CENPP-PE-HR

6 September 1991
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Bonneville Navigation Lock Sediment Evaluation

Abstract

According to requirements in section 404 (b) (1) of the Clean Water Act, sediments downstream from the Bonneville Navigation Lock were evaluated and found to be acceptable for unconfined in-water or upland disposal with no unacceptable adverse environmental impacts expected. The sediment ranged from sandy gravel to gravelly, silty sand. Concentrations of metals were below screening levels. Pesticides, PCBs and PAHs were below method detection limits.

Introduction

1. The Bonnevile Navigation Lock is located at River Mile (RM) 145.38 on the south side of the Columbia River. The authorized Federal navigation channel in this reach of the river is 300 feet wide and 27 feet deep, although currently the depth is maintained at 17 feet. The project width narrows from 300 feet at RM 145.15 to approximately 100 feet just downstream from the navigation lock at RM 145.38.

2. The area just below the navigation lock is dredged infrequently, with 2,050 cubic yards removed in 1986. Prior to 1986 the last dredging occurred in the late 1970s. There are no previous sediment quality reports covering this small downstream area below the navigation lock. This area is in a very high energy regime especially when water is released from the lock to lower an upstream vessel to the downstream level.

3. The purposes of the present study were to measure the physical nature of the sediment and to take some measurements of chemicals of concern to round out our knowlege of contaminants, if any, in the area.

Methods

4. Sediment samples were taken from three locations below the navigation lock (Figure 1). One sample, B-3, served as a reference site for possible downstream in-water disposal. Because of the rocky nature of the material below the lock, several attempts were made with a ponar grab sampler before acceptable samples were obtained. The material consisted of fist-sized, very angular rocks which were probably fill material used in constructing the north levee bordering the channel and for lining the south bank of the channel (see Figure 1). Samples for physical analysis were stored in zip-lock bags and delivered to U. S. Army Corps of Engineers Materials Lab, Troutdale, Oregon where grain size distribution and volatile solids were measured. Sub-samples of B-1 and B-2 were taken for chemical analyses using standard methods of handling and storage. These were composited into one sample, B-1/2, which was sent to Columbia Analytical Associates, Kelso, Washington where chemical tests were conducted to measure metals, pesticides, PCBs, PAHs, TOC and acid volatile sulfides (AVS).

Results

Physical

5. The material in the channel directly below the navigation lock is gravelly with some sand and fines. Several attempts were made to obtain samples by criss-crossing along the entire length and width of the shoal area in the channel, an area about 1,000 by 200 feet. The ponar sample attempts often came up empty or with a few fist-sized, angular rocks in the sampler. Sample B-1 contained enough material to keep for physical and chemical analysis. This material was a silty sand with gravel having a mean grain size in the range of pebbles (12.33 mm, Table 1). Sample B-2, near the edge of the channel from an area where wood chip bardges are sometimes moored (Figure 1), was a silty sand with some clay. Based on the attempts to obtain samples from throughout the project area, the B-2 material is characteristic of only a small part of the project sediments. The reference sample B-3, taken downstream from the project in a very high energy area of the Columbia River, was a well graded gravel with sand. This sample served to characterize potential in-water disposal site sediment. The organic content of all three samples, as measured by volatile solids, was between 2.2 and 3.8 percent.

Chemical

6. The project sediments were below EPA, Region 10 and USACE, Portland District screening levels for metals (1,2). There were no detectable concentrations of pesticides, PCBs and PAHs. Acid volatile sulfides (AVS) were 0.14 μ-moles/g. Total Organic Carbon (TOC) was 12.1 mg/g (1.21 %).

7. Quality control for all the chemical analyses was acceptable (see attached CAS QC report). Laboratory blanks for all methods were free of targeted analytes. Surrogate recoveries and relative percent differences of laboratory duplicates of pesticides, PCBs and PAHs were within QC limits. Matrix spike recoveries of metals, AVS and PAHs were also acceptable. Detection limits were marginally acceptable according to District guidelines for pesticides, PCBs and PAHs but were below established screening levels. Since none of the organics were detected they are below screening levels.

Discussion/Recommendations

8. The Bonneville Navigation Lock sediments are acceptable for unconfined in-water disposal as well as upland disposal (2). The material is composed predominantly of sand and gravel and is similar to placement sediments as shown by reference sample B-3. This general area of the river is a high energy environment and dispersive in nature. No chemical contaminants were found in the project sediment at concentrations above established concern levels and there are no point sources of contaminants in the area. These factors indicate that no unacceptable adverse environmental impacts are expected from in-water or upland disposal.

Table 1.

Results of physical analyses of Bonneville Navigation Lock sediments.

sample	mean gr. size	gravel	sand	fines	volatile solids	TOC*
	mm		%			mg/g
B-1	12.33	24.2	49.2	26.6	3.8	12.1
B-2	0.12	0.1	78.9	21.0	3.0	
B-3	7.16	81.3	18.7	0.0	2.2	

* from composited sample of B-1 and B-2

Table 2.

Concentrations of contaminants in Bonneville Navigation Lock sediments.

sample	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn	AVS	Organics*
					ppm				µm/g	ppb
B-1/2†	3.0	0.8	16.0	22.0	nd	18.0	14.0	124	0.14	nd

* organics/detection limits

pesticides	10-30	ppb
PCBs	100	
PAHs	100	

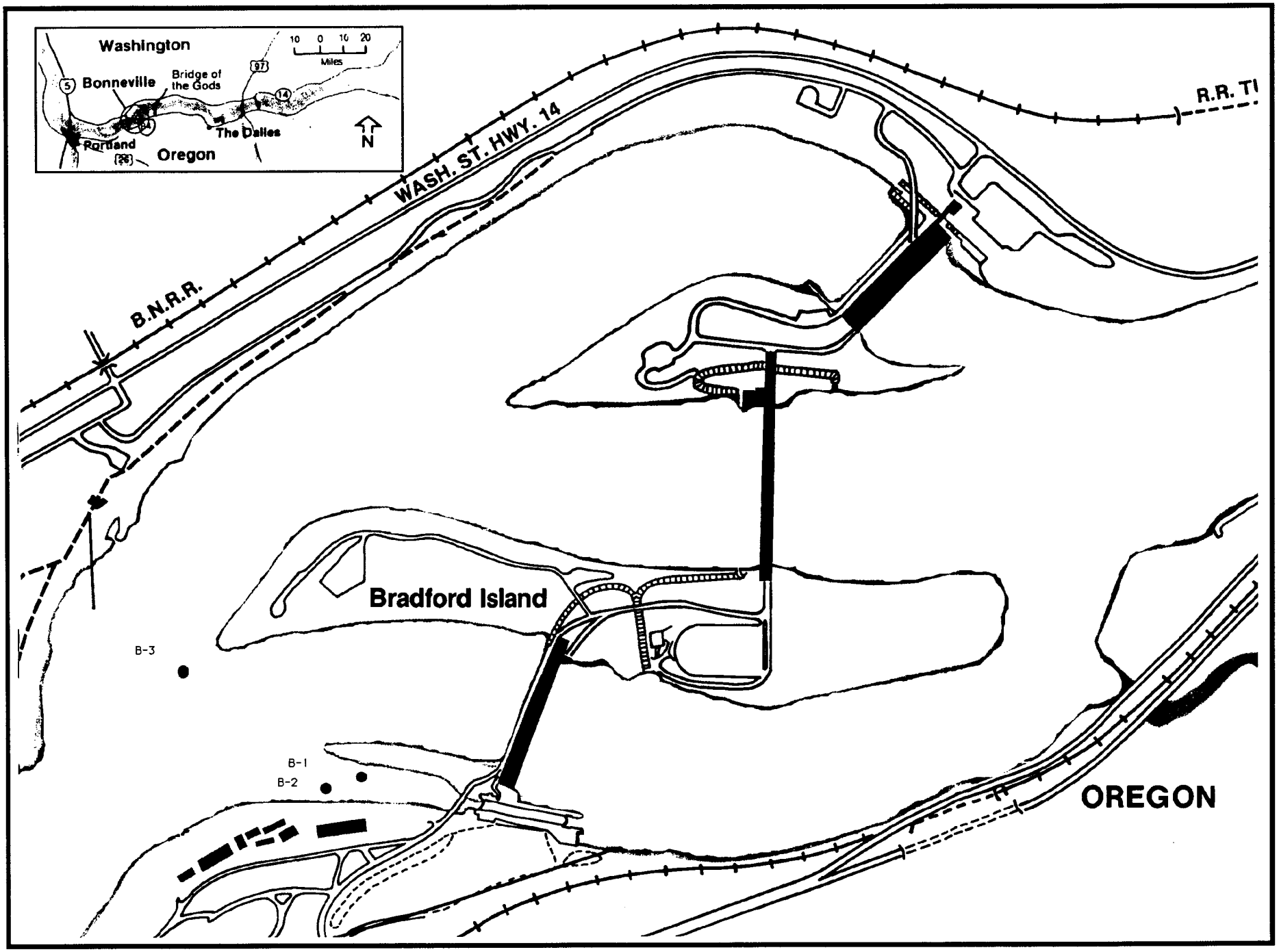
† composite of sample B-1 and B-2

REFERENCES

1. U. S. Environmental Protection Agency. Screening Levels on file with Ocean Dumping Coordinator, Region 10, Seattle.

2. U. S. Army Corps of Engineers, Portland District. Concern Levels on file in Planing and Engineering Division, Hydraulics and Hydrology Branch, Reservoir Regulation and Water Quality Section.

3. U. S. Environmental Protection Agency. Guidelines For Specification of Disposal Sites for Dredged or Fill Material. Code of Federal Regulations, 40 CFR 190.01, 1985.


Washington
Bonneville
Bridge of the Gods
The Dalles
Portland
Oregon
10 0 10 20
Miles
N
WASH. ST. HWY. 14
B.N.R.R.
R.R. T
Bradford Island
B-3
B-1
B-2
OREGON

COLUMBIA RIVER SALMON FLOW MEASURES SEDIMENT QUALITY CHEMICAL ANALYSIS SCHEDULE

LOCATION	RIVER MILE	SAMPLE #	DATE	Metals	PAH's	Phenols	Pest/PCB's	TOC	AVS	Dioxin/Furans	TBT
CASCADE LOCKS MARINA	O 149.2 R										
		CL-VC-1	9/24/91	X	X	X	X	X	X	X	
		CL-VC-1*	9/24/91								
		CL-VC-2	9/24/91	X	X	X	X	X	X	X	
		CL-VC-2*	9/24/91								
		CL-GC-1	9/25/91								
		CL-P-1	9/25/91	X	X		X	X	X		X
ROCK CREEK PARK	W 150.0 R										
		RC-VC-1	9/24/91	X	X		X	X	X		
		RC-VC-1*	9/24/91								
		RC-VC-2	9/24/91	X	X		X	X	X		
		RC-VC-2*	9/24/91								
		RC-VC-3	9/24/91	X	X		X	X	X	X	
		RC-VC-3*	9/24/91								
		RC-P-1	9/25/91	X	X		X	X	X	X	
		RC-P-2	9/25/91	X	X		X	X	X	X	
		RC-P-3	9/25/91	X	X		X	X	X		
		RCI-P-1	9/25/91	X	X		X	X	X		
		RCI-P-2	9/25/91	X	X		X	X	X		
HERMAN CREEK	O 150.8										
		HC-P-1	10/10/91	X	X		X	X	X	X	
		HC-P-2	10/10/91	X	X	X	X	X	X	X	X
		HC-P-3	10/10/91	X	X	X	X	X	X	X	
		HC-P-4	10/10/91	X	X		X	X	X	X	
GOVERNMENT COVE	O 151.9 C										
		GC-P-1	10/10/91	X	X		X	X	X		
		GC-P-2	10/10/91	X	X		X	X	X		
WIND RIVER BOAT RAMP/ MOUTH	W 154.8 R										
		WR-P-1	9/25/91								
		WR-P-2	9/25/91	X	X		X	X	X	X	
		WR-P-3	9/25/91	X	X		X	X	X	X	
		WR-P-4	9/25/91								
		WR-P-5	9/25/91								
MOUTH OF WIND RIVER	W 154.8 C										
		WR-VC-1	9/24/91	X	X		X	X	X		
		WR-VC-1*	9/24/91								
		WR-VC-2	9/24/91	X	X		X	X	X		
		WR-VC-2*	9/24/91								
		WR-VC-3	9/24/91	X	X		X	X	X		
		WR-VC-3*	9/24/91								
HOME VALLEY LUMBER MILL	W 154.8 C										
		HV-VC-1	9/24/91	X	X	X	X	X	X	X	
		HV-VC-1*	9/24/91								
		HV-VC-2	9/24/91	X	X	X	X	X	X	X	
		HV-VC-2*	9/24/91								
		HV-VC-3	9/24/91	X	X	X	X	X	X	X	
		HV-VC-3*	9/24/91								
PORT OF HOOD RIVER	O 169.0 C										
		PHR-VC-1	9/26/91	X	X		X	X	X	X	X
		PHR-VC-1*	9/26/91								
		PHR-VC-2	9/26/91	X	X		X	X	X	X	
		PHR-VC-2*	9/26/91								
		PHR-VC-3	9/26/91	X	X		X	X	X	X	X
		PHR-VC-3*	9/26/91								
HOOD RIVER MARINA	O 169.4 R										
		HRM-VC-1	9/26/91	X	X		X	X	X		
		HRM-VC-1*	9/26/91								
		HRM-VC-2	9/26/91	X	X		X	X	X		X
		HRM-VC-2*	9/26/91								
SD&S LUMBER	W 170.6 C										
		SDS-VC-1	9/26/91	X	X	X	X	X	X	X	
		SDS-VC-1*	9/26/91								
		SDS-VC-2	9/26/91	X	X	X	X	X	X	X	
		SDS-VC-2*	9/26/91								
		SDS-VC-3	9/26/91	X	X		X	X	X	X	
		SDS-VC-3*	9/26/91								
BINGEN BOAT BASIN & MARINA	W 171.7 R										
		BM-VC-1	9/26/91	X	X		X	X	X	X	X
		BM-VC-1*	9/26/91								
		BM-VC-2	9/26/91	X	X		X	X	X	X	
		BM-VC-2*	9/26/91								
		BM-VC-3	9/26/91	X	X		X	X	X	X	
		BM-VC-3*	9/26/91								
MAYER STATE PARK	O 181.0 R										
		MSP-P-1	9/25/91	X	X		X	X	X	X	
		MSP-P-2	9/25/91	X	X		X	X	X	X	
		MSP-P-3	9/25/91	X	X		X	X	X		
		MSP-P-4	9/25/91	X	X		X	X	X		

NOTE 1: Sample code; (VC) Vibracore, (GC) Gravity Core, (P) Ponar, (*) Physical Analyses Only.
NOTE 2: Dioxin/Furan Samples Were Composited Per Sampling Area.

