthene
120-82-1	1,2,4-Trichlorobenzene	120U	129-00-0	Pyrene
91-20-3	Naphthalene	120U	85-68-7	Butylbenzylphthalate
106-47-8	4-Chloroaniline	370U	91-94-1	3,3'-Dichlorobenzidine
87-68-3	Hexachlorobutadiene	240U	56-55-3	Benzo(a)Anthracene
59-50-7	4-Chloro-3-Methylphenol	240U	117-81-7	bis(2-Ethylhexyl)Phthalate
91-57-6	2-Methylnaphthalene	120U	218-01-9	Chrysene
77-47-4	Hexachlorocyclopentadiene	610U	117-84-0	Di-n-Octyl Phthalate
88-06-2	2,4,6-Trichlorophenol	610U	205-99-2	Benzo(b)Fluoranthene
95-95-4	2,4,5-Trichlorophenol	610U	207-08-9	Benzo(k)Fluoranthene
91-58-7	2-Chloronaphthalene	120U	50-32-8	Benzo(a)Pyrene
88-74-4	2-Nitroaniline	610U	193-39-5	Indeno(1,2,3-cd)Pyrene
131-11-3	Dimethyl Phthalate	120U	53-70-3	Dibenz(a,h)Anthracene
208-96-8	Acenaphthylene	120U	191-24-2	Benzo(ghi)Perylene
99-09-2	3-Nitroaniline	610U		

(1) Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	59.5%
2-Fluorobiphenyl	76.9%
d14-p-Terphenyl	81.6%

*Acid surrogate recoveries

d5-Phenol	67.9%
2-Fluorophenol	65.6%
2,4,6-Tribromophenol	79.6%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 13
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: A&H

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	5.8 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.21 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	18.1 mg/kg-dry		SWN	ICP
7440-50-8	Copper	5.2 mg/kg-dry		SWN	ICP
7439-92-1	Lead	5.11 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	11 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	22.7 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130N
 Matrix: Soil

Sample No.: YQ-EPA 13

Data Release Authorized: *Dale M. Lyle*
 DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
 Project: Batch No. 9&10
 BOA-37PR-121909&PR121910
 VTSR: 04/18/90

Date Extracted: 04/27/90
 Date Analyzed: 05/10/90
 Conc/Dil Factor: 1:20
 Dry Weight: 28.7 grams

GPC Cleanup: No
 Alumina Cleanup: Yes
 Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchloroendate	65%
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Data Qualifiers

U Indicates compound was analyzed for but not detected at the given detection limit.
 NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130N
 Matrix: Soils/Sediments

Sample No: YQ - EPA13

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: *John N. Zofa*
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/16/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 28.7 gm (Dry Weight)
 Percent Moisture: 22.9%
 pH: 8.4
 Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number	µg/Kg
108-95-2	Phenol	140U	83-32-9	Acenaphthene
111-44-4	bis(2-Chloroethyl)Ether	70U	51-28-5	2,4-Dinitrophenol
95-57-8	2-Chlorophenol	70U	100-02-7	4-Nitrophenol
541-73-1	1,3-Dichlorobenzene	70U	132-64-9	Dibenzofuran
106-46-7	1,4-Dichlorobenzene	70U	121-14-2	2,4-Dinitrotoluene
100-51-6	Benzyl Alcohol	350U	606-20-2	2,6-Dinitrotoluene
95-50-1	1,2-Dichlorobenzene	70U	84-66-2	Diethylphthalate
95-48-7	2-Methylphenol	70U	7005-72-3	4-Chlorophenyl-phenylether
108-60-1	bis(2-chloroisopropyl)Ether	70U	86-73-7	Fluorene
106-44-5	4-Methylphenol	70U	100-01-6	4-Nitroaniline
521-64-7	N-Nitroso-Di-n-Propylamine	70U	534-52-1	4,6-Dinitro-2-Methylphenol
7-72-1	Hexachloroethane	140U	86-30-6	N-Nitrosodiphenylamine(1)
98-95-3	Nitrobenzene	70U	101-55-3	4-Bromophenyl-phenylether
78-59-1	Isophorone	70U	118-74-1	Hexachlorobenzene
88-75-5	2-Nitrophenol	350U	87-86-5	Pentachlorophenol
105-67-9	2,4-Dimethylphenol	140U	85-01-8	Phenanthrene
65-85-0	Benzoic Acid	700U	120-12-7	Anthracene
111-91-1	bis(2-Chloroethoxy)Methane	70U	84-74-2	Di-n-Butylphthalate
120-83-2	2,4-Dichlorophenol	210U	206-44-0	Fluoranthene
120-82-1	1,2,4-Trichlorobenzene	70U	129-00-0	Pyrene
91-20-3	Naphthalene	70U	85-68-7	Butylbenzylphthalate
106-47-8	4-Chloroaniline	210U	91-94-1	3,3'-Dichlorobenzidine
87-68-3	Hexachlorobutadiene	140U	56-55-3	Benzo(a)Anthracene
59-50-7	4-Chloro-3-Methylphenol	140U	117-81-7	bis(2-Ethylhexyl)Phthalate
91-57-6	2-Methylnaphthalene	70U	218-01-9	Chrysene
77-47-4	Hexachlorocyclopentadiene	350U	117-84-0	Di-n-Octyl Phthalate
88-06-2	2,4,6-Trichlorophenol	350U	205-99-2	Benzo(b)Fluoranthene
95-95-4	2,4,5-Trichlorophenol	350U	207-08-9	Benzo(k)Fluoranthene
91-58-7	2-Chloronaphthalene	70U	50-32-8	Benzo(a)Pyrene
88-74-4	2-Nitroaniline	350U	193-39-5	Indeno(1,2,3-cd)Pyrene
131-11-3	Dimethyl Phthalate	70U	53-70-3	Dibenz(a,h)Anthracene
208-96-8	Acenaphthylene	70U	191-24-2	Benzo(ghi)Perylene
99-09-2	3-Nitroaniline	350U	(1)	Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	63.1%
2-Fluorobiphenyl	79.4%
d14-p-Terphenyl	79.9%

*Acid surrogate recoveries

d5-Phenol	71.9%
2-Fluorophenol	69.1%
2,4,6-Tribromophenol	84.0%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 14
Description:
 Sampled: / /
 Received: 04/18/90
 Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	16.1 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.136 mg/kg-dry	U	SWN	GFA
7440-47-3	Chromium	41.4 mg/kg-dry		SWN	ICP
7440-50-8	Copper	14.0 mg/kg-dry		SWN	ICP
7439-92-1	Lead	7.8 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.04 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	30 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	59.0 mg/kg-dry		SWN	ICP

ORGANICS ANALYSIS DATA SHEET -Method 8080- PESTICIDE/PCB

Lab Sample ID: 6130 O
Matrix: Soil

Sample No.: YQ-EPA 14

Data Release Authorized: Peter H. Kepler
DATA PREPARED: MAC:C (05/14/90) cpg

QC Report No.: 6130 - Battelle
Project: Batch No. 9&10
BOA-37PR-121909&PR121910
VTSR: 04/18/90

Date Extracted: 04/27/90
Date Analyzed: 05/10/90
Conc/Dil Factor: 1:20
Dry Weight: 20.6 grams

GPC Cleanup: No
Alumina Cleanup: Yes
Sulfur Cleanup: No

CAS Number		µg/kg
319-84-6	Alpha-BHC	4.0U
319-85-7	Beta-BHC	4.0U
319-86-8	Delta-BHC	6.0U
58-89-9	Gamma-BHC (Lindane)	4.0U
76-44-8	Heptachlor	4.0U
309-00-2	Aldrin	4.0U
1024-57-3	Heptachlor Epoxide	4.0U
959-98-8	Endosulfan I	4.0U
60-57-1	Dieldrin	4.0U
72-55-9	4,4'-DDE	8.0U
72-20-8	Endrin	8.0U
33212-65-9	Endosulfan II	8.0U
72-54-8	4,4'-DDD	8.0U
1031-07-8	Endosulfan Sulfate	16U
50-29-3	4,4'-DDT	8.0U
72-43-5	Methoxychlor	16U
53494-70-5	Endrin Ketone	12U
5103-74-2	Gamma-Chlordane	6.0U
5103-71-9	Alpha-Chlordane	6.0U
8001-35-2	Toxaphene	600U
-	Aroclor-1242/1016	80U
12672-29-6	Aroclor-1248	80U
11097-69-1	Aroclor-1254	80U
11096-82-5	Aroclor-1260	80U

* Pesticide Surrogate Recovery

Dibutylchlorendate	78%
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Data Qualifiers

- U Indicates compound was analyzed for but not detected at the given detection limit.
NA Indicates not analyzed.