Columbia River Salmon Flow Measures Sediment Quality Physical Data

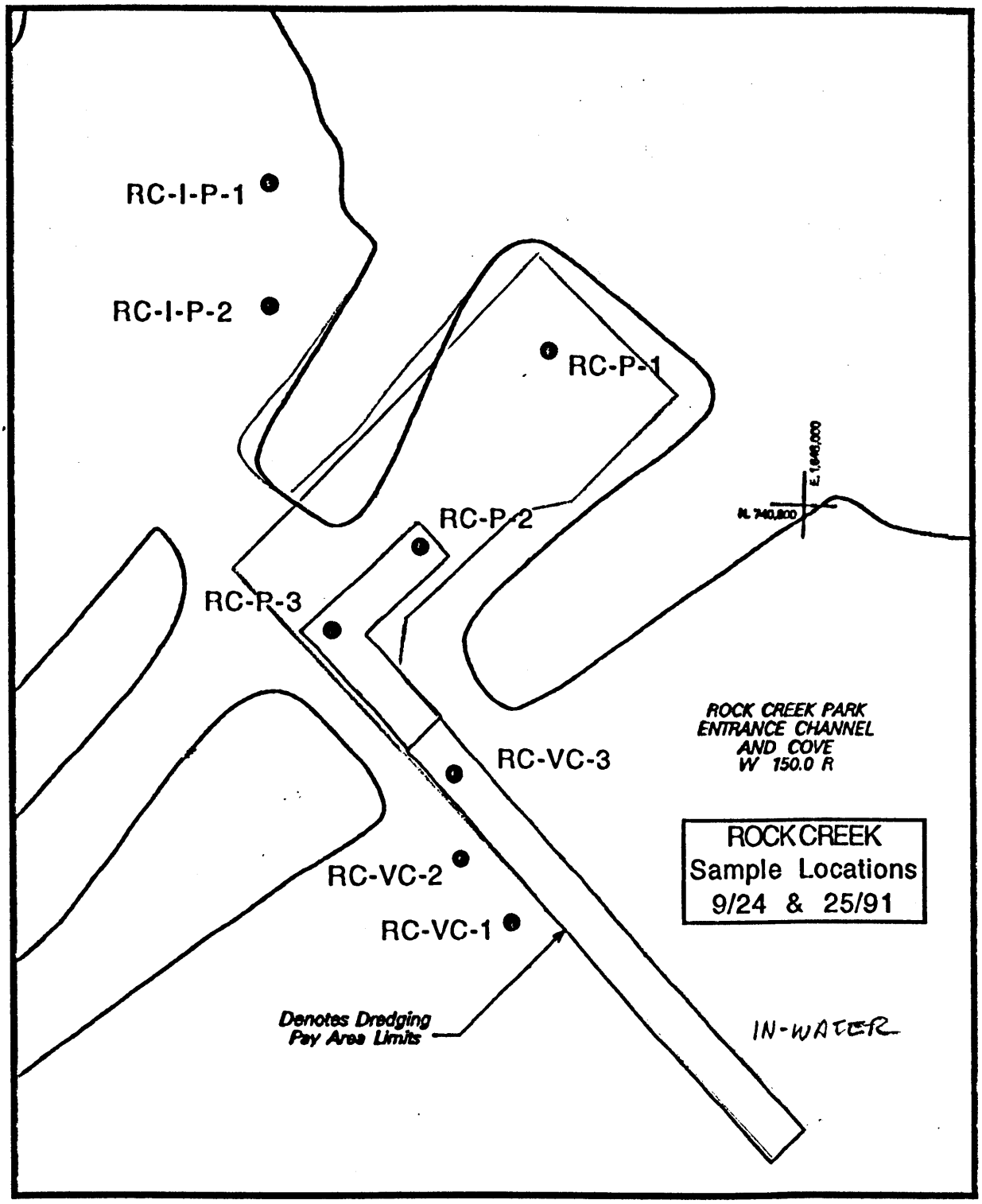
LOCATION	RIVER MILE	SAMPLE #	DATE	TIME	WATER DEPTH (feet)	PENETRATION (feet)	CORE LENGTH (inches)	VOLATILE SOLIDS (%)	MEDIAN GS D50 (mm)	MEAN GS (mm)	% FINES %
CASCADE LOCI	O 149.2 R										
MARINA		CL-VC-1	9/24/91	845	15	6	22	4.5	0.015	0.014	91.5
		CL-VC-1*	9/24/91					7.7	0.010	0.009	95.7
		CL-VC-2	9/24/91	936	6	5	27	5.3	0.081	0.193	36.2
		CL-VC-2*	9/24/91					8.5	0.029	0.034	84.3
		CL-GC-1	9/25/91	924	8	0.83		5.1	0.015	0.015	94.6
		CL-P-1	9/25/91	935	8	NA	NA	6.9	0.013	0.012	94.4
ROCK CREEK	W 150.0 R										
PARK		RC-VC-1	9/24/91	1400	5	7	39	4.2	0.320	0.950	22.9
		RC-VC-1*	9/24/91					4.8	0.940	2.016	15.9
		RC-VC-2	9/24/91	1415	5	7	14	2.8	0.690	1.880	20.2
		RC-VC-2*	9/24/91					3.6	1.920	2.780	11.2
		RC-VC-3	9/24/91	1425	7	5	18	7.4	0.450	0.840	18.7
		RC-VC-3*	9/24/91					3.6	4.710	7.250	9.2
		RC-P-1	9/25/91	1005	12	NA	NA	12.5	0.026	0.041	76.7
		RC-P-2	9/25/91	1020	10	NA	NA	11.6	0.053	0.075	54.0
		RC-P-3	9/25/91	1025	6	NA	NA	4.8	0.980	1.277	0.7
		RCI-P-1	9/25/91	1035	5	NA	NA	5.9	0.220	0.329	23.3
		RCI-P-2	9/25/91	1042	????	NA	NA	8.8	0.160	0.191	28.5
HERMAN CREEK	O 150.8										
		HC-P-1	10/10/91	1010	15	NA	NA	19.9	0.013	0.013	89.2
		HC-P-2	10/10/91	1025	15	NA	NA	1.7	38.700	31.280	18.7
		HC-P-3	10/10/91	1040	11	NA	NA	11.7	0.096	0.103	32.0
		HC-P-4	10/10/91	1100	11	NA	NA	3.8	0.045	0.050	64.4
GOVERNMENT	O 151.9 C										
COVE		GC-P-1	10/10/91	1230	12	NA	NA	9.6	0.013	0.012	94.1
		GC-P-2	10/10/91	1230	11	NA	NA	5.0	0.033	0.041	79.2
WIND RIVER B	W 154.8 R										
RAMP/ MOUTH		WR-P-1	9/25/91	900	4	NA	NA	2.8	12.800	13.840	1.4
		WR-P-2	9/25/91	904	11	NA	NA	6.5	15.000	17.900	10.1
		WR-P-3	9/25/91	915	7	NA	NA	9.7	0.065	0.072	48.7
		WR-P-4	9/25/91	920	4	NA	NA	****	38.000	38.270	0.0
		WR-P-5	9/25/91	935	2	NA	NA	****	25.600	27.930	0.0
MOUTH OF WIN	W 154.8 C										
RIVER		WR-VC-1	9/24/91	1236	5	8	26	3.7	0.600	2.010	7.4
		WR-VC-1*	9/24/91					2.5	0.200	0.208	14.1
		WR-VC-2	9/24/91	1305	2	8	42	4.5	0.019	0.018	93.8
		WR-VC-2*	9/24/91					16.1	0.063	0.069	49.8
		WR-VC-3	9/24/91	1318	3	5	34	4.4	0.140	0.149	17.5
		WR-VC-3*	9/24/91					10.7	0.110	0.110	27.9
HOME VALLEY	W 154.8 C										
LUMBER MILL		HV-VC-1	9/24/91	1115	14	6	21	12.3	0.022	0.033	82.1
		HV-VC-1*	9/24/91					6.8	0.015	0.014	86.6
		HV-VC-2	9/24/91	1145	12.5	12	40	11.6	0.023	0.046	75.1
		HV-VC-2*	9/24/91					1.3	0.065	0.091	49.3
		HV-VC-3	9/24/91	1155	12.5	8	34	11.3	0.019	0.018	82.6
		HV-VC-3*	9/24/91					7.5	0.110	0.197	38.0
PORT OF HOOD	O 169.0 C										
RIVER		PHR-VC-1	9/26/91	950	12.5	6	27	4.4	0.035	0.084	58.2
		PHR-VC-1*	9/26/91					0.9	0.280	0.330	2.1
		PHR-VC-2	9/26/91	1002	14	7	46	3.9	0.036	0.065	67.8
		PHR-VC-2*	9/26/91					3.8	0.032	0.047	73.8
		PHR-VC-3	9/26/91	1010	18	6	30	3.3	0.070	0.082	45.3
		PHR-VC-3*	9/26/91					4.3	0.095	0.170	28.6
HOOD RIVER	O 169.4 R										
MARINA		HRM-VC-1	9/26/91	1223	16	5	25	1.5	0.130	0.354	26.7
		HRM-VC-1*	9/26/91					1.2	0.970	7.350	6.0
		HRM-VC-2	9/26/91	1235	17	6	27	2.8	0.053	0.064	55.7
		HRM-VC-2*	9/26/91					2.4	0.065	0.118	49.3
SD&S LUMBER	W 170.6 C										
		SDS-VC-1	9/26/91	1045	18	3	9	5.0	0.030	1.040	66.2
		SDS-VC-1*	9/26/91					7.0	0.045	0.031	57.7
		SDS-VC-2	9/26/91	1058	14	5	27	6.9	0.150	0.169	23.7
		SDS-VC-2*	9/26/91					4.6	0.009	0.009	99.1
		SDS-VC-3	9/26/91	1108	14	4	22	4.5	0.030	0.037	80.0
		SDS-VC-3*	9/26/91					4.8	0.009	****	98.2
		1 A & B	11/6/91					13.3	0.020	0.026	84.1
		2 A & B	11/6/91					11.3	0.022	0.026	84.5
		3 A & B	11/6/91					10.0	0.022	0.026	86.3
		4 A & B	11/6/91					8.2	0.021	0.025	87.1
		5 A & B	11/6/91					8.9	0.028	0.031	82.4
		6 A & B	11/6/91					3.6	0.024	0.025	92.3
		7 A & B	11/6/91					5.4	0.025	0.028	86.2
BINGEN BOAT	W 171.7 R										
BASIN & MARINA		BM-VC-1	9/26/91	1135	15	6	39	4.0	0.027	0.036	79.3
		BM-VC-1*	9/26/91					3.6	0.039	0.046	64.1
		BM-VC-2	9/26/91	1145	14	7	47	5.1	0.022	0.025	93.7
		BM-VC-2*	9/26/91					4.6	0.022	0.024	95.2
		BM-VC-3	9/26/91	1156	14	7	34	2.8	0.038	0.044	73.0
		BM-VC-3*	9/26/91					4.5	0.030	0.041	76.4
MAYER STATE	O 181.0 R										
PARK		MSP-P-1	9/25/91	1320	6	NA	NA	10.5	0.042	0.045	70.6
		MSP-P-2	9/25/91	1326	7	NA	NA	4.0	0.027	0.030	88.5
		MSP-P-3	9/25/91	1333	7	NA	NA	9.7	0.016	0.015	90.1
		MSP-P-4	9/25/91	1337	8	NA	NA	4.2	0.018	0.017	95.5

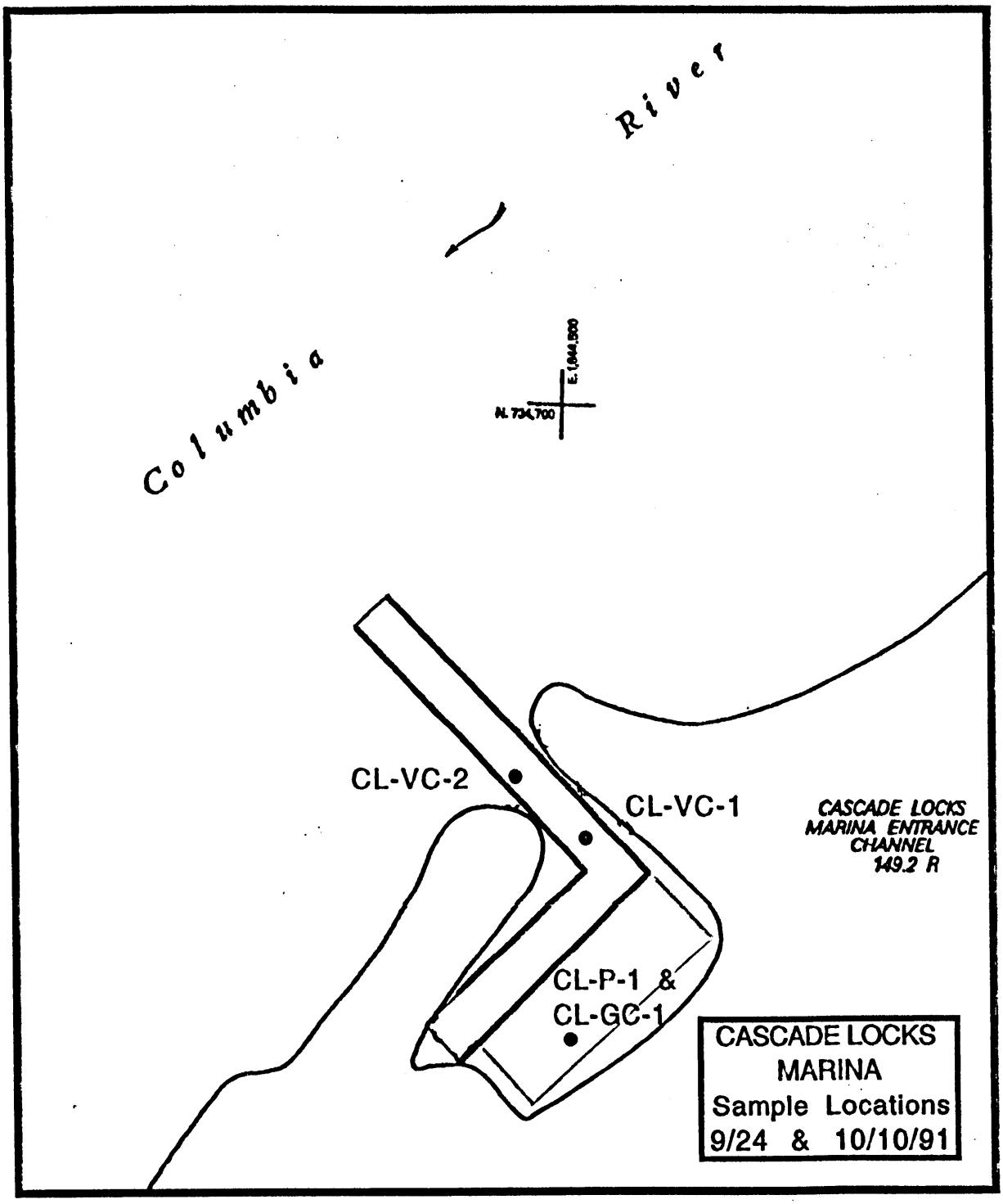
NOTE 1: (*) Denotes samples for physical analysis taken from the core catcher and nose cone of the vibracore.
NOTE 2: Sample code; (VC) Vibracore, (GC) Gravity Core, (P) Ponar, Sample 1A&B-7A&B were collected by clamshell.
NOTE 3: Fines is defined as that material passing a #230 sieve.