ORGANICS ANALYSIS DATA SHEET

Semivolatiles by Methods 625/8270

Lab ID: 6130O
 Matrix: Soils/Sediments

Sample No: YQ - EPA14

QC Report No: 6130 - Battelle
 Project No: Batch No 9 & 10
 VTSR: 04/18/90

Date Release Authorized: John T. Saper
 Report prepared 05/17/90 MAC:B

Date extracted: 04/27/90
 Analyzed (FINN 2): 05/16/90
 GPC Clean-up: NO (1 of 2)

Sample Wt: 20.6 gm (Dry Weight)
 Percent Moisture: 41.3%
 pH: 8.0
 Conc/Dilution: 1 to 1

CAS Number		µg/Kg	CAS Number	µg/Kg
108-95-2	Phenol	260	83-32-9	Acenaphthene
111-44-4	bis(2-Chloroethyl)Ether	97U	51-28-5	2,4-Dinitrophenol
95-57-8	2-Chlorophenol	97U	100-02-7	4-Nitrophenol
541-73-1	1,3-Dichlorobenzene	97U	132-64-9	Dibenzofuran
106-46-7	1,4-Dichlorobenzene	97U	121-14-2	2,4-Dinitrotoluene
100-51-6	Benzyl Alcohol	490U	606-20-2	2,6-Dinitrotoluene
95-50-1	1,2-Dichlorobenzene	97U	84-66-2	Diethylphthalate
95-48-7	2-Methylphenol	97U	7005-72-3	4-Chlorophenyl-phenylether
108-60-1	bis(2-chloroisopropyl)Ether	97U	86-73-7	Fluorene
106-44-5	4-Methylphenol	140	100-01-6	4-Nitroaniline
121-64-7	N-Nitroso-Di-n-Propylamine	97U	534-52-1	4,6-Dinitro-2-Methylphenol
7-72-1	Hexachloroethane	190U	86-30-6	N-Nitrosodiphenylamine(1)
98-95-3	Nitrobenzene	97U	101-55-3	4-Bromophenyl-phenylether
78-59-1	Isophorone	97U	118-74-1	Hexachlorobenzene
88-75-5	2-Nitrophenol	490U	87-86-5	Pentachlorophenol
105-67-9	2,4-Dimethylphenol	190U	85-01-8	Phenanthrone
65-85-0	Benzoic Acid	970U	120-12-7	Anthracene
111-91-1	bis(2-Chloroethoxy)Methane	97U	84-74-2	Di-n-Butylphthalate
120-83-2	2,4-Dichlorophenol	290U	206-44-0	Fluoranthene
120-82-1	1,2,4-Trichlorobenzene	97U	129-00-0	Pyrene
91-20-3	Naphthalene	97U	85-68-7	Butylbenzylphthalate
106-47-8	4-Chloroaniline	290U	91-94-1	3,3'-Dichlorobenzidine
87-68-3	Hexachlorobutadiene	190U	56-55-3	Benzo(a)Anthracene
59-50-7	4-Chloro-3-Methylphenol	190U	117-81-7	bis(2-Ethylhexyl)Phthalate
91-57-6	2-Methylnaphthalene	97U	218-01-9	Chrysene
77-47-4	Hexachlorocyclopentadiene	490U	117-84-0	Di-n-Octyl Phthalate
88-06-2	2,4,6-Trichlorophenol	490U	205-99-2	Benzo(b)Fluoranthene
95-95-4	2,4,5-Trichlorophenol	490U	207-08-9	Benzo(k)Fluoranthene
91-58-7	2-Chloronaphthalene	97U	50-32-8	Benzo(a)Pyrene
88-74-4	2-Nitroaniline	490U	193-39-5	Indeno(1,2,3-cd)Pyrene
131-11-3	Dimethyl Phthalate	97U	53-70-3	Dibenz(a,h)Anthracene
208-96-8	Acenaphthylene	97U	191-24-2	Benzo(ghi)Perylene
99-09-2	3-Nitroaniline	490U	(1)	Cannot be separated from diphenylamine

*Base/neutral surrogate recoveries

d5-Nitrobenzene	52.8%
2-Fluorobiphenyl	81.2%
d14-p-Terphenyl	78.3%

*Acid surrogate recoveries

d5-Phenol	68.4%
2-Fluorophenol	57.9%
2,4,6-Tribromophenol	76.2%

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: YQ-EPA 10
Description: Laboratory Duplicate
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AfH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	10.9 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.136 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	27.8 mg/kg-dry		SWN	ICP
7440-50-8	Copper	8.2 mg/kg-dry		SWN	ICP
7439-92-1	Lead	3.94 mg/kg-dry		SWN	GFA
7439-97-6	Mercury	0.04 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	19 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.4 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	43.7 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: 1646 STD
Description:
Sampled: / /
Received: 04/18/90
Matrix: Soil

Released by: AGH

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	16.5 mg/kg-dry		SWN	GFA
7440-43-9	Cadmium	0.200 mg/kg-dry		SWN	GFA
7440-47-3	Chromium	36.9 mg/kg-dry		SWN	ICP
7440-50-8	Copper	15.2 mg/kg-dry		SWN	ICP
7439-92-1	Lead	20 mg/kg-dry		SWN	ICP
7439-97-6	Mercury	0.06 mg/kg-dry		SCM	CVA
7440-02-0	Nickel	22 mg/kg-dry		SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	105 mg/kg-dry		SWN	ICP

Client: Battelle
Contact: Eric Crecelius
Project: PR 121910
ID number: Method Blank
Description:
Sampled: / /
Received: / /
Matrix: Soil

Released by: AG17

A N A L Y T I C A L R E S U L T S

CAS Number	Analyte	Concentration	C	Prep	M
7440-38-2	Arsenic	0.1 mg/kg-dry	U	SWN	GFA
7440-43-9	Cadmium	0.02 mg/kg-dry	U	SWN	GFA
7440-47-3	Chromium	0.5 mg/kg-dry	U	SWN	ICP
7440-50-8	Copper	0.2 mg/kg-dry	U	SWN	ICP
7439-92-1	Lead	0.1 mg/kg-dry	U	SWN	GFA
7439-97-6	Mercury	0.02 mg/kg-dry	U	SCM	CVA
7440-02-0	Nickel	1 mg/kg-dry	U	SWN	ICP
7440-22-4	Silver	0.3 mg/kg-dry	U	SWN	ICP
7440-66-6	Zinc	0.5 mg/kg-dry		SWN	ICP

Client: Battelle

Client's sample ID: YQ-EPA 10

ARI sample ID: 6130 KDUP

Units: mg/kg-dry

Analyte	Meth	Original Sample	Matrix Duplicate	RPD	Control Limit	Q
Arsenic	GFA	8.1	10.9	29.5	± 20 %	*
Cadmium	GFA	0.14	0.136	2.9	± 20 %	
Chromium	ICP	29.4	27.8	5.6	± 20 %	
Copper	ICP	9.4	8.2	13.6	± 20 %	
Lead	GFA	5.23	3.94	28.1	± 20 %	*
Mercury	CVA	0.02	0.04	66.7	± 0.02	
Nickel	ICP	20	19	5.1	± 20 %	
Silver	ICP	0.4	0.4	0.0	± 20 %	
Zinc	ICP	44.2	43.7	1.1	± 20 %	

RPD = Relative percent difference

'Q' codes: '*' = control limit not met

'L' = RPD not valid, alternate limit = ± detection limit

if RPD exceed control limit then examine results more closely for validity. Use best professional judgment. This is a QC/QA issue. For instance, the above does not present a problem regarding validity of data. Even though in 2 cases (As & Pb) the RPD exceed control limit, the data still appears close enough to be valid when compared to the data from the other samples taken in the area and previously taken for

Reed 9/24/90 S

REPORT OF CHEMICAL ANALYSES

Reported to:

Battelle Marine Sciences Laboratory
Attn: Mr. Eric A. Crecelius
439 West Sequim Bay Road
Sequim, WA 98382

By:

Twin City Testing Corporation
Organic Chemistry Department
662 Cromwell Avenue
St. Paul, MN 55114



662 CROMWELL AVENUE
ST. PAUL, MN 55114
PHONE 612/645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: BATTELLE

DATE: June 21, 1990

ISSUED TO: Battelle Marine Sciences Laboratory
Attn: Mr. Eric A. Crecelius
439 West Sequim Bay Road
Sequim, WA 98382

INVOICE NO: 4410 90-4452

INTRODUCTION

This report summarizes the results of the analyses performed on eight sediment samples and two QA samples which were submitted by a representative of Battelle Marine Sciences Laboratory. The samples were analyzed for the presence or absence of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) using a modified version of USEPA method 8290.

SAMPLE IDENTIFICATION

<u>Client ID</u>	<u>Sample Type</u>	<u>TCT ID</u>
YQ-EPA 2	Sediment	190672
YQ-EPA 3	Sediment	190673
YQ-EPA 6	Sediment	190674
YQ-EPA 8	Sediment	190675
YQ-EPA 9	Sediment	190677
YQ-EPA 12	Sediment	190678
YQ-EPA 13	Sediment	190679
YQ-EPA 14	Sediment	190680
YQ-EPA 14 Spike	Sediment	190680-MS
YQ-EPA 14 Spike Dup	Sediment	190680-MSD

METHODOLOGY

PCDD/PCDF Extraction

A portion of each sample was spiked with ¹³C₁₂-labeled PCDD/PCDF internal standards (Table 1) and continuously extracted with benzene for 18 hours in a Dean-Stark Soxhlet extractor. The extracts were quantitatively transferred to Kuderna Danish concentrators, concentrated, and solvent exchanged to hexane. The hexane extracts were then spiked with 2,3,7,8-TCDD-³⁷Cl₄ enrichment efficiency standard (Table 1) and processed through the analyte enrichment procedures described below.



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Analyte Enrichment for PCDD/PCDF Analyses

The extraction procedure often removes a variety of compounds, in addition to the PCDDs and PCDFs, from the sample matrix. Some of these compounds can directly interfere with the analyses while others can overload the capillary column causing degradation in chromatographic resolution or sensitivity. The analyte enrichment steps described below were used to remove interferences from the extracts.

The sample extracts were dissolved in 100 ml of hexane, transferred to separatory funnels, and washed with 1N sodium hydroxide, concentrated sulfuric acid, and distilled water. The hexane layers were concentrated to 1 ml and quantitatively transferred to liquid chromatography columns containing alternating layers of silica gel, 44% concentrated sulfuric acid on silica gel, and 33% 1 N sodium hydroxide on silica gel. The columns were eluted with 60 ml of hexane and each entire eluate was collected and concentrated, under a gentle stream of dry nitrogen, to a volume of 1 ml.

The extracts were then fractionated on liquid chromatography columns containing 4 g of activated alumina. The columns were eluted with 10 ml of hexane followed by 7 ml of 2.0% methylene chloride/hexane and 25 ml of 60% methylene chloride/hexane. The 60% methylene chloride/hexane fractions were concentrated to 1 ml under a stream of dry nitrogen and applied to the tops of chromatography columns containing 1 g of 5% AX-21 activated carbon on silica gel. Each column was eluted with cyclohexane/methylene chloride (50:50 V/V) and cyclohexane/methanol/benzene (75:20:5 V/V) in the forward direction, and then with benzene in the reverse direction. Each benzene fraction was collected, spiked with recovery standards (1,2,3,4-TCDD-¹³C₁₂ and 1,2,3,7,8,9-HxCDD-¹³C₁₂) and concentrated to a final volume of 20 uL.

PCDD/PCDF Analyses

The extracts were analyzed for the presence of PCDDs and PCDFs using combined capillary column gas chromatography/high resolution mass spectrometry (HRGC/HRMS). The instrumentation consisted of a Hewlett Packard Model 5890 gas chromatograph and a VG Model 70SE high resolution mass spectrometer. The capillary column was interfaced directly into the ion source of the mass spectrometer, thus providing the highest possible sensitivity while minimizing degradation of the chromatographic resolution.



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PCDD/PCDF Analyses (Cont.)

The mass spectrometer was operated in the electron impact ionization mode at a mass resolution of 10,000-11,000 ($M/\Delta M$, 10 percent valley definition). This resolution is sufficient to resolve most interferences, such as PCBs, thus providing the highest level of confidence that the detected levels of PCDD/PCDF are not false positives resulting from interferences. Typical operating parameters for the HRGC/HRMS analyses are summarized in Table 2.

The data were acquired by selected-ion-recording (SIR) monitoring the groups of ion masses described in EPA method 8290. The five groups corresponded to the tetrachlorinated through octachlorinated congener classes. Each group contained three ion masses for the PCDDs (with the exception of TCDD which contained two ion masses), two ion masses for the PCDFs, the corresponding ion masses from the two isotopically labeled internal standards, and the ion mass characteristic of the polychlorinated diphenylether (PCDPE) which, if present, could cause false responses in the dibenzofuran channels. The third PCDD ion mass monitored in the pentachloro through octachlorodibenzo-p-dioxin groups prevented the possibility of misinterpretation of a polychlorinated biphenylene isomer as a PCDD. The two ion masses monitored for TCDD also fulfilled this purpose.

Each group of ion masses also contained a lock mass which was monitored during the analyses to detect suppressive interferences. It is particularly important to detect this type of interference since it can cause the quantification of congener class levels to be artificially high if it occurs during the elution of an internal standard or low if it occurs during the elution of the native analytes.

The lock mass was also used by the data system to automatically correct the mass focus of the instrument. The data system determined the centroid of the lock mass during each data acquisition cycle and corrected the mass focus of the analyte and internal standard ion masses to assure that the centers of the mass peaks were being monitored.

The criteria used to judge positive responses for the PCDD/PCDF isomer included:

- Simultaneous response at both ion masses of the PCDD or PCDF
- Signal to noise ratio equal to or greater than 2.5:1.0 for both ion masses



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PCDD/PCDF Analyses (Cont.)

- Chlorine isotope ratio within 15% of the theoretical value
- Chromatographic retention time within -1 to +3 seconds of the authentic standards (where applicable)
- Chromatographic retention times within elution windows determined from analyses of standard mixtures
- Absence of simultaneous response between the PCDF and diphenylether ion traces

A list of the exact ion masses monitored for the determination of PCDD/PCDF isomers and the PCDF congeners is presented in Table 3. Also included are the theoretical chlorine isotope ratios for the ten congener classes.

PCDD/PCDF Quantification and Calculations

The PCDD/PCDF isomers were quantified by comparison of their responses to the responses of the labeled internal standards as described in the draft version of EPA Method 8290. Relative response factors were calculated from analyses of standard mixtures containing representatives of each of the PCDD/PCDF congener classes at five concentration levels, and each of the internal standards at one concentration level, as shown in Table 4. The PCDD/PCDF response factors were calculated by comparing the sum of the responses from the two ion masses monitored for each chlorine congener class to the sum of the responses from the two ion masses of the corresponding isotopically labeled internal standard. Table 5 shows the response factor at each of the calibration levels as well as the average response factors and the relative percent deviation for each. The formula for the response factor calculation is:

$$Rf = \frac{A_n \times Q_{is}}{A_{is} \times Q_n}$$



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PCDD/PCDF Quantification and Calculations (Cont.)

where:

Rf = Response factor

An = Sum of integrated areas for native isomer

Qis = Quantity of labeled internal standard

Ais = Sum of integrated areas for labeled internal standard

Qn = Quantity of native isomer

The levels of PCDD/PCDF in the samples were quantified using the following equation:

$$C = \frac{An \times Qis}{Ais \times W \times Rf}$$

where:

C = Concentration of target isomer or congener class

An = Sum of integrated area for the target isomer or congener class

Qis = Amount of labeled internal standard added to the sample

Ais = Sum of integrated areas for the labeled internal standard

W = Sample weight, volume or area

Rf = Response factor

Each pair of ion mass peaks in the selected-ion-current chromatograms was evaluated manually to determine if it met the criteria for a PCDD or PCDF isomer. Areas of all peaks exhibiting correct ion ratios and having retention times within the correct windows were then summed for calculations of total congener concentrations. A summary of the high resolution initial calibration chlorine isotope ratios is presented in Table 6.

A limit of detection (LOD) based on producing a signal that is 2.5 times the noise level, was calculated for each undetected 2,3,7,8-substituted isomer of any tetra through octa chlorinated congener class. The noise heights used to calculate the detection limits were measured at the retention time of the specific isomer. The formula used for calculating the LOD is:



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PCDD/PCDF Quantification and Calculations (Cont.)

$$\text{LOD} = \frac{H_n \times Q_{\text{is}} \times 2.5}{H_{\text{is}} \times W \times R_f}$$

where:

LOD = Single isomer limit of detection

H_n = Sum of noise heights at native isomer retention time

Q_{is} = Quantity of labeled internal standard

H_{is} = Sum of peak heights for labeled internal standard

W = Sample weight, volume or surface area

R_f = Response factor

The recovery of the ³⁷Cl₄ enrichment efficiency standard and each ¹³C₁₂-labeled internal standard, relative to either 1,2,3,4-TCDD-¹³C₁₂ or 1,2,3,7,8,9-HxCDD-¹³C₁₂, was calculated using the following equation:

$$\%R = \frac{A_{\text{is}} \times W_{\text{rs}} \times 100\%}{R_{\text{fr}} \times A_{\text{rs}} \times W_{\text{is}}}$$

where:

%R = Percent recovery of labeled internal standard

A_{is} = Sum of integrated areas of internal standard

W_{rs} = ng of recovery standard

A_{rs} = Sum of integrated areas of recovery standard

R_{fr} = Response factor of the specific labeled internal standard isomer relative to the recovery standard

W_{is} = ng of the labeled internal standard added to the sample prior to extraction



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RESULTS

The results of the sample analyses are included in Appendix A and are expressed on a dry sample weight basis.

DISCUSSION

The recoveries of the $^{13}\text{C}_{12}$ -labeled PCDD/PCDF internal standards in the samples were generally in the range of 50-75%, indicating a level of efficiency through the extraction and enrichment steps that is considered typical for this sample matrix type. Since the method is based on isotope dilution, the quantifications are automatically corrected for variations in recovery and accurate values are obtained for the 2,3,7,8-substituted PCDD/PCDF in the samples. The samples were found to contain chlorinated diphenylethers (PCDPEs), substances which can cause a false positive responses for PCDFs. The instrument monitors for the presence of PCDPEs, and any simultaneous response in the PCDPE and CDF ion channels is reported as "not detected" due to the possibility that the furan is an artifact produced from the diphenylether. The detection limit for each affected isomer is, therefore, elevated.

A laboratory method blank was prepared and processed along with the sample extraction batch as part of our routine quality assurance/quality control procedures. The data from this analysis, included at the beginning of Appendix A, show the blank to contain selected PCDD/PCDF isomers at low background levels (less than 0.2 parts-per-trillion/isomer) with the exception of those in the hepta and octa congener classes, which were present at levels of approximately 3-40 parts-per-trillion. These levels were below the levels determined for the same isomers in the actual samples, thus indicating that the sample processing steps did not contribute significantly to the levels determined for the samples.

Two quality control matrix spike samples were prepared by extracting separate aliquots of actual sample matrix fortified with native standard materials. The data sheets, included at the end of Appendix A, show that the native analytes were recovered at levels that typically ranged from 75-115%. This indicates a high level of accuracy for these determinations.



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REMARKS

The sample extracts will be retained for a period of 60 days from the date of this report and then discarded unless other arrangements are made. The raw mass spectral and chromatographic data will be archived on magnetic tape for a period of not less than one year.