Columbia River Salmon Flow Measures Sediment Quality Heavy Metal Data

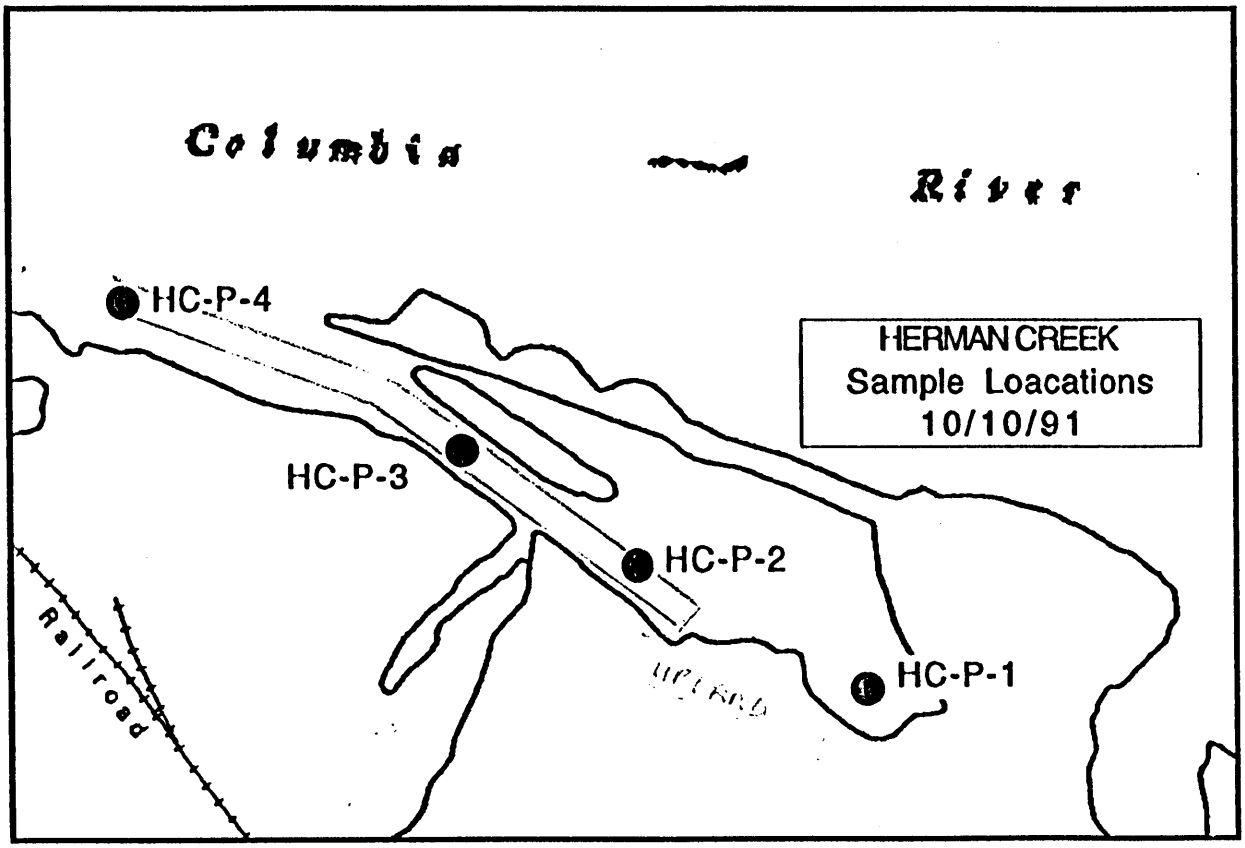
SAMPLE #	TOC	AVS	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickle	Zinc
	%		mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
CL-VC-1	0.79	-0.1	3	0.2	34	38	14	0.07	33	80
CL-VC-2	0.95	-0.1	6	0.9	18	22	37	0.05	20	125
CL-P-1	2.52	20	6	1.9	28	51	27	0.11	20	228
RC-VC-1	0.23	-0.1	4	0.1	20	63	10	0.03	13	80
RC-VC-2	0.19	-0.1	4	0.1	16	65	8	0.03	16	76
RC-VC-3	5.84	-0.1	7	-0.1	13	60	8	0.03	14	74
RC-P-1	3.51	0.8	5	0.6	18	64	18	0.07	15	108
RC-P-2	3.61	0.9	25	0.4	18	66	13	0.06	19	98
RC-P-3	0.25	-0.1	6	0.1	10	58	8	0.04	16	61
RCI-P-1	1.50	-0.1	8	0.6	12	60	8	0.04	18	66
RCI-P-2	1.77	-0.1	5	0.3	12	64	8	0.03	18	70
HC-P-1	6.37	1.6	5	0.8	24	44	20	0.08	23	137
HC-P-2	3.01	-0.5	5	1.1	25	33	16	0.06	22	130
HC-P-3	6.48	1.1	3	0.2	22	34	7	0.02	22	65
HC-P-4	1.07	0.5	4	0.8	16	18	12	0.05	16	121
GC-P-1	3.71	17.5	7	2.2	32	46	31	0.13	22	268
GC-P-2	1.58	3.3	5	1.4	20	25	17	0.08	18	173
WR-P-2	1.49	-0.1	5	0.6	12	44	10	0.04	13	78
WR-P-3	3.70	-0.1	4	0.2	13	41	10	0.06	11	69
WR-VC-1	0.10	-0.1	3	-0.1	7	48	4	0.03	9	63
WR-VC-2	0.31	-0.1	4	0.1	8	33	5	0.04	11	70
WR-VC-3	1.43	-0.1	5	0.2	12	47	6	0.05	15	98
HV-VC-1	5.15	0.4	5	1.5	22	56	18	0.10	18	100
HV-VC-2	2.28	0.6	5	1.2	14	42	17	0.11	15	95
HV-VC-3	0.30	0.2	4	0.5	14	49	12	0.10	13	91
PHR-VC-1	2.47	-0.1	4	0.8	21	30	12	0.09	14	87
PHR-VC-2	1.22	0.3	6	0.8	13	18	10	0.05	11	90
PHR-VC-3	1.31	-0.1	3	0.7	14	19	15	0.06	10	85
HRM-VC-1	0.74	-0.1	4	0.6	16	21	32	0.03	10	108
HRM-VC-2	0.78	-0.1	2	0.3	18	22	8	0.03	15	73
SDS-VC-1	0.81	0.4	3	0.4	25	24	14	0.06	14	111
SDS-VC-2	1.08	-0.1	6	0.7	26	29	39	0.11	25	107
SDS-VC-3	1.28	0.3	7	1.8	20	26	24	0.12	19	174
BM-VC-1	1.34	0.3	4	0.4	23	26	13	0.08	24	66
BM-VC-2	1.73	0.7	13	0.8	24	37	34	0.13	22	152
BM-VC-3	1.54	-0.1	5	1.1	22	25	16	-0.02	20	131
MSP-P-1	2.34	1.3	4	1.6	18	23	41	0.06	22	142
MSP-P-2	1.23	1.3	5	1.5	22	26	46	0.07	23	175
MSP-P-3	0.62	-0.1	13	0.7	28	32	40	0.03	30	117
MSP-P-4	1.22	10	6	1.5	22	28	57	0.09	27	178
MAXIMUM			25	2.2	34	66	57	0.13	33	268

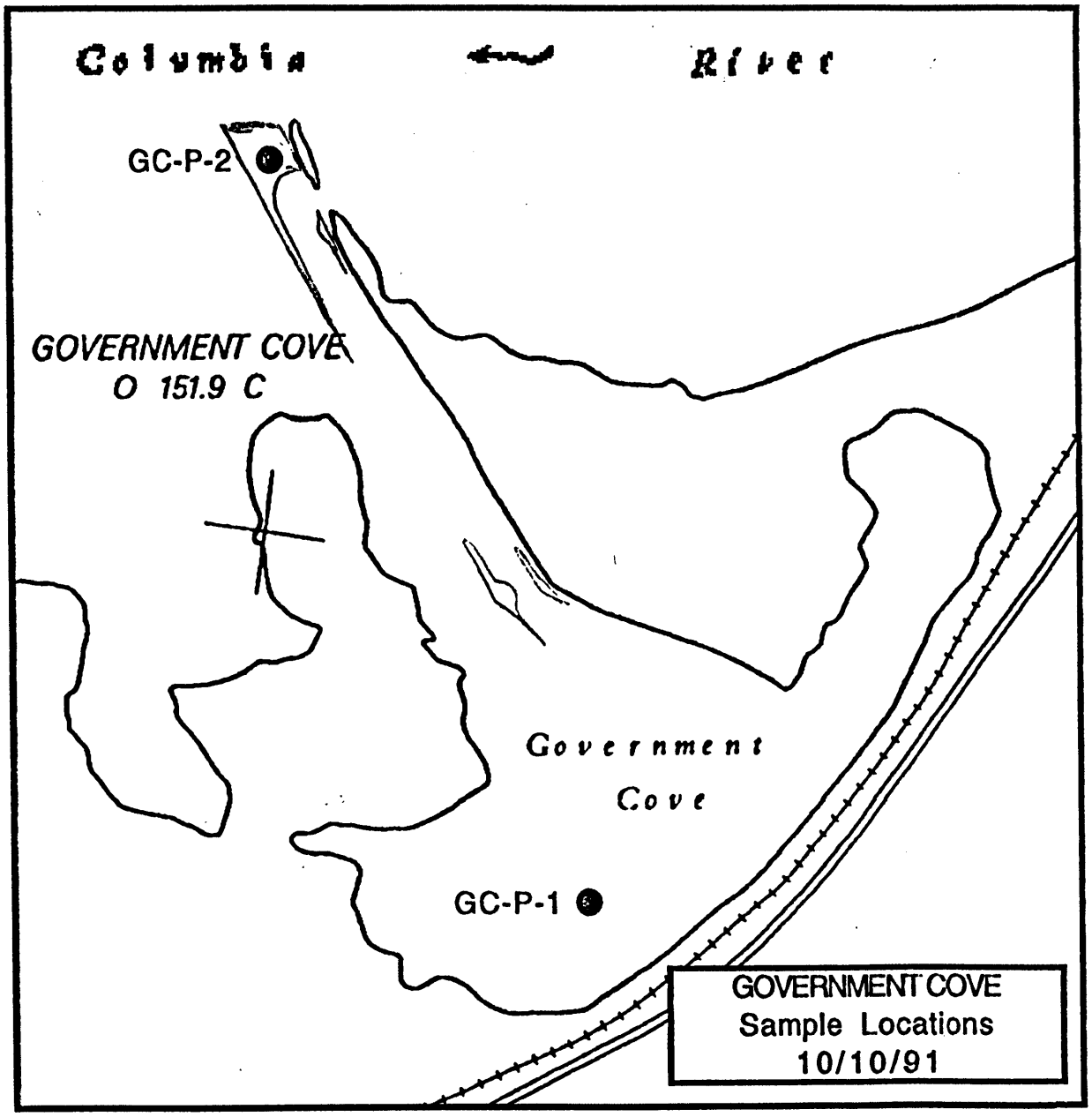
USACE, NPP Concern Level	40	1.0	20-300	50	40	0.15		250
EPA, Reg. 10 Screening Level	57	0.96		81	6.6	0.21	140	160
EPA, Reg. 10 Maximum Level	700	9.6		810	660	2.10		1,600
EPA, Reg. 5 Guidlines Nonpolluted	300		25	25	40	1.00	20	90
Wiss. DNR Sed. Qual. Guidlines	10	1	100	100	50	0.10	100	100
Ontario ME Open Water Classification	8	1	25	25	50	0.30	25	100
Beak Consit. Sed. Qual. Guidlines	17	2.5	100	85	55	0.60	92	143


RC-I-P-1
RC-I-P-2
RC-P-1
RC-P-2
RC-P-3
RC-VC-3
RC-VC-2
RC-VC-1
E. 1,648,000
N. 740,800
ROCK CREEK PARK
ENTRANCE CHANNEL
AND COVE
W 150.0 R
ROCK CREEK
Sample Locations
9/24 & 25/91
Denotes Dredging
Pay Area Limits
IN-WATER

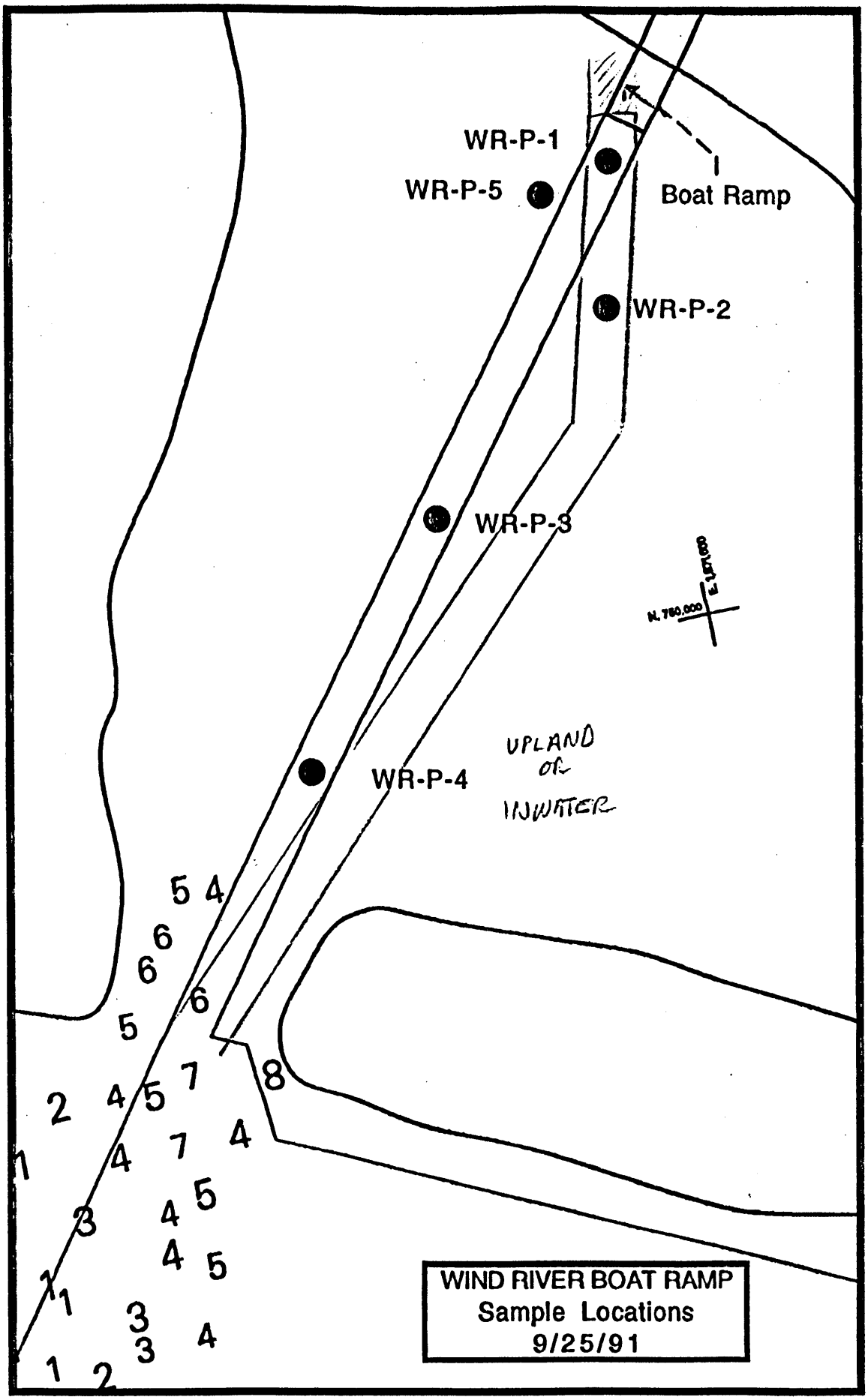

River
Columbia
E. 1,044,800
N. 734,700
CL-VC-2
CL-VC-1
CASCADE LOCKS
MARINA ENTRANCE
CHANNEL
149.2 R
CL-P-1 &
CL-GC-1
CASCADE LOCKS
MARINA
Sample Locations
9/24 & 10/10/91

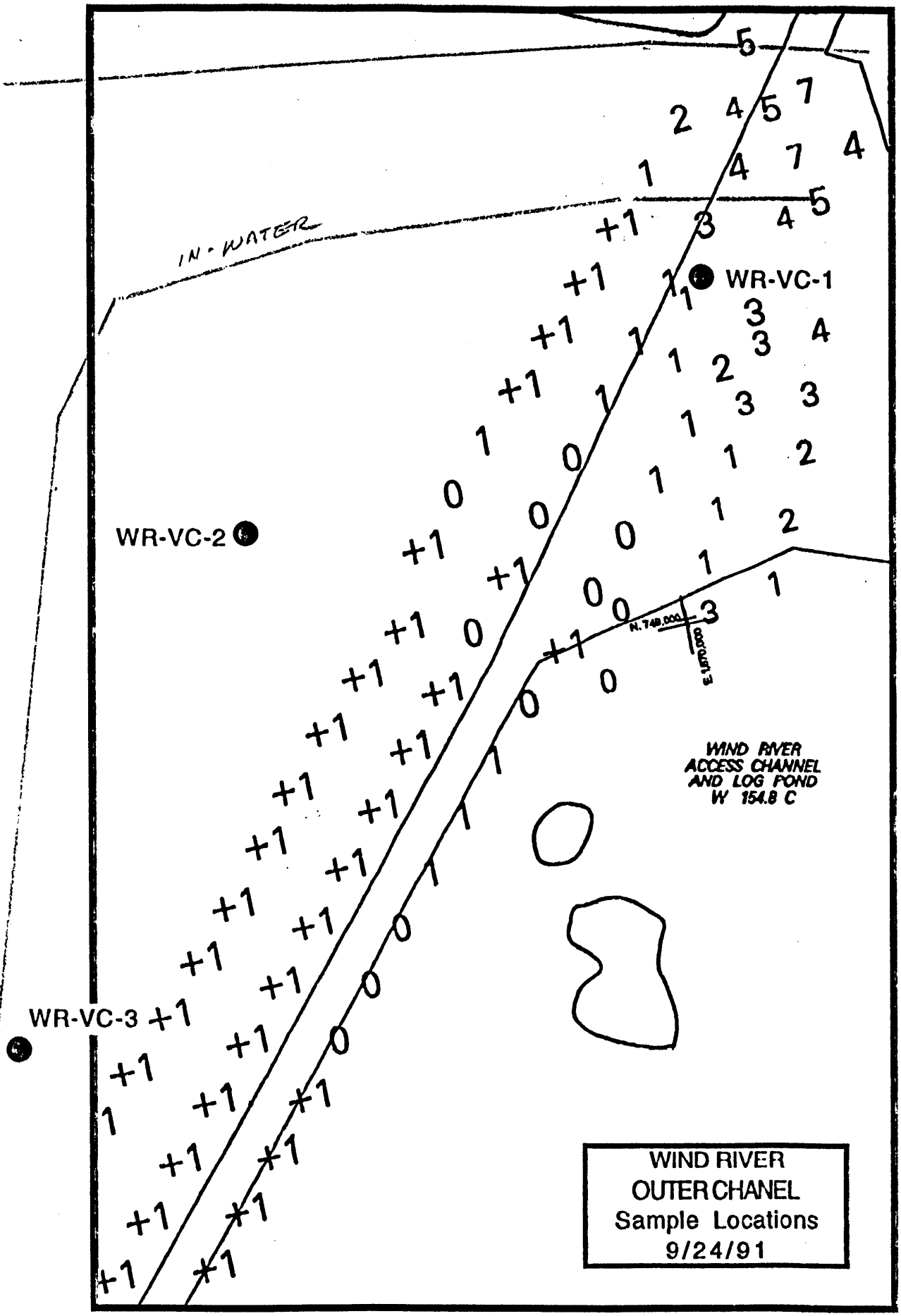
IN-WATER

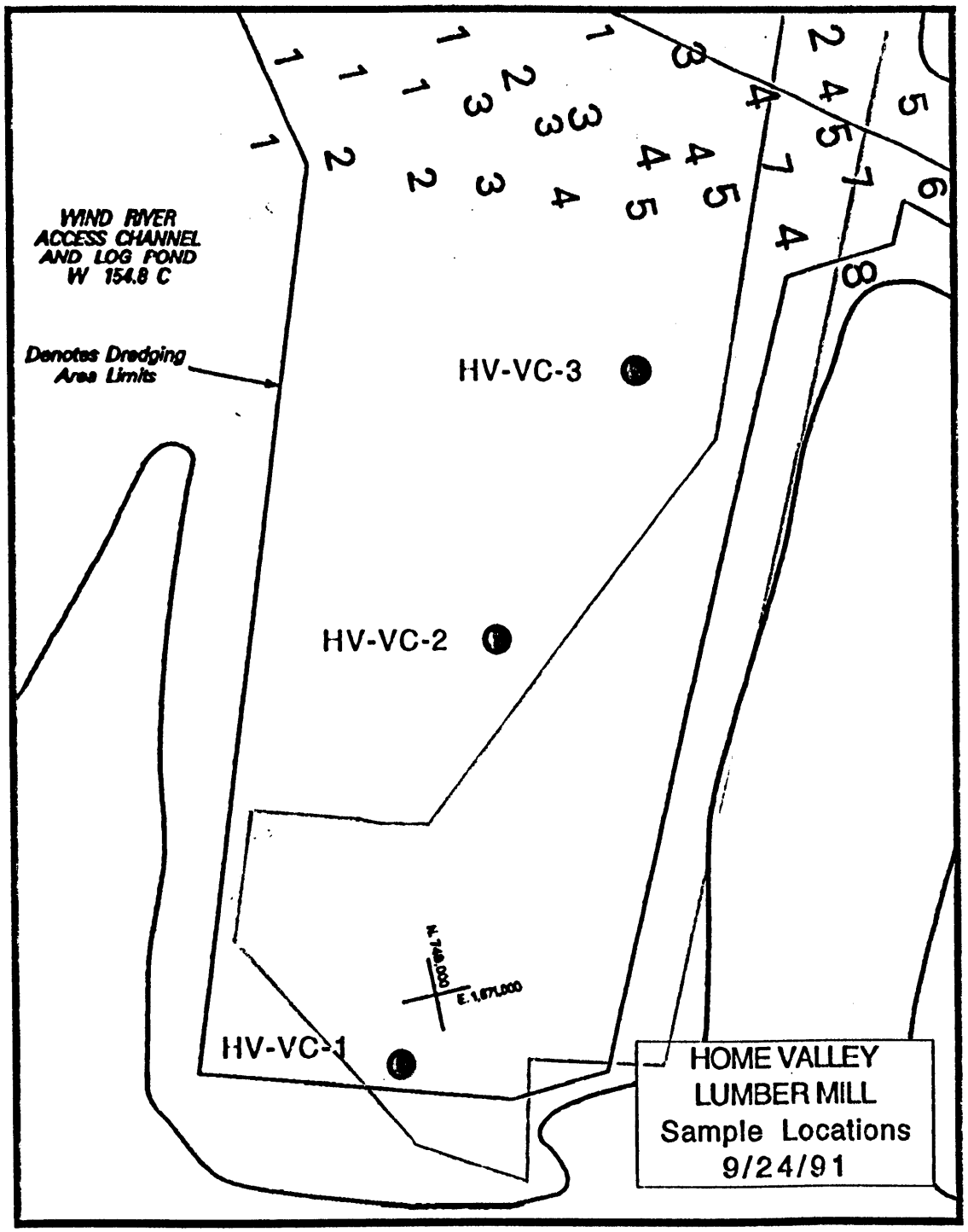

Columbia
River
HC-P-4
HERMAN CREEK
Sample Loacations
10/10/91
HC-P-3
HC-P-2
HC-P-1
Railroad

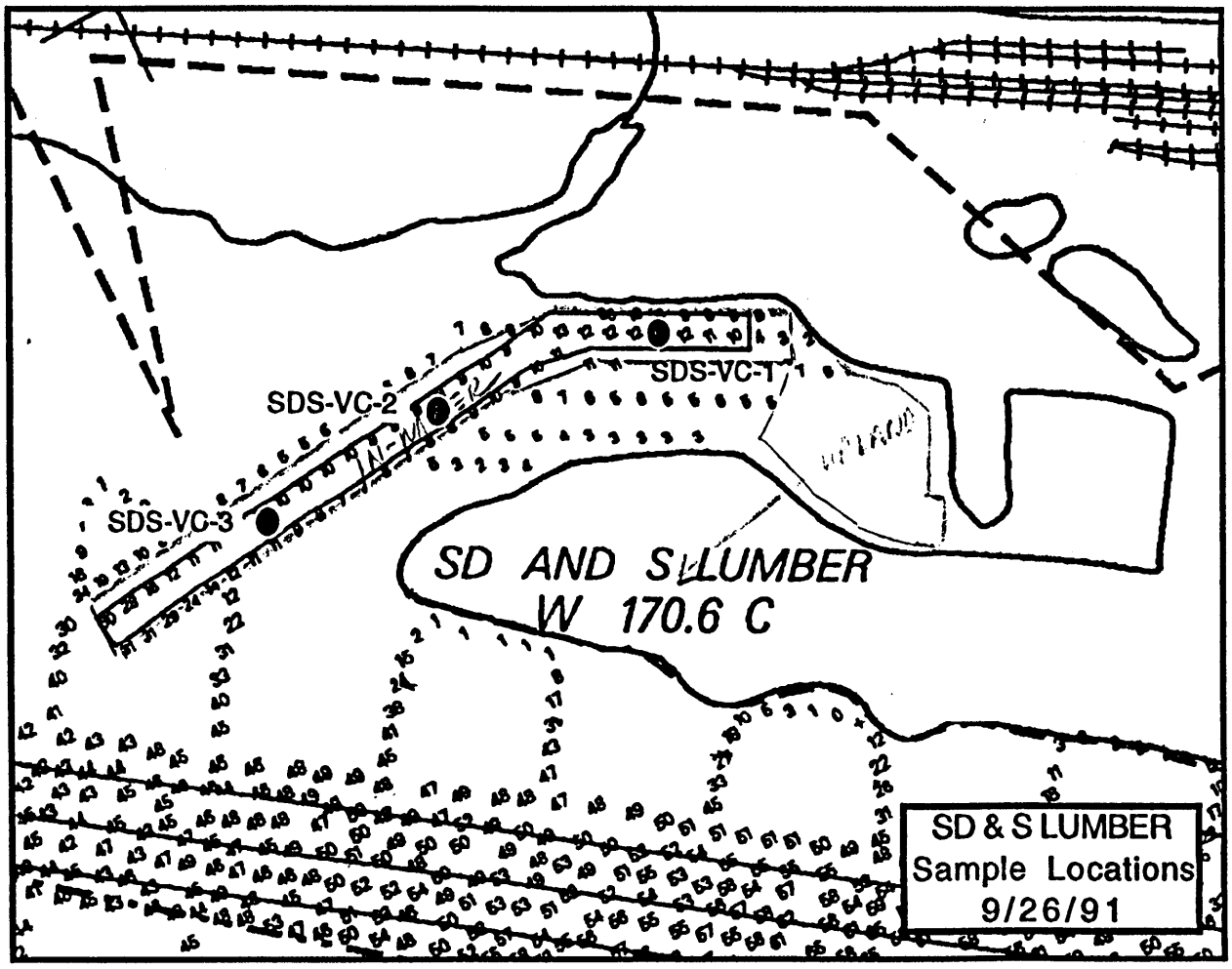

Columbia River
GC-P-2
GOVERNMENT COVE
O 151.9 C
Government Cove
GC-P-1
GOVERNMENT COVE
Sample Locations
10/10/91