TWIN CITY TESTING CORPORATION

Steven W. Hannan, Scientist
Mass Spectrometry Section

Charles V. Sueper
Charles V. Sueper, Supervisor
High Resolution Mass Spectrometry

*approved by:

Fred L. DeRoos, Ph.D.
Vice President
Chemistry

SWH/CSV/tls

TABLE 1
Spike Levels of PCDD/PCDF Standards

Internal Standards:

	<u>Spike Level (ng)</u>
2,3,7,8-TCDF- ¹³ C ₁₂	2.0
2,3,7,8-TCDD- ¹³ C ₁₂	2.0
1,2,3,7,8-PeCDF- ¹³ C ₁₂	2.0
2,3,4,7,8-PeCDF- ¹³ C ₁₂	2.0
1,2,3,4,7,8-PeCDD- ¹³ C ₁₂	2.0
1,2,3,4,7,8-HxCDF- ¹³ C ₁₂	2.0
1,2,3,6,7,8-HxCDF- ¹³ C ₁₂	2.0
1,2,3,7,8,9-HxCDF- ¹³ C ₁₂	2.0
2,3,4,6,7,8-HxCDF- ¹³ C ₁₂	2.0
1,2,3,4,7,8-HxCDD- ¹³ C ₁₂	2.0
1,2,3,6,7,8-HxCDD- ¹³ C ₁₂	2.0
1,2,3,4,6,7,8-HpCDF- ¹³ C ₁₂	2.0
1,2,3,4,7,8,9-HpCDF- ¹³ C ₁₂	2.0
1,2,3,4,6,7,8-HpCDD- ¹³ C ₁₂	2.0
OCDD- ¹³ C ₁₂	4.0

Recovery Standards

1,2,3,4-TCDD- ¹³ C ₁₂	2.0
1,2,3,7,8,9-HxCDD- ¹³ C ₁₂	2.0

Enrichment Efficiency Standard

2,3,7,8-TCDD- ³⁷ Cl ₄	0.8
---	-----

TABLE 2

**High Resolution PCDD/PCDF Analyses
HRGC/HRMS Operating Parameters**

Mass Resolution	10,000-11,000 (M/ Δ M, 10% valley)
Electron Energy	32 electron volts
Accelerating Voltage	8,000 volts
Source Temperature	275°C
Preamplifier Gain	10 ⁻⁶ amp/volt
Multiplier Gain	~10 ⁵
Chromatographic Column	60 M DB-5
Transfer Line Temperature	300°C
Injection Mode	Splitless
Carrier Gas	Helium
Carrier Flow Velocity	~30 cm/sec



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TABLE 3

Exact Ion Masses Monitored
for the Determination of PCDDs, PCDFs, and PCDPES

Compound	Accurate Mass			Theoretical Ratio Mass 2/Mass 3
	Mass 1	Mass 2	Mass 3	
Tetra-CDDs		319.8965	321.8936	0.77
Tetra-CDFs		303.9016	305.8987	0.77
Hexa-CDPES	375.8364			
Penta-CDDs	353.8576	355.8546	357.8517	1.54
Penta-CDFs		339.8597	341.8567	1.54
Hepta-CDPES	409.7974			
Hexa-CDDs	387.8187	389.8156	391.8127	1.23
Hexa-CDFs		373.8207	375.8178	1.23
Octa-CDPES	445.7555			
Hepta-CDDs	421.7798	423.7766	425.7737	1.03
Hepta-CDFs		407.7817	409.7788	1.03
Nona-CDPES	479.7165			
Octa-CDD	455.7409	457.7377	459.7347	0.88
Octa-CDF		441.7428	443.7398	0.88
Deca-CDPE	513.6775			

CDDs = Chlorinated Dibenzo-p-dioxins

CDFs = Chlorinated Dibenzofurans

CDPES = Chlorinated Diphenylethers

TABLE 4**High Resolution Calibration Solutions**

<u>Native CDDs/CDFs</u>		<u>Concentration (pg/uL)</u>				
		<u>CS1</u>	<u>CS2</u>	<u>CS3</u>	<u>CS4</u>	<u>CS5</u>
2,3,7,8-TCDD		0.5	2	10	40	200
2,3,7,8 TCDF		0.5	2	10	40	200
1,2,3,7,8-PeCDD		2.5	10	50	200	1000
1,2,3,7,8-PeCDF		2.5	10	50	200	1000
2,3,4,7,8-PeCDF		2.5	10	50	200	1000
1,2,3,4,7,8-HxCDD		2.5	10	50	200	1000
1,2,3,6,7,8-HxCDD		2.5	10	50	200	1000
1,2,3,7,8,9-HxCDD		2.5	10	50	200	1000
1,2,3,4,7,8-HxCDF		2.5	10	50	200	1000
1,2,3,6,7,8-HxCDF		2.5	10	50	200	1000
1,2,3,7,8,9-HxCDF		2.5	10	50	200	1000
2,3,4,6,7,8-HxCDF		2.5	10	50	200	1000
1,2,3,4,6,7,8-HpCDD		2.5	10	50	200	1000
1,2,3,4,6,7,8-HpCDF		2.5	10	50	200	1000
1,2,3,4,7,8,9-HpCDF		2.5	10	50	200	1000
OCDD		5.0	20	100	400	2000
OCDF		5.0	20	100	400	2000
<u>Internal Standards</u>						
2,3,7,8-TCDD ¹³ C ₁₂		100	100	100	100	100
2,3,7,8-TCDF ¹³ C ₁₂		100	100	100	100	100
1,2,3,7,8-PeCDD ¹³ C ₁₂		100	100	100	100	100
1,2,3,7,8-PeCDF ¹³ C ₁₂		100	100	100	100	100
2,3,4,7,8-PeCDF ¹³ C ₁₂		100	100	100	100	100
1,2,3,4,7,8-HxCDD ¹³ C ₁₂		100	100	100	100	100
1,2,3,6,7,8-HxCDD ¹³ C ₁₂		100	100	100	100	100
1,2,3,4,7,8-HxCDF ¹³ C ₁₂		100	100	100	100	100
1,2,3,6,7,8-HxCDF ¹³ C ₁₂		100	100	100	100	100
1,2,3,7,8,9-HxCDF ¹³ C ₁₂		100	100	100	100	100
2,3,4,6,7,8-HxCDF ¹³ C ₁₂		100	100	100	100	100
1,2,3,4,6,7,8-HpCDD ¹³ C ₁₂		100	100	100	100	100
1,2,3,4,6,7,8-HpCDF ¹³ C ₁₂		100	100	100	100	100
1,2,3,4,7,8,9-HpCDF ¹³ C ₁₂		100	100	100	100	100
OCDD ¹³ C ₁₂		200	200	200	200	200
<u>Recovery Standards</u>						
1,2,3,4-TCDD ¹³ C ₁₂		100	100	100	100	100
1,2,3,7,8,9-HxCDD ¹³ C ₁₂		100	100	100	100	100
<u>Enrichment Efficiency Standard</u>						
2,3,7,8-TCDD ³⁷ C ₁₄		0.5	2	10	40	200



twin city testing

corporation

TABLE #5
 HRGC/HRMS Analyses VG70-VSE
 HRGC/HRMS Initial Calibration (5-11-90) Summary of Response Factors

Isomer	TCT Std #	LOW CS-1	CS-2	CS-3	CS-4	HIGH CS-5	Average RF	Percent RSD
2,3,7,8-TCDF		0.9148	0.9802	0.9862	0.9519	1.0151	0.9696	3.51
2,3,7,8-TCDD		1.1126	1.0557	1.0907	1.0511	1.1394	1.0899	3.08
1,2,3,7,8-PnCDF		1.2275	1.1425	1.2359	1.1070	1.1325	1.1691	4.49
2,3,4,7,8-PnCDF		1.0101	1.0234	0.9944	0.9665	1.0016	0.9992	1.90
1,2,3,7,8-PnCDD		1.0389	1.0648	1.0446	1.0437	1.0825	1.0549	1.55
1,2,3,4,7,8-HxCDF		1.1516	1.2370	1.1478	1.0368	1.0288	1.1204	6.99
1,2,3,6,7,8-HxCDF		1.3791	1.1674	1.1334	1.2213	1.2061	1.2214	6.92
1,2,3,7,8,9-HxCDF		1.3002	1.2165	1.1301	1.1565	1.1426	1.1892	5.29
2,3,4,6,7,8-HxCDF		1.1632	1.1873	1.1112	1.1293	1.1232	1.1429	2.46
1,2,3,4,7,8-HxCDD		0.8602	1.1387	1.0716	0.8514	0.8682	0.9580	12.75
1,2,3,6,7,8-HxCDD		1.0920	0.9425	0.9346	1.0791	1.0899	1.0276	7.09
1,2,3,7,8,9-HxCDD		0.8753	0.8454	0.7403	0.9389	0.9951	0.8790	9.85
1,2,3,4,6,7,8-HpCDF		1.6464	1.7181	1.5804	1.5228	1.5820	1.6100	4.15
1,2,3,4,7,7,8-HpCDF		1.2606	1.3318	1.3161	1.2155	1.2978	1.2844	3.26
1,2,3,4,6,7,8-HpCDD		0.9518	0.9814	0.9949	0.9184	0.9703	0.9633	2.76
OCDF		1.3118	1.4911	1.3767	1.3427	1.4300	1.3904	4.59
OCDD		1.4222	1.2827	1.2205	1.1549	1.2349	1.2630	7.08
TOTAL PeCDFs		1.1188	1.0830	1.1151	1.0368	1.0671	1.0842	2.83
TOTAL HxCDFs		1.2485	1.2020	1.1306	1.1360	1.1252	1.1685	4.17
TOTAL HxCDDs		0.9425	0.9755	0.9155	0.9565	0.9844	0.9549	2.57
TOTAL HpCDFs		1.4535	1.5250	1.4483	1.3692	1.4399	1.4472	3.42
2,3,7,8-TCDF*		1.6143	1.6875	1.6743	1.6315	1.6115	1.6438	1.91
2,3,7,8-TCDD*		0.9146	0.8841	1.0926	0.8957	1.0108	0.9596	8.35
2,3,7,8,-TCDD-C137		0.9803	0.9025	1.1565	0.9707	1.1169	1.0254	9.32
1,2,3,7,8-PnCDF*		1.2455	1.4014	0.9197	1.3184	1.4389	1.2648	14.64
2,3,4,7,8-PnCDF*		1.6584	1.6988	1.5903	1.6464	1.7880	1.6764	3.92
1,2,3,7,8-PnCDD*		0.9412	0.9767	0.9243	0.9342	1.0320	0.9617	4.09
1,2,3,4,7,8-HxCDF*		1.2089	1.2013	1.2901	1.1751	1.0682	1.1887	6.02
1,2,3,6,7,8-HxCDF*		1.0746	1.2521	1.3178	0.9615	0.9772	1.1166	12.92
1,2,3,7,8,9-HxCDF*		1.2797	1.2322	1.3894	1.1730	1.1184	1.2385	7.51
2,3,4,6,7,8-HxCDF*		1.0564	0.9996	1.2623	0.9723	0.9905	1.0562	10.11
1,2,3,4,7,8-HxCDD*		0.9564	0.7845	0.9689	0.9437	0.8206	0.8948	8.56
1,2,3,6,7,8-HxCDD*		0.9368	1.0491	1.1516	0.8772	0.8570	0.9743	11.39
1,2,3,4,6,7,8-HpCDF*		0.9305	0.9544	0.9674	0.8902	0.8411	0.9167	5.02
1,2,3,4,7,8,9-HpCDF*		0.9057	0.9118	0.9751	0.8407	0.8405	0.8948	5.64
1,2,3,4,6,7,8-HpCDD*		0.9004	0.9801	0.9870	0.8871	0.8476	0.9204	5.91
OCDD*		0.6925	0.6767	0.7723	0.6395	0.6191	0.6800	7.79

* = C13 Labeled Isomer

TABLE #5 - A
 HRGC/HRMS Analyses VG70-VSE
 HRGC/HRMS Initial Calibration (6-15-90) Summary of Response Factors

Isomer	TCT Std #	LOW				HIGH		Average RF	Percent RSD
		CS-1	CS-2	CS-3	CS-4	CS-5			
2,3,7,8-TCDF		0.8512	0.7905	0.7791	0.8291	0.9110		0.8322	5.67
2,3,7,8-TCDD		0.9079	0.7612	0.8082	0.8821	1.0663		0.8851	11.81
1,2,3,7,8-PnCDF		1.1318	1.1261	1.1415	1.2097	1.3334		1.1885	6.60
2,3,4,7,8-PnCDF		0.9936	0.9680	0.9865	1.0839	1.1383		1.0341	6.36
1,2,3,7,8-PnCDD		1.0155	1.0384	1.0851	0.9842	1.0711		1.0389	3.53
1,2,3,4,7,8-HxCDF		1.0802	1.2021	1.2316	1.2171	1.2284		1.1919	4.76
1,2,3,6,7,8-HxCDF		1.2605	1.0971	1.1477	1.1587	1.3661		1.2060	7.96
1,2,3,7,8,9-HxCDF		1.1978	1.1528	1.1860	1.1149	1.2755		1.1854	4.51
2,3,4,6,7,8-HxCDF		1.1065	1.0972	1.1808	1.1092	1.2987		1.1585	6.58
1,2,3,4,7,8-HxCDD		0.8610	1.0173	0.8382	1.0514	0.8904		0.9317	9.25
1,2,3,6,7,8-HxCDD		1.0689	0.8530	1.0632	0.8973	1.1187		1.0002	10.49
1,2,3,7,8,9-HxCDD		1.0443	0.8786	1.0384	0.8764	1.1218		0.9919	9.87
1,2,3,4,6,7,8-HpCDF		1.6097	1.7573	1.5866	1.7777	1.7038		1.6870	4.55
1,2,3,4,7,7,8-HpCDF		1.2529	1.1841	1.3123	1.3446	1.3923		1.2973	5.59
1,2,3,4,6,7,8-HpCDD		0.9837	0.8759	1.0003	0.9304	0.9668		0.9514	4.66
OCDF		1.3699	1.3148	1.5137	1.3246	1.5707		1.4187	7.34
OCDD		1.2985	1.1809	1.2177	1.1642	1.2571		1.2237	4.02
TOTAL PeCDFs		1.0627	1.0470	1.0640	1.1468	1.2359		1.1113	6.43
TOTAL HxCDFs		1.1613	1.1373	1.1865	1.1500	1.2922		1.1855	4.71
TOTAL HxCDDs		0.9914	0.9163	0.9799	0.9417	1.0436		0.9746	4.49
TOTAL HpCDFs		1.4313	1.4707	1.4495	1.5611	1.5480		1.4921	3.53
2,3,7,8-TCDF*		1.6638	1.7749	1.6897	1.6448	1.6454		1.6837	2.88
2,3,7,8-TCDD*		0.8877	0.7410	0.9815	0.8150	0.9972		0.8845	11.03
2,3,7,8,-TCDD-C137		0.8751	0.5819	0.8490	0.7633	1.0381		0.8215	18.16
1,2,3,7,8-PnCDF*		1.2188	1.3538	1.4780	1.4759	1.4034		1.3860	6.91
2,3,4,7,8-PnCDF*		1.4044	1.4531	1.8385	1.5826	1.7053		1.5968	10.02
1,2,3,7,8-PnCDD*		0.7710	0.7495	0.9640	0.9238	1.0418		0.8900	12.67
1,2,3,4,7,8-HxCDF*		1.1790	1.1159	1.1003	1.0862	1.0589		1.1081	3.62
1,2,3,6,7,8-HxCDF*		1.3427	1.4614	1.2090	1.4145	1.1153		1.3086	9.85
1,2,3,7,8,9-HxCDF*		1.1862	1.1709	1.1048	1.1740	1.0352		1.1342	5.03
2,3,4,6,7,8-HxCDF*		0.9055	0.8687	0.9746	0.9615	0.9271		0.9275	4.12
1,2,3,4,7,8-HxCDD*		0.7922	0.7255	0.7439	0.7144	0.8132		0.7578	5.07
1,2,3,6,7,8-HxCDD*		0.8049	0.9477	0.7992	0.9291	0.7882		0.8538	8.14
1,2,3,4,6,7,8-HpCDF*		0.7349	0.6943	0.7589	0.7609	0.6806		0.7259	4.55
1,2,3,4,7,8,9-HpCDF*		0.7003	0.6495	0.7423	0.6875	0.6909		0.6941	4.28
1,2,3,4,6,7,8-HpCDD*		0.6962	0.6898	0.6959	0.7274	0.6728		0.6964	2.54
OCDD*		0.5547	0.5315	0.5582	0.6210	0.5573		0.5645	5.30

* = C13 Labeled Isomer

TABLE #6
HRGC/HRMS Analyses
Initial Calibration (5-11-90) VG70-VSE
Summary of Isotope Ratios

Isomer	TCT Std #	LOW				HIGH	Limits
		CS-1	CS-2	CS-3	CS-4	CS-5	
2,3,7,8-TCDF		0.80	0.78	0.79	0.79	0.78	0.65-0.89
2,3,7,8-TCDD		0.82	0.78	0.79	0.77	0.78	0.65-0.89
1,2,3,7,8-PnCDF		1.41	1.59	1.59	1.56	1.54	1.32-1.78
2,3,4,7,8-PnCDF		1.62	1.57	1.57	1.57	1.55	1.32-1.78
1,2,3,7,8-PnCDD		1.66	1.61	1.56	1.57	1.57	1.32-1.78
1,2,3,4,7,8-HxCDF		1.28	1.31	1.25	1.23	1.16	1.05-1.43
1,2,3,6,7,8-HxCDF		1.30	1.25	1.26	1.27	1.22	1.05-1.43
1,2,3,7,8,9-HxCDF		1.21	1.30	1.26	1.23	1.21	1.05-1.43
2,3,4,6,7,8-HxCDF		1.34	1.28	1.27	1.24	1.21	1.05-1.43
1,2,3,4,7,8-HxCDD		1.20	1.21	1.23	1.24	1.21	1.05-1.43
1,2,3,6,7,8-HxCDD		1.28	1.23	1.25	1.27	1.27	1.05-1.43
1,2,3,7,8,9-HxCDD		1.29	1.28	1.26	1.23	1.25	1.05-1.43
1,2,3,4,6,7,8-HpCDF		1.02	1.03	1.01	1.02	1.03	0.88-1.20
1,2,3,4,7,7,8-HpCDF		1.03	0.98	1.02	1.05	1.04	0.88-1.20
1,2,3,4,6,7,8-HpCDD		1.01	1.02	1.03	1.05	1.05	0.88-1.20
OCDF		0.83	0.90	0.90	0.91	0.92	0.76-1.02
OCDD		0.95	0.89	0.90	0.91	0.89	0.76-1.02
1234-TCDD-REC		0.78	0.78	0.78	0.81	0.80	0.65-0.89
123789-HxCDD-REC		1.26	1.20	1.29	1.24	1.25	1.05-1.43
2,3,7,8-TCDF*		0.80	0.80	0.79	0.80	0.77	0.65-0.89
2,3,7,8-TCDD*		0.78	0.79	0.78	0.79	0.79	0.65-0.89
2,3,7,8,-TCDD-C137	****	****	****	****	****	*****	*****
1,2,3,7,8-PnCDF*		1.56	1.57	1.64	1.60	1.57	1.32-1.78
2,3,4,7,8-PnCDF*		1.57	1.56	1.60	1.58	1.59	1.32-1.78
1,2,3,7,8-PnCDD*		1.57	1.56	1.58	1.58	1.60	1.32-1.78
1,2,3,4,7,8-HxCDF*		0.54	0.55	0.53	0.55	0.55	0.43-0.59
1,2,3,6,7,8-HxCDF*		0.52	0.55	0.54	0.53	0.54	0.43-0.59
1,2,3,7,8,9-HxCDF*		0.54	0.54	0.54	0.55	0.54	0.43-0.59
2,3,4,6,7,8-HxCDF*		0.53	0.55	0.53	0.55	0.54	0.43-0.59
1,2,3,4,7,8-HxCDD*		1.24	1.20	1.29	1.25	1.25	1.05-1.43
1,2,3,6,7,8-HxCDD*		1.27	1.24	1.32	1.27	1.27	1.05-1.43
1,2,3,4,6,7,8-HpCDF*		0.46	0.45	0.47	0.46	0.45	0.37-0.51
1,2,3,4,7,8,9-HpCDF*		0.46	0.44	0.46	0.47	0.44	0.37-0.51
1,2,3,4,6,7,8-HpCDD*		1.08	1.05	1.04	1.04	1.07	0.88-1.20
OCDD*		0.92	0.93	0.91	0.88	0.92	0.76-1.02