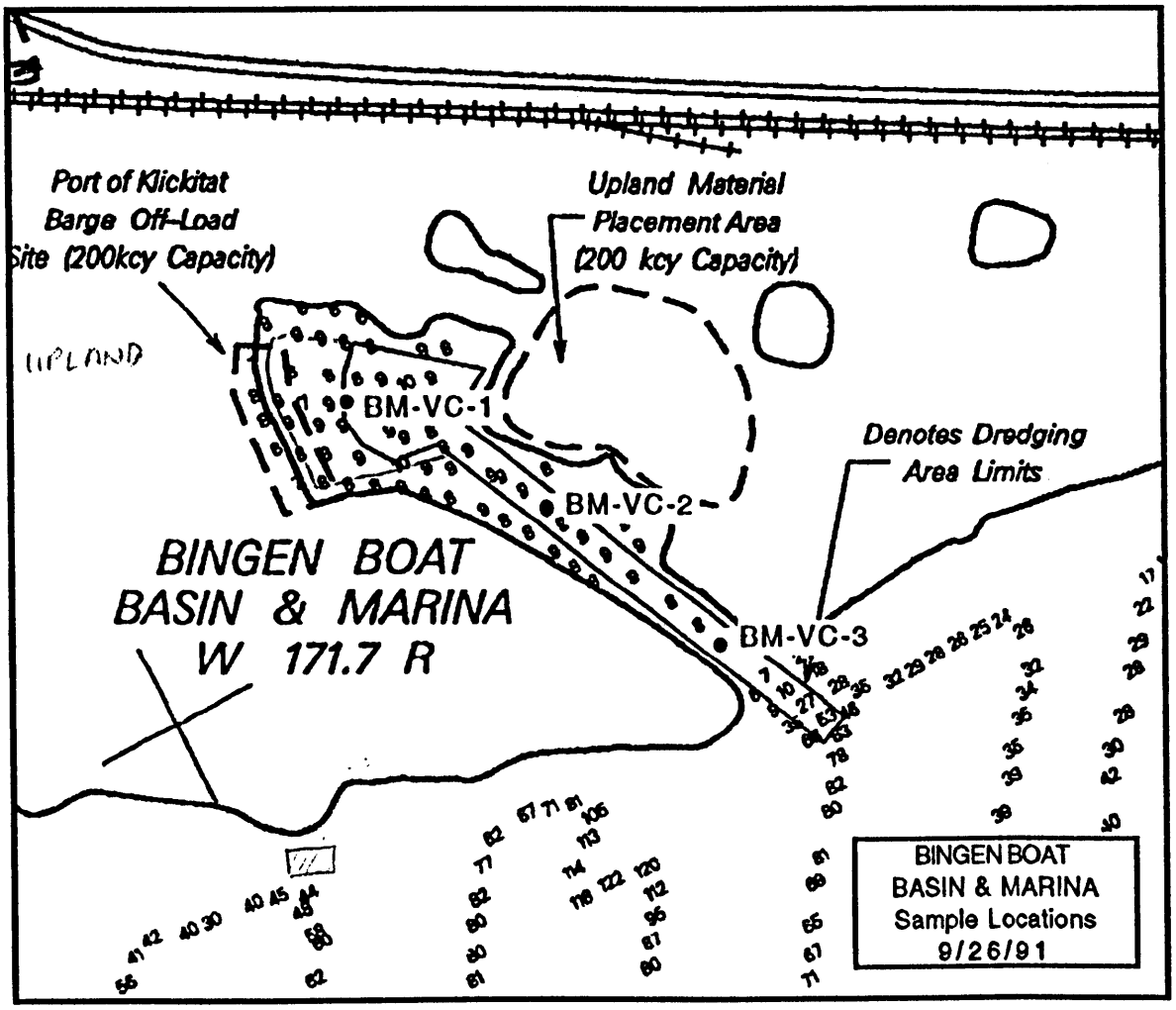
IN-WATER

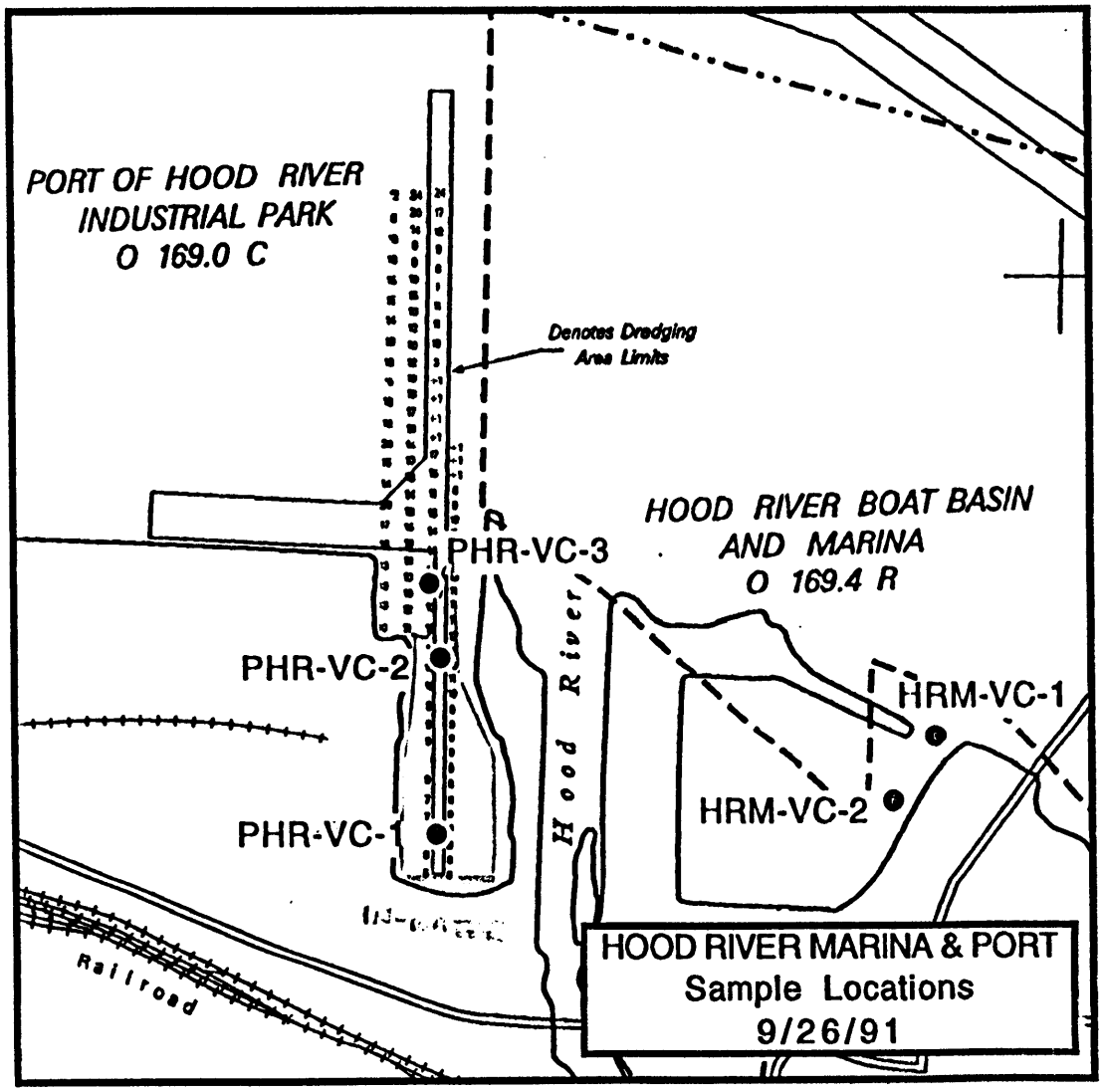

WR-P-1
WR-P-5
Boat Ramp
WR-P-2
WR-P-3
WR-P-4
UPLAND
OR
INWATER
WIND RIVER BOAT RAMP
Sample Locations
9/25/91

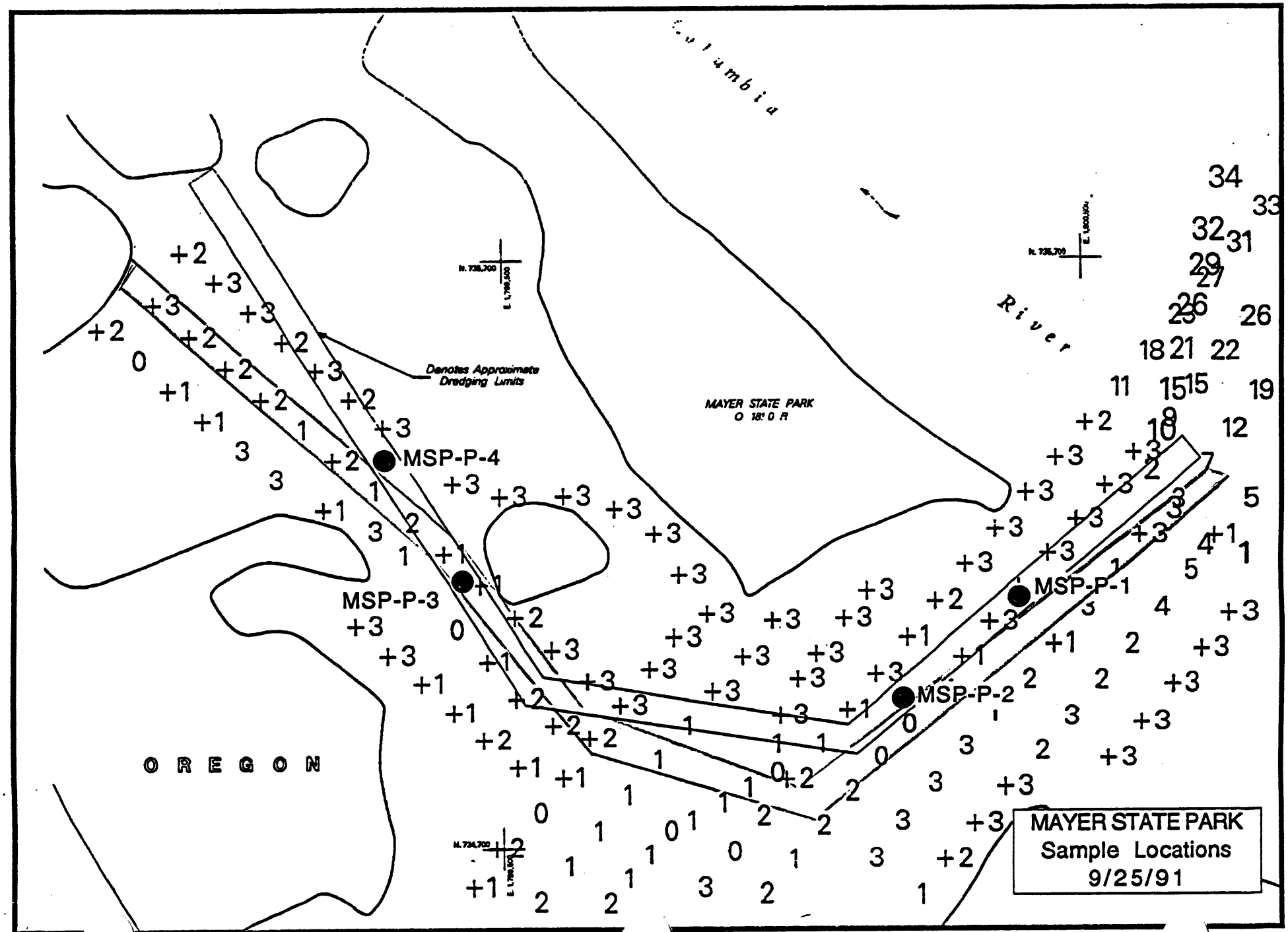

IN-WATER
WR-VC-1
WR-VC-2
WR-VC-3
N.749,000
E.1,370,000
WIND RIVER
ACCESS CHANNEL
AND LOG POND
W 154.8 C
WIND RIVER
OUTER CHANEL
Sample Locations
9/24/91


WIND RIVER
ACCESS CHANNEL
AND LOG POND
W 154.8 C
Denotes Dredging
Area Limits
HV-VC-3
HV-VC-2
HV-VC-1
N. 748,000
E. 1,671,000
HOME VALLEY
LUMBER MILL
Sample Locations
9/24/91


SDS-VC-1
SDS-VC-2
SDS-VC-3
SD AND S LUMBER
W 170.6 C
SD & S LUMBER
Sample Locations
9/26/91


Port of Klickitat
Barge Off-Load
Site (200kcy Capacity)
Upland Material
Placement Area
(200 kcy Capacity)
UPLAND
BM-VC-1
BM-VC-2
BM-VC-3
Denotes Dredging
Area Limits
BINGEN BOAT
BASIN & MARINA
W 171.7 R
BINGEN BOAT
BASIN & MARINA
Sample Locations
9/26/91


PORT OF HOOD RIVER
INDUSTRIAL PARK
O 169.0 C
Denotes Dredging
Area Limits
HOOD RIVER BOAT BASIN
AND MARINA
O 169.4 R
PHR-VC-3
PHR-VC-2
PHR-VC-1
HRM-VC-1
HRM-VC-2
Hood River
Railroad
HOOD RIVER MARINA & PORT
Sample Locations
9/26/91



IN-WA (MAY NOT DREDGE - BUDGET)

COLUMBIA RIVER SALMON FLOW MEAS SEDIMENT QUALITY PHENOL DATA

SAMPLE #	DATE	Phenol	2-Chlorophenol	2-Nitrophenol	2,4_Dimethylphenol	2,4-Dichlorophenol	4-Chloro-3-methlphenol	2,4,6-Triclorophenol	4-Nitrophenol	2,4-Dinitrophenol	2-Methyl-4,6-dinitrophenol	Pentachlorophenc
CL-VC-1	9/24/91											
CL-VC-2	9/24/91											
HC-P-2	10/10/91											
HC-P-3	10/10/91											
HV-VC-1	9/24/91											
HV-VC-2	9/24/91											
HV-VC-3	9/24/91											
SDS-VC-1	9/26/91											
SDS-VC-2	9/26/91											
MRL		300	300	600	300	300	300	600	2000	2000	2000	2000
Maximum		0	0	0	0	0	0	0	0	0	0	0
EPA, Region 10 Screening Leve		120			10							69

NOTE 1: (P) Ponar Sample, (VC) Vibracore Sample.

Columbia River Salmon Flow Measures Dioxin Data

TEQ 15ng/kg
Bioaccumulation

SAMPLE SITE	SAMPLE No.	RIVER MILE	TOC	2378 TCDF	TOTAL TCDF	2378 TCDD	TOTAL TCDD	12378 PeCDF	23478 PeCDF	TOTAL PeCDF	12378 PeCDD	TOTAL PeCDD	123478 HxCDF	123678 HxCDF	123789 HxCDF	234678 HxCDF	TOTAL HxCDF	123478 HxCDD	123678 HxCDD	123789 HxCDD	TOTAL HxCDD	1234678 HpCDF	1234789 HpCDF	TOTAL HpCDF	1234678 HpCDD	TOTAL HpCDD	OCDF	OCDD
TEF			0.1	0.0	1.0	0.0	.05	.05	0.0	0.5	0.0	0.1	0.1	0.1	0.05	0.0	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	.001	.001
CASCADE LOCKS MARINA	CL-VC-1-2	0 149.2 R	0.87	1.50	2.20	-0.33	-0.33	-0.70	-0.47	-0.70	-0.45	-2.50	-1.00	-0.78	-0.42	-0.26	-1.00	-0.94	-1.30	-0.83	-1.30	-1.90	-0.75	-1.90	2.10	3.90	-1.00	12.00
ROCK CREEK PARK	RC-P-1-2	W 150.0 R	3.56	0.81	1.80	-0.28	-0.28	-0.43	-0.42	-0.43	-0.41	2.60	-0.22	-0.22	-0.22	-0.22	2.90	2.40	1.40	1.30	34.00	2.60	-0.32	6.00	30.00	92.00	4.10	130.00
HERMAN CREEK	HC-P-1-4	O 150.9 R	4.98	0.64	1.40	-0.18	-0.18	-0.41	-0.41	-1.00	-0.51	-6.00	-0.40	-0.29	0.46	-0.24	6.10	-1.10	1.30	-0.67	2.60	3.00	-0.46	8.80	15.00	29.00	3.20	110.00
WIND RIVER BOAT RAMP/MOUTH	WR-P-2-3	W 154.8 R	2.60	-0.32	-0.32	-0.45	-0.64	-0.79	-0.87	-0.87	-0.77	-1.20	-2.10	-1.30	-0.58	-0.66	-2.10	-1.90	-2.00	-1.80	-2.00	-3.20	-1.30	-3.20	4.60	9.80	-2.10	21.00
HOME VALLEY LUMBER MILL	HV-VC-1-3	W 154.8 R	2.58	-0.39	-0.39	-0.23	-0.23	-0.35	-0.35	-0.53	-0.33	-1.70	-0.40	-0.32	-0.29	-0.26	-0.40	-1.00	-1.00	-0.85	-1.00	-1.10	-0.57	2.50	6.30	14.00	-2.40	36.00
FORT OF HOOD RIVER	PHR-VC-1-3	O 169.0 C	1.67	-0.70	-0.70	-0.32	-0.32	-0.45	-0.45	-0.45	-0.52	-2.70	-0.41	-0.41	-0.41	-0.41	15.00	-0.78	5.80	-0.78	44.00	22.00	-0.85	110.00	590.00	1100.00	170.00	4600.00
SDS LUMBER	SDS-VC-1-3	W 170.6 C	1.06	-0.33	-0.52	-0.27	-0.27	-0.63	-0.69	-0.69	0.47	-2.30	-0.77	-0.57	-0.35	-0.40	3.70	-1.20	-1.20	-1.20	4.00	5.60	-0.28	11.00	24.00	48.00	9.00	380.00
BINGEN BOAT BASIN & MARINA	BM-VC-1-3	W 171.7 R	1.54	-0.17	-0.60	-0.38	-0.38	-0.65	-0.65	-0.65	-0.34	-2.40	-1.60	-1.90	-0.61	-1.60	3.80	-1.70	-3.00	-1.70	21.00	10.00	-5.90	8.00	7.30	16.00	-2.60	28.00
MAYER STATE PARK	MSP-P-1-2	O 181.0 R	1.78	2.50	3.80	-0.39	-0.56	-0.83	-0.92	-0.92	-0.63	-2.60	-1.00	-0.72	-1.00	-0.59	-1.00	-1.50	-1.40	-1.30	-1.50	-1.10	-0.82	-1.10	-6.90	-6.90	-1.60	26.00
MINIMUM			0.87	0.64	1.40	0.00	0.00	0.00	0.00	0.00	0.47	2.60	0.00	0.00	0.46	0.00	2.90	2.40	1.30	1.30	2.60	2.60	0.00	2.50	2.10	3.90	3.20	12.00
MAXIMUM			4.98	2.50	3.80	0.00	0.00	0.00	0.00	0.00	0.47	2.60	0.00	0.00	0.46	0.00	15.00	2.40	5.80	1.30	44.00	22.00	0.00	110.00	590.00	1100.00	170.00	4600.00
Broadbalk, GB *	Soil 1846	NA	NA	0.79	8.50	0.05	0.86	1.10	0.82	10.10	0.13	2.40	1.00	0.63	-0.01	0.66	7.70	0.18	0.31	0.28	5.10	3.30	0.25	4.80	2.80	5.80	2.90	13.00
Broadbalk, GB *	Soil 1986	NA	NA	1.00	9.00	0.06	1.60	1.00	0.86	10.80	0.27	3.80	1.20	0.81	-0.01	0.53	9.10	0.31	0.57	0.48	8.60	4.20	0.31	6.00	6.30	0.00	5.20	25.00
Bothnian Sea **	SRE 5 (0-1 cm)	NA	NA	76.00	800.00	9.10	180.00	49.00	70.00	600.00	32.00	470.00	55.00	56.00	38.00	100.00	710.00	34.00	150.00	91.00	1100.00	NA	NA	720.00	NA	720.00	-9.00	810.00
Bothnian Sea **	SRE 5 (30-35 cm)	NA	NA	-2.10	64.00	-2.50	100.00	-1.50	-1.00	21.00	-11.80	40.00	-0.70	-1.90	-1.40	-0.07	7.80	-1.70	-1.70	-6.10	42.00	NA	NA	-2.50	NA	32.00	-12.00	-50.00
Baltic Sea **	40 (0-1 cm)	NA	NA	88.00	780.00	8.40	220.00	92.00	91.00	150.00	40.00	620.00	110.00	97.00	29.00	94.00	890.00	34.00	34.00	76.00	1100.00	NA	NA	1100.00	NA	1300.00	23.00	1500.00
Baltic Sea **	40 (30-35 cm)	NA	NA	-2.10	28.00	-1.50	19.00	-0.70	-0.60	8.20	-1.20	22.00	-1.50	-1.50	-4.00	-2.10	ND	-3.40	-3.40	-5.20	33.00	NA	NA	9.50	NA	39.00	-15.00	-73.00

NOTE 1: (-) indicates none detected, value is the method detection level, (ND) indicates none detected when detection limit is not known, (NA) not applicable.
NOTE 2: (*) Data from Kjeller, Lars-Owe, et al., Environmental Science and Technology. 1991, 25, 1619-1627.
NOTE 3: (**) Data from Rappe, Christoffer, et al., Swedish Environmental Protection Agency, Report March 1987.

(–) denotes not detected at number (level) following negative sign

Columbia River Salmon Flow Measures Dioxin Data

SAMPLE SITE	2378 TCDF	TOTAL TCDF	2378 TCDD	TOTAL TCDD	12378 PeCDF	23478 PeCDF	TOTAL PeCDF	12378 PeCDD	TOTAL PeCDD	123478 HxCDF	123678 HxCDF	123789 HxCDF	234678 HxCDF	TOTAL HxCDF	123478 HxCDD	123678 HxCDD	123789 HxCDD	TOTAL HxCDD	1234678 HpCDF	1234789 HpCDF	TOTAL HpCDF	1234678 HpCDD	TOTAL HpCDD	OCDF	OCDD
1989 TEFs	0.10	0.00	1.00	0.00	0.05	0.50	0.00	0.50	0.00	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.00	0.01	0.01	0.00	0.01	0.00	0.001	0.001
CL-VC-1-2	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.000	0.012
RC-P-1-2	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.14	0.13	0.00	0.03	0.00	0.00	0.30	0.00	0.004	0.130
HC-P-1-4	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.13	0.00	0.00	0.03	0.00	0.00	0.15	0.00	0.003	0.110
WR-P-2-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.000	0.021
HV-VC-1-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.000	0.036
PHR-VC-1-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.00	0.22	0.00	0.00	5.90	0.00	0.170	4.600
SDS-VC-1-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.24	0.00	0.009	0.380
BM-VC-1-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.000	0.028
MSP-P-1-2	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.026
MINIMUM	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.05	0.00	0.00	0.24	0.13	0.13	0.00	0.03	0.00	0.00	0.02	0.00	0.003	0.012
MAXIMUM	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.05	0.00	0.00	0.24	0.58	0.13	0.00	0.22	0.00	0.00	5.90	0.00	0.170	4.600
Broadbalk, GB *	0.08	0.00	0.05	0.00	0.06	0.41	0.00	0.07	0.00	0.10	0.06	0.00	0.07	0.00	0.02	0.03	0.03	0.00	0.03	0.00	0.00	0.03	0.00	0.003	0.013
Broadbalk, GB *	0.10	0.00	0.06	0.00	0.05	0.43	0.00	0.14	0.00	0.12	0.08	0.00	0.05	0.00	0.03	0.06	0.05	0.00	0.04	0.00	0.00	0.06	0.00	0.005	0.025
Bothnian Sea **	7.60	0.00	9.10	0.00	2.45	35.00	0.00	16.00	0.00	5.50	5.60	3.80	10.00	0.00	3.40	15.00	9.10	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.810
Bothnian Sea **	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000
Baltic Sea **	8.80	0.00	8.40	0.00	4.60	45.50	0.00	20.00	0.00	11.00	9.70	2.90	9.40	0.00	3.40	3.40	7.60	0.00	0.00	0.00	0.00	0.00	0.00	0.023	1.500
Baltic Sea **	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000

Columbia River Salmon Flow Measures Sediment Quality Pest/PCB Data

SAMPLE #	TOC %	Alpha-BHC	Gamma-BHC	Beta-BHC	Heptachlor	Delta-BHC	Aldrin	Heptachlor Epoxide	Endosulfan I	4,4'-DDE	Dieldrin	Endrin	4,4'-DDD	Endosulfan II	4,4'-DDT	Endrin Aldehyde	Endosulfan sulfate	Methoxychlor	Toxaphene	Clordane	Total PCB's
RC-P-1 (1st anal)	3.51																60				
RC-P-1 (2nd anal)	3.51																-10				
HC-P-1 (Nov 21 anal)	6.37												8		6						
HV-VC-1 (1st anal)	5.15												-10								
HV-VC-1 (2nd anal)	5.15												5								
PHR-VC-3 (1st anal)	1.31												-10								
PHR-VC-3 (2nd anal)	1.31												16								
SDS-VC-3 (1st anal)	1.26												10								
SDS-VC-3 (2nd anal)	1.26												-5								
MSP-P-4 (1st anal)	1.22																60				
MSP-P-4 (2nd anal)	1.22																-5				
MRL (ppb)		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	50	20	40
MRL Elevated (ppb)		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	40	300	200	
MAXIMUM			0	0	0	0	0	0	0	0	0	0	16	0	6	0	60	0	0	0	0

USACE, NPP Concern Levels															total 10 - 20						400 - 500
EPA, Region 10 Screening Levels			10		10		10	10			10				total 6.9					10	130
Wiss. DNR Sed. Qual. Guidlines					50	50	10				10	50								10	50
Beak Consit. Sed. Qual. Guidlines		20		12	8	11.3	8	18		20	70	12	32		24 - 36					30	

(-) denotes not detected at number (level) following negative sign.

Columbia River Salmon Flow Measures Sediment Quality PAH Low MRL

Sample #	TOC	Naphthalene	Acenaphthene	Acenaphthylene	Flourene	Phenanthrene	Anthracene	Total LPAH	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene	Indeno(1,2,3-cd)pyrene	Total HPAH
CL-VC-1	0.79	70				40		110	80	40		10				10			140
CL-VC-2	0.95							0											0
CL-P-1	2.52							0	120			40							160
RC-VC-1	0.23							0											0
RC-VC-2	0.19							0											0
RC-VC-3	5.84							0											0
RC-P-1	3.51					40		40		70		20			20		60	10	180
RC-P-2	3.61					60		60	160	100		20			20				300
RC-P-3	0.25	80	80	80.0				240											0
RCI-P-1	1.5	70	70	70.0		10		220											0
RCI-P-2	1.77							0											0
HC-P-1	6.37					50		50	180	80		30		10	20		40	20	380
HC-P-2	3.01					20		20											0
HC-P-3	6.48							0											0
HC-P-4	1.07	220				20		240	80	30									110
GC-P-1	3.71							0											0
GC-P-2	1.58	540				50		590		40					20				60
WR-P-2	1.49							0											0
WR-P-3	3.7	120						120	30						20				50
WR-VC-1	0.1							0											0
WR-VC-2	0.31							0											0
WR-VC-3	1.43							0											0
HV-VC-1	5.15						20	20		40		120	40						200
HV-VC-2	2.28							0											0
HV-VC-3	0.3							0								20			20
PHR-VC-1	2.47							0				180							180
PHR-VC-2	1.22							0				120							120
PHR-VC-3	1.31							0				40							40
HRM-VC-1	0.74					10		10	40	30									70
HRM-VC-2	0.76					20		20	50	20									70
SDS-VC-1	0.81							0											0
SDS-VC-2	1.08					20		20	40	30		10							80
SDS-VC-3	1.26					20		20	80	50	10	30					30		200
BM-VC-1	1.34							0											0
BM-VC-2	1.73					20		20		40									40
BM-VC-3	1.54							0		40									40
MSP-P-1	2.34					20		20	40	30		20			30			20	140
MSP-P-2	1.23							0			10	10			20		20	10	70
MSP-P-3	0.62							0											0
MSP-P-4	1.22	130				10		140		30		10			20			20	80
MRL (ppb)		50	50	50	20	10	10		20	20	10	10	20	10	10	10	20	10	
MAXIMUM		540	80	80	0	60	20	590	180	100	10	180	40	10	30	20	60	20	380
USACE, NPP Concern Levels																			1,500 to 2,000
EPA, Region 10 Screening Leve		210	63	64	64	320	130	6,100	630	430	450	670	800	800	680	120	540	69	51,000
USACE, WES Screening Levels						520/1300			860/2160	870/2170	520/1300	770/1920			790/1980				