* = C13 Labeled Isomer

TABLE #6 -A
 HRGC/HRMS Analyses VG70-VSE
 Initial Calibration (6-15-90) Summary of Isotope Ratios

Isomer	TCT Std #	LOW				HIGH CS-5	Limits
		CS-1	CS-2	CS-3	CS-4		
2,3,7,8-TCDF		0.81	0.83	0.78	0.79	0.82	0.65-0.89
2,3,7,8-TCDD		0.84	0.74	0.81	0.78	0.75	0.65-0.89
1,2,3,7,8-PnCDF		1.67	1.56	1.61	1.65	1.56	1.32-1.78
2,3,4,7,8-PnCDF		1.68	1.57	1.59	1.61	1.55	1.32-1.78
1,2,3,7,8-PnCDD		1.66	1.64	1.53	1.50	1.53	1.32-1.78
1,2,3,4,7,8-HxCDF		1.24	1.23	1.28	1.22	1.21	1.05-1.43
1,2,3,6,7,8-HxCDF		1.16	1.15	1.34	1.21	1.20	1.05-1.43
1,2,3,7,8,9-HxCDF		1.18	1.13	1.31	1.16	1.23	1.05-1.43
2,3,4,6,7,8-HxCDF		1.13	1.18	1.27	1.20	1.19	1.05-1.43
1,2,3,4,7,8-HxCDD		1.27	1.33	1.27	1.26	1.27	1.05-1.43
1,2,3,6,7,8-HxCDD		1.32	1.37	1.32	1.31	1.31	1.05-1.43
1,2,3,7,8,9-HxCDD		1.25	1.35	1.28	1.29	1.28	1.05-1.43
1,2,3,4,6,7,8-HpCDF		1.07	1.01	1.06	1.05	1.03	0.88-1.20
1,2,3,4,7,7,8-HpCDF		1.04	1.01	1.06	1.06	1.02	0.88-1.20
1,2,3,4,6,7,8-HpCDD		1.09	1.00	1.07	1.05	1.04	0.88-1.20
OCDF		0.93	0.95	0.90	0.95	0.90	0.76-1.02
OCDD		0.91	0.91	0.90	0.90	0.89	0.76-1.02
1234-TCDD-REC		0.80	0.82	0.80	0.79	0.79	0.65-0.89
123789-HxCDD-REC		1.31	1.29	1.20	1.31	1.32	1.05-1.43
2,3,7,8-TCDF*		0.81	0.80	0.82	0.77	0.77	0.65-0.89
2,3,7,8-TCDD*		0.78	0.79	0.78	0.79	0.78	0.65-0.89
2,3,7,8,-TCDD-C137		****	****	****	****	****	*****
1,2,3,7,8-PnCDF*		1.63	1.59	1.66	1.70	1.54	1.32-1.78
2,3,4,7,8-PnCDF*		1.60	1.60	1.64	1.73	1.53	1.32-1.78
1,2,3,7,8-PnCDD*		1.56	1.58	1.61	1.59	1.60	1.32-1.78
1,2,3,4,7,8-HxCDF*		0.57	0.53	0.57	0.51	0.59	0.43-0.59
1,2,3,6,7,8-HxCDF*		0.57	0.53	0.59	0.53	0.59	0.43-0.59
1,2,3,7,8,9-HxCDF*		0.55	0.52	0.58	0.52	0.59	0.43-0.59
2,3,4,6,7,8-HxCDF*		0.57	0.52	0.57	0.53	0.58	0.43-0.59
1,2,3,4,7,8-HxCDD*		1.26	1.27	1.20	1.31	1.28	1.05-1.43
1,2,3,6,7,8-HxCDD*		1.31	1.33	1.23	1.31	1.33	1.05-1.43
1,2,3,4,6,7,8-HpCDF*		0.46	0.46	0.45	0.46	0.45	0.37-0.51
1,2,3,4,7,8-HpCDF*		0.45	0.45	0.46	0.45	0.45	0.37-0.51
1,2,3,4,6,7,8-HpCDD*		1.05	1.05	1.07	1.06	1.04	0.88-1.20
OCDD*		0.90	0.92	0.93	0.91	0.92	0.76-1.02

* = C13 Labeled Isomer

APPENDIX A

 TWIN CITY TESTING CORPORATION
 * PCDF/PCDD ANALYSIS RESULTS *

 Client....BATTELLE

Sample ID (TCT#).....METHOD BLANK 4-30-90
 Analysis Date.....5-9-90
 Filename.....V00509F
 Analyst.....BB
 Sample Amount.....0.0101 kg
 ICAL Date.....5-11-90
 CCAL Filename.....V00509D

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	nd	0.42	2378-TCDF-C13....	2.00	55
TOTAL TCDF	0.19	-----	2378-TCDD-C13...:	2.00	65
2378-TCDD	nd	0.14	12378-PeCDF-C13..:	2.00	31
TOTAL TCDD	0.66	-----	23478-PeCDF-C13..:	2.00	43
12378-PeCDF	0.15	-----	12378-PeCDD-C13..:	2.00	41
23478-PeCDF	nd	0.32	123478-HxCDF-C13.	2.00	89
TOTAL PeCDF	0.83	-----	123478-HxCDF-C13.	2.00	84
123478-HxCDF	nd	0.18	123478-HxCDD-C13.	2.00	77
TOTAL PeCDD	0.46	-----	1234678-HxCDF-C13.	2.00	72
123478-HxCDF	nd	0.18	1234678-HxCDD-C13.	2.00	79
TOTAL PeCDD	0.46	-----	1234678-HxCDF-C13.	2.00	75
123478-HxCDF	nd	0.20	1234678-HxCDD-C13.	2.00	89
123678-HxCDF	nd	0.29	1234678-HpCDF-C13	2.00	95
123789-HxCDF	nd	0.41	OCDD-C13.....	4.00	84
234678-HxCDF	nd	0.21	1234-TCDD-C13...:	2.00	na
TOTAL HxCDF	nd	-----	123789-HxCDD-C13.	2.00	na
123478-HxCDD	nd	0.18	2378-TCDD-C13....	0.80	69
123678-HxCDD	nd	0.25			
123789-HxCDD	nd	0.16			
TOTAL HxCDD	nd	-----			
1234678-HpCDF	nd	0.27			
1234789-HpCDF	nd	0.31			
TOTAL HpCDF	nd	-----			
1234678-HpCDD	3.10	-----	Total 2378-TCDD		
TOTAL HpCDD	5.50	-----	Equivalence =	0.089 ng/kg	
OCDF	1.20	-----			
OCDD	43.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