Columbia River Salmon Flow Measures Sediment Quality PAH High MRL

Sample #	TOC	Naphthalene	Acenaphthene	Acenaphthylene	Flourene	Phenanthrene	Anthracene	Total LPAH	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Benzo(g,h,i)perylene	Indeno(1,2,3-cd)pyrene	Total HPAH
CL-VC-1	0.79	100				40		140	80	40		10				10			140
CL-VC-2	0.95							0											0
RC-VC-1	0.23							0											0
RC-VC-2	0.19							0											0
RC-VC-3	5.84							0											0
RC-P-1	3.51					40		40		70		20			20		60	10	180
RC-P-2	3.61	70	40			60		170	160	100		20			20				300
RC-P-3	0.25	300						300											0
RCI-P-1	1.5					10		10											0
RCI-P-2	1.77							0											0
WR-P-2	1.49							0											0
WR-P-3	3.7	100						100	30						20				50
WR-VC-1	0.1							0											0
WR-VC-2	0.81							0											0
WR-VC-3	1.43							0											0
HV-VC-1	5.15						20	20		40		120	40						200
HV-VC-2	2.26							0											0
HV-VC-3	0.3							0								20			20
PHR-VC-1	2.47							0				180							180
PHR-VC-2	1.22							0				120							120
PHR-VC-3	1.31							0				40							40
HRM-VC-1	0.74					10		10	40	30									70
HRM-VC-2	0.78					20		20	50	20									70
SDS-VC-1	0.81							0											0
SDS-VC-2	1.08					20		20	40	30		10							80
SDS-VC-3	1.28					20		20	80	50	10	30					30		200
BM-VC-1	1.34					20		20	40										40
BM-VC-2	1.73							0											0
BM-VC-3	1.54							0											0
MSP-P-1	2.34					20		20	40	30		20			30			20	140
MSP-P-2	1.23							0			10	10			20		20	10	70
MSP-P-3	0.62							0											0
MSP-P-4	1.22					10		10		30		10			20			20	80
MRL (ppb)		100	100	100	20	10	10		20	20	10	10	20	10	10	10	20	10	
MRL (PHR-VC-2)		400	400	400	80	40	40		80		40		80	40	40	40	80	40	
MAXIMUM		300	40	0	0	60	20	300	160	100	10	180	40	0	30	20	60	20	300
USACE, NPP Concern Levels																			1,500 to 2,000
EPA, Region 10 Screening Levels		210	63	64	64	320	130	6,100	630	430	450	670	800	800	680	120	540	69	51,000
USACE, WES Screening Levels						520/1300			860/2160	870/2170	520/1300	770/1920			790/1980				

Bonneville Second Powerhouse Forebay Sediment Evaluation

Abstract

In July 1997 seven sediment samples were collected from Bonneville Second Powerhouse forebay and water supply conduits. Two of the samples were taken from the downstream portion of the south Auxiliary Water Supply (AWS) conduit by divers inspecting the inside of the south AWS. Three additional samples were taken from the surface of the sediment deposits at the north end of the forebay. The final two samples were collected from the sediment and woody debris removed from the north AWS intake trash rack by clamshell and stockpiled on Cascade Island, at the south end of the Elevation 90 Deck crane way extension. Physical analysis, run on four sediments, indicated the material ranges from gavel to very fine sand, with largest fractions in the coarse to medium sand range. Chemical analysis, run on five sediments, included metals, pesticides/polychlorobiphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), total organic carbon (TOC), acid volatile sulfide (AVS), phenols and dioxin screen (P450). The portion of the sample submitted to the lab is representative of the material dredged except for the woody debris. Since the wood is waterlogged and would not be a navigation hazard covered under the ocean disposal rules, it can be placed in-water with the sediment.

Introduction

1. Bonneville Second Powerhouse is located at River Mile (RM) 145 on the north side of the Columbia River.

2. There has been no prior sampling at Bonneville Second Powerhouse. Informational sampling and analysis was done on sediment downstream from the First Powerhouse Navigational Lock, on the south side of the river, in 1991 (1), with results acceptable for unconfined in-water or upland disposal . This same downstream area was dredged in1986 and in the late 1970s.

3. This project was conducted for emergency debris removal and maintenance dredging of the Second Powerhouse forebay.

Methods

4. As previously mentioned, on July 24,1997 two sediment samples were taken by divers inside the AWS conduit located at the south end of the Second Powerhouse forebay (Figure 1). These samples, PH#1 and PH#2, were submitted for chemical analysis only, due to lack of volume for physical analyses. Three surface sediment samples, B2-GC-1 (lost due to rupturing of the plastic bag containing the sample), B2-GC-2 and B2-GC-3

(Figure 1), were taken with a Benthos gravity corer at the north end of the forebay on July 28,1997. These samples were difficult to recover because of an unusually large percentage of shell fragments and woody debris, which would not allow the sampler's retainer to close and hold the sample properly. However, the portion of the samples sent to the laboratory did not contain large amounts of volatile solids (B2-GC-1 (lost) ,2.77% for B2-GC-2 and 2.44 % for B2-GC-3). Two samples, taken July 28, 1997, B2-G-1 and B2-G-2 (Figure 1), were collected from the sediment removed from the north AWS intake trash rack by clamshell and stockpiled on Cascade Island (only chemical analysis were run on these samples). Physical samples were placed in zip-lock bags and shipped to Columbia Analytical Services (CAS), Kelso Washington, for dredge analysis (particle size, hydrometer, particle shape, void ratio, dry bulk density and volatile solids). Chemical samples were placed in, pre-cleaned, EPA approved, glass jars and chilled to 4° C ± 2°C. Samples were shipped, using EPA approved methods for shipping and handling, to Columbia Analytical Services (CAS) for analysis of metals, acid volatile sulfide (AVS), pesticides/ polychlorobiphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs) by SIM method, total organic carbon (TOC), phenols and dioxin screen (P-450). All sampling and analysis were performed according to EPA/USACE approved methods (4). Laboratory quality control (QC) standards were run by CAS laboratory during sample analysis.

Results/Discussion

5. The results of physical analysis are shown in Table 1. There was little variance between samples. The percent passing the No. 200 screen ranged from 4.7 % to 7.7 % with volatile solids from 1.6 % to 3.6 %. However, based on the difficulty of obtaining samples with the gravity corer, and the large volume of large woody debris in the sediments removed from the AWS trash rack, the samples collected are not considered representative of the material to be dredged. Woody debris observed in the stockpiles of materials removed from the forebay prior to the sampling operation ranged from a few millimeters to more than 10 meters in length. The stockpiled materials were removed from the AWS intakes using both a 4 cubic meter trash rake that collects material by raking the intake screen (approximately 6-inch by 6-inch mesh) and a 1.5 cubic meter clamshell bucket that can reach up to 10 meters away from the powerhouse intakes. Neither of these devices are reported to get good recovery of the sediment fraction of the material taken from the forebay. The trash rake retrieved a 2 cubic meter bulk sample from which B2-G-1 and B2-G-2 were obtained. It was visually estimated to contain 5% woody debris, most of which was small bark fragments, but several pieces of wood roughly 1 meter long and 3cm diameter were also in the partially filled rake. Allowing for the 500ml sample size, which was found to contain around 2.7 % volatile solids, the 5% visual estimate of woody debris in the sediment probably represents the bulk percentage of wood to be expected in the total volume of material to be dredged. Since the wood is waterlogged and would not be a navigation hazard covered under the ocean disposal rules, it can be placed in-water with the sediment.

6. The concentrations of inorganic and TOC are shown in Table 2. All concentrations are below established screening levels of concern (SLC) (3). Zinc was the metal with the highest concentration with a low of 97 ppm and a high of 114 ppm. The average level of zinc at 104 ppm is only 65 % of the SLC. Cadmium had the second highest concentration level with an average of .96 ppm which is only 33 % of the SLC. All of the other metals were less than 15 % of the SLC.

7. The results of organic analysis are shown in Table 3 & Table 4. PCBs were not detected in any on the samples. Pesticides (4,4'-DDT and Lindane) were detected in three of the samples, but similar levels were also found in the method blank. The samples were re-extracted past recommended holding time with only one sample showing a concentration (4,4'-DDT = 3 ppb < half of the SLC) above the method detection limit. PAHs were less than 30% of the SLC. Phenols analyses were all less than the SLC, with 4 methylphenol detected at 100ppb (83% of the SLC) in sample B2-GC-1. The other phenols were less than 17% of the SLC, with most below the method detection limit. All concentrations of organics are below established concern levels (3).

8. The results of physical and chemical analyses of the sediment compare with the samples taken downstream of the Bonneville Navigational Lock in 1991. The material is similar to that of other Columbia River sediment studies (5). This and previous sediment quality evaluations in the area conclude that no unacceptable, adverse environmental impacts would be expected from its disposal. The disposal of this material meets the provisions of the Clean Water Act (CWA) for both unconfined in-water and upland disposal.

References

1. Briton J. U.S. Army Corps of Engineers, Portland District. September 1991. Bonneville Navigation Lock Sediment Evaluation

2. U. S. Environmental Protection Agency and U. S. Army Corps of Engineers. February 1991. Evaluation of Dredge Material proposed for Ocean Disposal (Testing Manuel).

3. U. S. Army Corps of Engineers, Portland District. November 1991. Levels of Concern Tier II Analysis. (A list of chemicals and associated concern levels in bulk sediment, established as a temporary guideline useful in evaluating toxicity of sediment. These levels of concern are subject to change as new information warrants.)

4. U. S. Environmental Protection Agency. Guidelines for /specification of Disposal Sites for Dredging or Fill Material. Code of Federal Regulations, 40 CFR 190.01, 1985.

5. U. S. Army Corps of Engineers, Portland District. October 1991. Columbia River Pool Lowering (MOP).

Figure 1
Bonneville Powerhouse #2 Sediment Sampling, July 1997

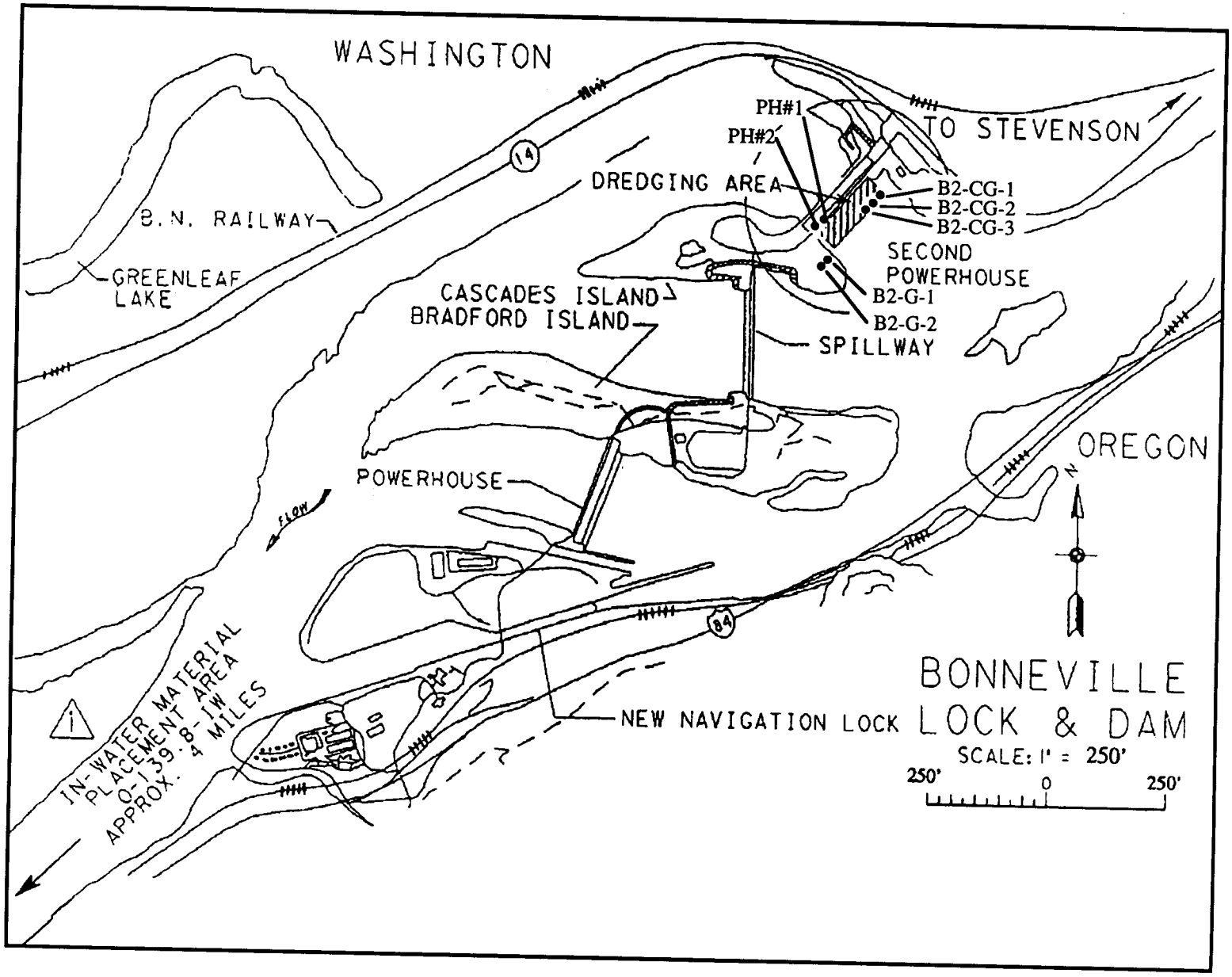


Table 1

Bonneville Powerhouse #2 Sediment - Physical Analysis

	mm	>No.10 >2.0mm	No. 20-200 0.85-0.075mm	<N0. 200 <0.075mm	%
sample	median grain size	gravel	sand	fine	volitle solids
B2-GC-1*	*	*	*	*	*
B2-GC-2	0.13000	2.1	93.2	<4.7	2.77
B2-GC-3	0.13500	1.8	90.5	<7.7	2.44
B2-G1	0.13500	1.6	93.2	<5.2	3.62
B2-G2	0.13400	0.6	94.1	<5.3	1.57

* Sample B2-GC-1 Lost when bag ruptured.