 TWIN CITY TESTING CORPORATION
 * PCDF/PCDD ANALYSIS RESULTS *

 Client....BATTELLE

Sample ID (Client's#) YQ-EPA 2
 Sample ID (TCT#) 190672
 Analysis Date..... 5-21-90
 Filename..... V00521K
 Analyst..... BB
 Sample Amount..... 0.0053 kg
 ICAL Date..... 5-11-90
 CCAL Filename..... V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	1.40	-----	2378-TCDF-C13....	2.00	59
TOTAL TCDF	6.00	-----	2378-TCDD-C13....	2.00	61
2378-TCDD	nd	0.46	12378-PeCDF-C13..	2.00	60
TOTAL TCDD	2.00	-----	23478-PeCDF-C13..	2.00	38
12378-PeCDF	0.23	-----	12378-PeCDD-C13..	2.00	58
23478-PeCDF	nd	0.66	123478-HxCDF-C13.	2.00	67
TOTAL PeCDF	12.00	-----	123678-HxCDF-C13.	2.00	75
12378-PeCDD	1.50	-----	123678-HxCDD-C13.	2.00	55
TOTAL PeCDD	2.50	-----	1234678-HpCDF-C13	2.00	50
123478-HxCDF	1.50	-----	1234678-HpCDD-C13	2.00	67
123678-HxCDF	nd	11.00	OCDD-C13.....	2.00	68
123789-HxCDF	1.40	-----		4.00	47
234678-HxCDF	nd	0.41	1234-TCDD-C13...:	2.00	44
TOTAL HxCDF	48.00	-----	123789-HxCDD-C13:	2.00	na
123478-HxCDD	2.20	-----	2378-TCDD-C137...	0.80	na
123678-HxCDD	11.00	-----			75
123789-HxCDD	4.00	-----			
TOTAL HxCDD	55.00	-----			
1234678-HpCDF	15.00	-----			
1234789-HpCDF	1.10	-----			
TOTAL HpCDF	16.00	-----			
1234678-HpCDD	240.00	-----	Total 2378-TCDD		
TOTAL HpCDD	630.00	-----	Equivalence =	6.9 ng/kg	
OCDF	34.00	-----			
OCDD	1400.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 3
Sample ID (TCT#).....190673
Analysis Date.....5-21-90
Filename.....V00521L
Analyst.....BB
Sample Amount.....0.0071 kg
ICAL Date.....5-11-90
CCAL Filename.....V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.95	-----	2378-TCDF-C13....	2.00	73
TOTAL TCDF	6.60	-----	2378-TCDD-C13....	2.00	81
2378-TCDD	nd	0.84	12378-PeCDF-C13..	2.00	79
TOTAL TCDD	0.98	-----	23478-PeCDF-C13..	2.00	74
12378-PeCDF	0.36	-----	12378-PeCDD-C13..	2.00	78
23478-PeCDF	0.52	-----	123478-HxCDF-C13.	2.00	78
TOTAL PeCDF	14.00	-----	123678-HxCDF-C13.	2.00	71
12378-PeCDD	1.90	-----	123789-HxCDF-C13.	2.00	63
TOTAL PeCDD	1.90	-----	234678-HxCDF-C13.	2.00	68
123478-HxCDF	nd	7.90	123478-HxCDD-C13.	2.00	72
123678-HxCDF	1.30	-----	123678-HxCDD-C13.	2.00	71
123789-HxCDF	1.80	-----	1234678-HpCDF-C13	2.00	51
234678-HxCDF	0.20	-----	1234789-HpCDF-C13	2.00	60
TOTAL HxCDF	71.00	-----	1234678-HpCDD-C13	2.00	42
123478-HxCDD	3.50	-----	1234678-HpCDD-C13	2.00	58
123678-HxCDD	19.00	-----	OCDD-C13.....	4.00	na
123789-HxCDD	7.30	-----	1234-TCDD-C13....	2.00	na
TOTAL HxCDD	72.00	-----	123789-HxCDD-C13.	2.00	na
1234678-HpCDF	29.00	-----	2378-TCDD-C137...	0.80	103
1234789-HpCDF	1.30	-----			
TOTAL HpCDF	30.00	-----			
1234678-HpCDD	380.00	-----	Total 2378-TCDD		
TOTAL HpCDD	770.00	-----	Equivalence =	11 ng/kg	
OCDF	51.00	-----			
OCDD	2300.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 6
Sample ID (TCT#).....190674
Analysis Date.....5-21-90
Filename.....V00521M
Analyst.....BB
Sample Amount.....0.0083 kg
ICAL Date.....5-11-90
CCAL Filename.....V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.61	-----	2378-TCDF-C13....	2.00	65
TOTAL TCDF	1.40	-----	2378-TCDD-C13....	2.00	70
2378-TCDD	nd	0.41	12378-PeCDF-C13..	2.00	63
TOTAL TCDD	1.30	-----	23478-PeCDF-C13..	2.00	60
12378-PeCDF	nd	0.36	12378-PeCDD-C13..	2.00	44
23478-PeCDF	0.17	-----	123478-HxCDF-C13.	2.00	58
TOTAL PeCDF	2.30	-----	123789-HxCDF-C13.	2.00	43
12378-PeCDD	nd	0.59	234678-HxCDD-C13.	2.00	47
TOTAL PeCDD	nd	-----	1234789-HxCDD-C13.	2.00	49
123478-HxCDF	0.41	-----	123678-HxCDD-C13.	2.00	54
123678-HxCDF	0.81	-----	1234678-HpCDF-C13	2.00	38
123789-HxCDF	0.60	-----	1234789-HpCDF-C13	2.00	46
234678-HxCDF	nd	0.52	1234-TCDD-C13...:	2.00	na
TOTAL HxCDF	9.20	-----	123789-HxCDD-C13.	2.00	na
123478-HxCDD	0.47	-----	2378-TCDD-C137...	0.80	75
123678-HxCDD	1.50	-----			
123789-HxCDD	1.00	-----			
TOTAL HxCDD	8.10	-----			
1234678-HpCDF	2.80	-----			
1234789-HpCDF	0.46	-----			
TOTAL HpCDF	8.30	-----			
1234678-HpCDD	27.00	-----	Total 2378-TCDD		
TOTAL HpCDD	59.00	-----	Equivalence =	1.1 ng/kg	
OCDF	7.20	-----			
OCDD	180.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 8
Sample ID (TCT#).....190675
Analysis Date.....5-21-90
Filename.....V00521N
Analyst.....BB
Sample Amount.....0.0070 kg
ICAL Date.....5-11-90
CCAL Filename.....V00521A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.97	-----	2378-TCDF-C13....	2.00	75
TOTAL TCDF	4.40	-----	2378-TCDD-C13....	2.00	82
2378-TCDD	nd	0.36	12378-PeCDF-C13..	2.00	77
TOTAL TCDD	2.40	-----	23478-PeCDF-C13..	2.00	72
12378-PeCDF	nd	0.53	12378-PeCDD-C13..	2.00	59
23478-PeCDF	0.31	-----	123478-HxCDF-C13.	2.00	67
TOTAL PeCDF	4.90	-----	123789-HxCDF-C13.	2.00	54
12378-PeCDD	0.62	-----	234678-HxCDD-C13.	2.00	60
TOTAL PeCDD	1.10	-----	123678-HxCDD-C13.	2.00	62
123478-HxCDF	0.79	-----	1234678-HpCDF-C13	2.00	65
123678-HxCDF	1.00	-----	1234789-HpCDF-C13	2.00	47
123789-HxCDF	0.86	-----	OCDD-C13.....	4.00	54
234678-HxCDF	nd	0.29	1234-TCDD-C13....	2.00	na
TOTAL HxCDF	15.00	-----	123789-HxCDD-C13.	2.00	na
123478-HxCDD	nd	0.89	2378-TCDD-C137...	0.80	84
123678-HxCDD	3.10	-----			
123789-HxCDD	1.80	-----			
TOTAL HxCDD	20.00	-----			
1234678-HpCDF	6.20	-----			
1234789-HpCDF	nd	0.96			
TOTAL HpCDF	10.00	-----			
1234678-HpCDD	58.00	-----	Total 2378-TCDD		
TOTAL HpCDD	130.00	-----	Equivalence =	2.4 ng/kg	
OCDF	21.00	-----			
OCDD	390.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 9
Sample ID (TCT#).....190677
Analysis Date.....5-24-90
Filename.....V00524M
Analyst.....BB
Sample Amount.....0.0057 kg
ICAL Date.....5-11-90
CCAL Filename.....V00524A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	1.30	-----	2378-TCDF-C13....	2.00	78
TOTAL TCDF	7.30	-----	2378-TCDD-C13....	2.00	78
12378-PeCDF	0.38	-----	12378-PeCDF-C13..	2.00	61
TOTAL TCDD	6.40	-----	23478-PeCDF-C13..	2.00	58
12378-PeCDF	0.52	-----	12378-PeCDD-C13..	2.00	56
TOTAL PeCDF	7.30	-----	123478-HxCDF-C13.	2.00	58
12378-PeCDD	1.20	-----	123678-HxCDF-C13.	2.00	65
TOTAL PeCDD	1.20	-----	123789-HxCDF-C13.	2.00	51
123478-HxCDF	nd	0.46	234678-HxCDF-C13.	2.00	55
123678-HxCDF	nd	15.00	123478-HxCDD-C13.	2.00	64
123789-HxCDF	0.70	-----	123678-HxCDD-C13.	2.00	54
234678-HxCDF	nd	0.45	1234678-HpCDF-C13	2.00	43
TOTAL HxCDF	19.00	-----	123789-HpCDF-C13	2.00	53
123478-HxCDD	nd	0.16	1234678-HpCDD-C13	2.00	46
123678-HxCDD	0.97	-----	OCDD-C13.....	4.00	45
123789-HxCDD	3.90	-----			
TOTAL HxCDD	2.70	-----			
1234678-HpCDF	25.00	-----	1234-TCDD-C13....	2.00	na
1234789-HpCDF	11.00	-----	123789-HxCDD-C13.	2.00	na
TOTAL HpCDF	40.00	-----			
1234678-HpCDD	85.00	-----	Total 2378-TCDD		
TOTAL HpCDD	220.00	-----	Equivalence =	3.9 ng/kg	
OCDF	32.00	-----			
OCDD	620.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#) YQ-EPA 12
Sample ID (TCT#) 190678
Analysis Date..... 5-25-90
Filename..... V00525D
Analyst..... BB
Sample Amount..... 0.0069 kg
ICAL Date..... 5-11-90
CCAL Filename..... V00525A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	1.50	-----	2378-TCDF-C13....	2.00	70
TOTAL TCDF	11.00	-----	2378-TCDD-C13....	2.00	69
2378-TCDD	nd	1.90	12378-PeCDF-C13..	2.00	70
TOTAL TCDD	3.60	-----	23478-PeCDF-C13..	2.00	71
12378-PeCDF	0.44	-----	12378-PeCDD-C13..	2.00	66
23478-PeCDF	0.51	-----	123478-HxCDF-C13.	2.00	59
TOTAL PeCDF	8.40	-----	123678-HxCDF-C13.	2.00	68
12378-PeCDD	nd	0.83	123678-HxCDD-C13.	2.00	51
TOTAL PeCDD	1.90	-----	1234678-HpCDF-C13	2.00	51
123478-HxCDF	1.10	-----	1234789-HxCDF-C13.	2.00	60
123678-HxCDF	nd	3.70	1234678-HpCDD-C13	2.00	56
123789-HxCDF	0.99	-----	OCDD-C13.....	2.00	46
234678-HxCDF	0.44	-----	1234678-HpCDF-C13	2.00	46
TOTAL HxCDF	21.00	-----	1234789-HxCDD-C13.	2.00	40
123478-HxCDD	0.74	-----	1234789-HxCDF-C13.	2.00	32
123678-HxCDD	3.20	-----	OCDD-C13.....	2.00	na
123789-HxCDD	2.10	-----	1234678-HxCDD-C13.	2.00	na
TOTAL HxCDD	29.00	-----			
1234678-HpCDF	12.00	-----	2378-TCDD-C137...	0.80	72
1234789-HpCDF	1.30	-----			
TOTAL HpCDF	46.00	-----			
1234678-HpCDD	72.00	-----			
TOTAL HpCDD	160.00	-----			
OCDF	43.00	-----	Total 2378-TCDD Equivalence =	2.8 ng/kg	
OCDD	550.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#)....YQ-EPA 13
Sample ID (TCT#).....190679
Analysis Date.....5-25-90
Filename.....V00525E
Analyst.....BB
Sample Amount.....0.0095 kg
ICAL Date.....5-11-90
CCAL Filename.....V00525A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.59	-----	2378-TCDF-C13....	2.00	53
TOTAL TCDF	4.40	-----	2378-TCDD-C13....	2.00	53
12378-PeCDF	0.29	-----	12378-PeCDF-C13..	2.00	62
TOTAL TCDD	7.70	-----	23478-PeCDF-C13..	2.00	58
12378-PeCDF	0.18	-----	12378-PeCDD-C13..	2.00	54
23478-PeCDF	nd	0.21	123478-HxCDF-C13.	2.00	60
TOTAL PeCDF	1.40	-----	123478-HxCDF-C13.	2.00	61
12378-PeCDD	0.35	-----	123478-HxCDD-C13.	2.00	55
TOTAL PeCDD	2.30	-----	1234678-HpCDF-C13	2.00	53
123478-HxCDF	0.32	-----	1234678-HpCDF-C13	2.00	47
123678-HxCDF	0.39	-----	1234678-HpCDD-C13	2.00	61
123789-HxCDF	0.45	-----	OCDD-C13.....	4.00	50
234678-HxCDF	nd	0.33	1234-TCDD-C13...:	2.00	na
TOTAL HxCDF	3.90	-----	123789-HxCDD-C13:	2.00	na
123478-HxCDD	0.32	-----	2378-TCDD-C137...	0.80	76
123678-HxCDD	0.78	-----			
123789-HxCDD	0.55	-----			
TOTAL HxCDD	7.20	-----			
1234678-HpCDF	1.60	-----			
1234789-HpCDF	nd	0.72			
TOTAL HpCDF	5.00	-----			
1234678-HpCDD	13.00	-----	Total 2378-TCDD		
TOTAL HpCDD	28.00	-----	Equivalence =	1.2 ng/kg	
OCDF	4.70	-----			
OCDD	130.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#) YQ-EPA 14
Sample ID (TCT#) 190680
Analysis Date..... 5-25-90
Filename..... V00525F
Analyst..... BB
Sample Amount..... 0.0081 kg
ICAL Date..... 5-11-90
CCAL Filename..... V00525A

NATIVE ISOMERS	CONC. ng/kg	DL ng/kg	INTERNAL STANDARDS	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.52	-----	2378-TCDF-C13....	2.00	79
TOTAL TCDF	3.20	-----	2378-TCDD-C13....	2.00	74
2378-TCDD	nd	0.64	12378-PeCDF-C13..	2.00	70
TOTAL TCDD	1.60	-----	23478-PeCDF-C13..	2.00	67
12378-PeCDF	0.29	-----	12378-PeCDD-C13..	2.00	62
23478-PeCDF	0.28	-----	123478-HxCDF-C13.	2.00	58
TOTAL PeCDF	2.60	-----	123678-HxCDF-C13.	2.00	69
12378-PeCDD	0.51	-----	123678-HxCDD-C13.	2.00	55
TOTAL PeCDD	1.80	-----	1234678-HpCDF-C13	2.00	64
23478-HxCDF	0.61	-----	1234678-HpCDD-C13	2.00	54
123678-HxCDF	0.55	-----	OCDD-C13.....	4.00	62
123789-HxCDF	0.64	-----	1234678-HpCDF-C13	2.00	67
234678-HxCDF	nd	0.24	1234678-HpCDD-C13	2.00	53
TOTAL HxCDF	6.60	-----	123789-HxCDD-C13.	2.00	66
123478-HxCDD	0.86	-----	123478-HxCDD-C137...	0.80	na
123678-HxCDD	0.86	-----			78
123789-HxCDD	1.10	-----			
TOTAL HxCDD	13.00	-----			
1234678-HpCDF	3.40	-----			
1234789-HpCDF	nd	0.58			
TOTAL HpCDF	3.40	-----			
1234678-HpCDD	23.00	-----	Total 2378-TCDD		
TOTAL HpCDD	54.00	-----	Equivalence =	1.4 ng/kg	
OCDF	10.00	-----			
OCDD	200.00	-----			

CONC= Concentrations, calculated as described in EPA method 8290.

DL= Detection limits, calculated as described in EPA method 8290.

na= not applicable

nd= not detected

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#)..... YQ-EPA 14 SPIKE
Sample ID (TCT#)..... 190680-MS
Analysis Date..... 6-19-90
Filename..... V00619F
Analyst..... BB
Sample Amount..... 0.0066 kg
ICAL Date..... 6-15-90
CCAL Filename..... V00619C

NATIVE ISOMERS	Qs (NG)	Qm (NG)	% REC.	INTERNAL STANDARD	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.80	0.82	103	2378-TCDF-C13....	2.00	11
TOTAL TCDF	0.80	0.82	103	2378-TCDD-C13....	2.00	24
2378-TCDD	0.80	0.87	109	12378-PeCDF-C13..	2.00	51
TOTAL TCDD	0.80	0.87	109	23478-PeCDF-C13..	2.00	73
12378-PeCDF	4.00	3.50	88	12378-PeCDD-C13..	2.00	69
23478-PeCDF	4.00	3.50	88	123478-HxCDF-C13.	2.00	66
TOTAL PeCDF	8.00	7.00	88	123478-HxCDF-C13.	2.00	74
12378-PeCDD	4.00	3.70	93	1234678-HxCDD-C13.	2.00	74
TOTAL PeCDD	4.00	3.70	93	1234678-HxCDD-C13.	2.00	67
123478-HxCDF	4.00	3.00	75	1234678-HxCDD-C13.	2.00	37
123678-HxCDF	4.00	3.90	98	1234789-HxCDF-C13.	2.00	54
123789-HxCDF	4.00	3.40	85	OCDD-C13.....	4.00	31
234678-HxCDF	4.00	3.50	88	1234678-HxCDD-C13.	2.00	XX
TOTAL HxCDF	16.00	14.00	88	123789-HxCDD-C13.	2.00	XX
123478-HxCDD	4.00	3.10	78	2378-TCDD-C137...	0.80	26
123678-HxCDD	4.00	3.60	90			
123789-HxCDD	4.00	3.10	78			
TOTAL HxCDD	12.00	9.80	82			
1234678-HpCDF	4.00	3.40	85			
1234789-HpCDF	4.00	3.60	90			
TOTAL HpCDF	8.00	7.00	88			
1234678-HpCDD	4.00	3.30	83			
TOTAL HpCDD	4.00	3.30	83			
OCDF	8.00	8.20	103			
OCDD	8.00	8.00	100			

Qs= Quantity spiked.

Qm= Quantity measured.

%REC.= Percent recovered.

TCT Invoice Number....4410 90-4452

* TWIN CITY TESTING CORPORATION *
* PCDF/PCDD ANALYSIS RESULTS *

Client....BATTELLE

Sample ID (Client's#)..... YQ-EPA 14 SPIKE DUP
Sample ID (TCT#)..... 190680-MSD
Analysis Date..... 6-19-90
Filename..... V00619F
Analyst..... BB
Sample Amount..... 0.0063 kg
ICAL Date..... 6-15-90
CCAL Filename..... V00619C

NATIVE ISOMERS	QS (NG)	QM (NG)	% REC.	INTERNAL STANDARD	ng's ADDED	PERCENT RECOVERY
2378-TCDF	0.80	0.77	96	2378-TCDF-C13....	2.00	30
TOTAL TCDF	0.80	0.77	96	2378-TCDD-C13....	2.00	38
12378-PeCDF	0.80	0.79	99	12378-PeCDF-C13..	2.00	56
TOTAL TCDD	0.80	0.79	99	23478-PeCDF-C13..	2.00	111
12378-HxCDF	4.00	3.90	98	123789-HxCDF-C13.	2.00	94
23478-HxCDF	4.00	3.80	95	123478-HxCDF-C13.	2.00	43
TOTAL PeCDF	8.00	7.70	96	234678-HxCDF-C13.	2.00	27
123478-HxCDF	4.00	4.20	105	1234789-HxCDF-C13.	2.00	61
TOTAL PeCDD	4.00	4.20	105	1234678-HxCDD-C13.	2.00	57
123478-HxCDD	4.00	3.50	88	1234678-HxCDD-C13.	2.00	85
123678-HxCDF	4.00	3.80	95	1234678-HxCDF-C13.	2.00	67
123789-HxCDF	4.00	3.50	88	12346789-HxCDF-C13.	2.00	23
234678-HxCDF	4.00	3.60	90	12346789-HxCDF-C13.	2.00	38
TOTAL HxCDF	16.00	14.00	88	12346789-HxCDD-C13.	2.00	25
1234789-HxCDD	4.00	2.90	73	12346789-HxCDD-C13.	2.00	21
123678-HxCDD	4.00	3.70	93	12346789-HxCDF-C13.	2.00	XX
123789-HxCDD	4.00	2.30	58	12346789-HxCDF-C13.	2.00	XX
TOTAL HxCDD	12.00	8.90	74			
1234678-HpCDF	4.00	3.60	90			
1234789-HpCDF	4.00	3.80	95			
TOTAL HpCDF	8.00	7.40	93			
1234678-HpCDD	4.00	3.60	90			
TOTAL HpCDD	4.00	3.60	90			
OCDF	8.00	9.20	115			
OCDD	8.00	8.00	100			

QS= Quantity spiked.

QM= Quantity measured.

%REC.= Percent recovered.

TCT Invoice Number....4410 90-4452