Table 2

Bonneville Powerhouse #2 Sediment - Inorganic and Total Organic Carbon (TOC) Analysis

	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn	AVS	TOC
					ppm					ppm	%
B2-GC-1	4	0.44	10.0	16.3	7.66	<0.05	11.1	0.10	97.8	2.0	0.43
B2-GC-2	3	0.25	9.3	10.0	7.58	<0.05	11.1	0.06	96.9	<0.3	0.39
B2-GC-3	5	0.39	9.2	14.9	8.6	<0.05	10.3	0.11	105	<0.3	0.21
PH2 #1	2	0.26	10.9	10.6	8.86	<0.05	11.4	0.06	108	2.3	0.35
PH2 #2	15	0.26	11.2	10.7	8.75	<0.05	10.6	0.07	114	2.1	0.08

Table 3

Bonneville Powerhouse #2 Sediment - Organic Analysis

	PCB - 7 arochlor analytes (ppb)	Pesticides - **19organochlorine analytes (ppb)		
		alapha-BHC	gamma-BHC (Lindane)	4,4'-DDT
B2-GC-1	ND	<0.2	0.2* (r = <0.2)	0.7* (r = <0.2)
B2-GC-2	ND	<0.2	<0.2	<0.3
B2-GC-3	ND	<0.2	0.3* (r = <0.2)	2* (r = 3)
PH2 #1	ND	<0.2	<0.2	0.5* (r = <0.2)
PH2 #2	ND	0.2	0.3* (r = <0.2)	1* (r = <0.2)

ND = none detected

** table shows only analytes where detection was noted

*Low level concentrations of Lindane and 4,4-DDT were present in the Method Blank.
The affected samples were reextracted past the recommended holding time. The results from both are reported.
r = rerun

Table 4a

Bonneville Powerhouse #2 Sediment - Organic Analysis (cont'd)
Polynuclear Aromatic Hydrocarbons (PAH) - 8 (low density) analytes

	Acenapththene	Acenaphthylene	Anthracene	Dibenzofuran	Fluorene
B2-GC-1	18	0.7	13	1	10
B2-GC-2	1	2	<0.6	<0.5	0.9
B2-GC-3	2	6	4	1	1
PH2 #1	<0.5	0.2	<0.6	<0.5	<0.5
PH2 #2	1	0.6	0.9	<0.5	0.7

	2-Methylnapthalene	Naphthalene	Phenanthrene	**Total Low PAHs**
B2-GC-1	3	3	29	77.7
B2-GC-2	2	4	1	10.9
B2-GC-3	3	3	4	24
PH2 #1	1	0.8	0.9	2.9
PH2 #2	2	3	3	11.2

Table 4b

Bonneville Powerhouse #2 Sediment - Organic Analysis (cont'd)
Polynuclear Aromatic Hydrocarbons (PAHs) - 10 (high density) analytes

	Benz(a)anthracene	Benzo(b)fluroanthene	Benzo(k)fluroanthene	Benzo(g,h,I)perylene	Benzo(a)pyrene
B2-GC-1	5	4	4	7	7
B2-GC-2	<0.7	<0.8	<0.6	1	1
B2-GC-3	2	3	2	2	2
PH2 #1	1	1	1	1	2
PH2 #2	<0.7	<0.8	<0.6	0.5	<0.5

	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Pyrene
B2-GC-1	7	3	22	7	27
B2-GC-2	0.8	0.6	1	1	1
B2-GC-3	5	1	13	1	11
PH2 #1	1	<0.5	2	1	2
PH2 #2	0.6	<0.5	2	<0.7	1

	Total High PAHs
B2-GC-1	93.0
B2-GC-2	6.4
B2-GC-3	42.0
PH2 #1	12.0
PH2 #2	4.1

Table 5

Bonneville Powerhouse #2 Sediment - Phenol Analysis (ppb)

	Phenol	2-Methylphenol	4-Methylphenol	2,4-Dimethylphenol	Pentachlorophenol
B2-GC-1	**10**	<30	**100**	<50	<50
B2-GC-2	<8	<30	<50	<50	<50
B2-GC-3	<8	<30	<50	<50	<50
PH2 #1	**20**	<30	<50	<50	<50
PH2 #2	<8	<30	<50	<50	<50

Report Date: December 17, 2001
Job Number: A11120B
PO Number: 3142
Project No: None Provided
Project Name: None Provided

Pat Hunter
US Army Corps of Engineers
Bonneville Lock & Dam
General Delivery
Cascade Locks, OR 97014

Analytical Narrative

The sample was received on 11/20/01 by Coffey Laboratories, Inc. (CLI) Sample Reception personnel under strict chain of custody protocol. The following information was provided at the time of sample reception:

Laboratory Sample ID	Field Identification	Matrix	Collection Date	Collection Time
A11120B-1	2	Sand	11/19/01	NP
A11120B-2	5	Sand	11/19/01	NP
A11120B-3	8	Sand	11/19/01	NP

The recommended holding time for each batch of analyses was in accordance with the data quality objectives as specified in the CLI Quality Assurance Plan unless otherwise noted.

Acceptable precision and accuracy were achieved for all analyses associated with this work order as demonstrated by the recoveries of the quality control samples analyzed concurrently with each batch.

The data submitted in this report is for the sole and exclusive use of the above-named client. All samples associated with the work order will be retained a maximum of 15 days from the report date or until the maximum holding time expires. All results pertain only to samples submitted.

Thank you for allowing Coffey Laboratories to be of service to you. If you have questions or need further assistance, please do not hesitate to call our Customer Services Department.

Sincerely,

John A. Guild

Technical Services

TS /atc

Coffey Laboratories, Inc.
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Analytical Data

US Army Corps of Engineers

Job Number: A11120B

Lab Sample ID: A11120B-1
Field ID: 2
Date/Time: 11/19/01
Matrix: Sand

EPA Category: Extractable Organics
Analysis Performed: EPA 8081; Organochlorine Pesticides by GC/ECD
Analysis Date: 12/06/01
Analyst: AB

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Aldrin	0.0009	ND	ND
alpha-BHC	0.0006	ND	ND
beta-BHC	0.0006	ND	ND
gamma-BHC (Lindane)	0.0006	ND	ND
delta-BHC	0.0006	ND	ND
Chlordane	0.02	ND	ND
4,4-DDD	0.0006	ND	ND
4,4-DDE	0.0006	ND	ND
4,4-DDT	0.0006	ND	ND
Dieldrin	0.0009	ND	ND
Endosulfan I	0.0006	ND	ND
Endosulfan II	0.0006	ND	ND
Endosulfan sulfate	0.0006	ND	ND
Endrin	0.0006	ND	ND
Endrin aldehyde	0.0006	ND	ND
Endrin ketone	0.0006	ND	ND
Heptachlor	0.0009	ND	ND
Heptachlor epoxide	0.0009	ND	ND
Hexachlorobenzene	0.0009	ND	ND
Methoxychlor	0.001	ND	ND
Toxaphene	0.06	ND	ND
Propachlor	0.006	ND	ND
Aroclor 1016	0.06	ND	ND
Aroclor 1221	0.06	ND	ND
Aroclor 1232	0.06	ND	ND
Aroclor 1242	0.06	ND	ND
Aroclor 1248	0.06	ND	ND
Aroclor 1254	0.06	ND	ND
Pentachloronitrobenzene (Surr.)	---	---	78%
Decachlorobiphenyl (Surr.)	---	---	103%

Results expressed as mg/kg unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

US Army Corps of Engineers

Job Number: A11120B

Lab Sample ID: A11120B-1
Field ID: 2
Date/Time: 11/19/01
Matrix: Sand

EPA Category: Extractable Organics
Analysis Performed: EPA 8081; Organochlorine Pesticides by GC/ECD
Analysis Date: 12/06/01
Analyst: AB

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Aroclor 1260	0.06	ND	ND

Results expressed as mg/kg unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

US Army Corps of Engineers

Job Number: A11120B

Lab Sample ID: A11120B-2
Field ID: 5
Date/Time: 11/19/01
Matrix: Sand

EPA Category: Extractable Organics
Analysis Performed: EPA 8081; Organochlorine Pesticides by GC/ECD
Analysis Date: 12/06/01
Analyst: AB

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Aldrin	0.001	ND	ND
alpha-BHC	0.0007	ND	ND
beta-BHC	0.0007	ND	ND
gamma-BHC (Lindane)	0.0007	ND	ND
delta-BHC	0.0007	ND	ND
Chlordane	0.03	ND	ND
4,4-DDD	0.0007	ND	ND
4,4-DDE	0.0007	ND	ND
4,4-DDT	0.0007	ND	ND
Dieldrin	0.001	ND	ND
Endosulfan I	0.0007	ND	ND
Endosulfan II	0.0007	ND	ND
Endosulfan sulfate	0.0007	ND	ND
Endrin	0.0007	ND	ND
Endrin aldehyde	0.0007	ND	ND
Endrin ketone	0.0007	ND	ND
Heptachlor	0.001	ND	ND
Heptachlor epoxide	0.001	ND	ND
Hexachlorobenzene	0.001	ND	ND
Methoxychlor	0.001	ND	ND
Toxaphene	0.07	ND	ND
Propachlor	0.007	ND	ND
Aroclor 1016	0.07	ND	ND
Aroclor 1221	0.07	ND	ND
Aroclor 1232	0.07	ND	ND
Aroclor 1242	0.07	ND	ND
Aroclor 1248	0.07	ND	ND
Aroclor 1254	0.07	ND	ND
Pentachloronitrobenzene (Surr.)	---	---	78%
Decachlorobiphenyl (Surr.)	---	---	100%

Results expressed as mg/kg unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

US Army Corps of Engineers

Job Number: A11120B

Lab Sample ID: A11120B-2
Field ID: 5
Date/Time: 11/19/01
Matrix: Sand

EPA Category: Extractable Organics
Analysis Performed: EPA 8081; Organochlorine Pesticides by GC/ECD
Analysis Date: 12/06/01
Analyst: AB

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Aroclor 1260	0.07	ND	ND

Results expressed as mg/kg unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

US Army Corps of Engineers

Job Number: A11120B

Lab Sample ID: A11120B-3
Field ID: 8
Date/Time: 11/19/01
Matrix: Sand

EPA Category: Extractable Organics
Analysis Performed: EPA 8081; Organochlorine Pesticides by GC/ECD
Analysis Date: 12/06/01
Analyst: AB

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Aldrin	0.0009	ND	ND
alpha-BHC	0.0006	ND	ND
beta-BHC	0.0006	ND	ND
gamma-BHC (Lindane)	0.0006	ND	ND
delta-BHC	0.0006	ND	ND
Chlordane	0.03	ND	ND
4,4-DDD	0.0006	ND	ND
4,4-DDE	0.0006	ND	ND
4,4-DDT	0.0006	ND	ND
Dieldrin	0.0009	ND	ND
Endosulfan I	0.0006	ND	ND
Endosulfan II	0.0006	ND	ND
Endosulfan sulfate	0.0006	ND	ND
Endrin	0.0006	ND	ND
Endrin aldehyde	0.0006	ND	ND
Endrin ketone	0.0006	ND	ND
Heptachlor	0.0009	ND	ND
Heptachlor epoxide	0.0009	ND	ND
Hexachlorobenzene	0.0009	ND	ND
Methoxychlor	0.001	ND	ND
Toxaphene	0.06	ND	ND
Propachlor	0.006	ND	ND
Aroclor 1016	0.06	ND	ND
Aroclor 1221	0.06	ND	ND
Aroclor 1232	0.06	ND	ND
Aroclor 1242	0.06	ND	ND
Aroclor 1248	0.06	ND	ND
Aroclor 1254	0.06	ND	ND
Pentachloronitrobenzene (Surr.)	---	---	78%
Decachlorobiphenyl(Surr.)	---	---	103%

Results expressed as mg/kg unless otherwise noted.
ND means none detected at or above the detection limit listed.

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Analytical Data

US Army Corps of Engineers

Job Number: A11120B

Lab Sample ID: A11120B-3
Field ID: 8
Date/Time: 11/19/01
Matrix: Sand

EPA Category: Extractable Organics
Analysis Performed: EPA 8081; Organochlorine Pesticides by GC/ECD
Analysis Date: 12/06/01
Analyst: AB

Parameter	Detection Limit	Laboratory Blank	Analytical Result
Aroclor 1260	0.06	ND	ND

Results expressed as mg/kg unless otherwise noted.
ND means none detected at or above the detection limit listed.

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SAMPLING & ANALYSIS PLAN

BONNEVILLE FOREBAY
SEDIMENT CHARACTERIZATION

July 2002

Prepared by:

CENWP-EC-HR

Portland District
Corps of Engineers

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Field Sampling Plan - Bonneville Forebay Characterization

1.0 PROJECT DESCRIPTION, SITE HISTORY AND ASSESSMENT

1.1 Project Site Location and Description. Bonneville Dam is located between River Mile (RM) 145 and 146 of the Columbia River. The area of this sediment characterization event will extend upstream of the forebay, beyond the eddy currents effect associated with the dam, which reaches upstream to the area at the west end of Goose Island (see figure 1).

This characterization will exclude the area identified as within or adjacent to the former Bradford Island Dump Site. All areas associated with the remedial action of the former dumpsite at Bradford Island will be sampled under a different SAP following CERCLA guidance. The purpose of this sampling plan is to gather additional baseline information. No samples are planned for areas where recent data has been collected (< 5 years old - see figure 1).

1.2 PREVIOUS SAMPLING EVENTS

1.2.1 Dredging Projects

In 1991 informational sampling and analysis was done on sediment downstream from the First Powerhouse Navigational Lock, on the south side of the river, with results acceptable for unconfined in-water or upland disposal. This same downstream area was dredged in 1986 and in the late 1970s.

In July 1997 seven sediment samples were collected from Bonneville Second Powerhouse forebay and water supply conduits. Two of the samples were taken from the downstream portion of the south Auxiliary Water Supply (AWS) conduit by divers inspecting the inside of the south AWS. Three additional samples were taken from the surface of the sediment deposits at the north end of the forebay. The final two samples were collected from the sediment and woody debris removed from the north AWS intake trash rack by clamshell and stockpiled on Cascade Island, at the south end of the Elevation 90 Deck crane way extension. Physical analysis, run on four sediments, indicated the material ranges from gavel to very fine sand, with largest fractions in the coarse to medium sand range. Chemical analysis, run on five sediments, included metals, pesticides/polychlorobiphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), total organic carbon (TOC), acid volatile sulfide (AVS), phenols and dioxin screen (P450). The portion of the sample submitted to the lab was representative of the material dredged, except for the woody debris. Results determined the material to be acceptable for unconfined in-water or upland disposal.

On December 18, 2001 a total of three (3) sediment samples were collected from a shoal at the adult fish ladder discharge (water intake) on the south bank of Bradford Island. All samples were submitted for physical analyses including total volatile solids and also analyzed for metals (9

inorganic), total organic carbon, pesticides and polychlorinated biphenyls, phenols, phthalates, miscellaneous extractables, polynuclear aromatic hydrocarbons and organotin.

None of the laboratory data results exceeded their respective screening levels in the DMEF. All sediment was determined to be suitable for unconfined, in-water placement; however, the 1577 CY of material dredged was, as a management option, barged to RABANCO's company Regional Disposal facility in Roosevelt Washington.

On January 14 & 15, 2002 thirteen (13) sediment samples (includes 1 field dup.) from four (4) stations were collected at potential log boom anchor point locations. Sediments were tested for lead, mercury, PCBs, hydrocarbons, TOC and grain size. One (1) sample analysis detected mercury slightly over the 0.41 mg/kg DMEF screening level (SL) at 0.419mg/kg. The field duplicate indicated motor oil at a 195mg/kg level, which exceeds the ODEQ Numeric Soil Cleanup standards (Soil Matrix) of 100 mg/kg. The analysis of the primary sample, associated with the field duplicate analyses above, indicated motor oil at 43.6 mg/kg, which is considerable less than the duplicate sample and well below ODEQ standard. The material represented by this sampling event is to be side-cast to construct the proposed anchor structures. The volume of sediment to be side-cast for the project was estimated be less than 100 CY, which is a sufficiently small volume to be considered as having little or no environmental impact at the chemical levels reported.

1.2.2 Study Projects

In 1991 in a Minimum Operating Pool (MOP) study at Bonneville, which included twelve (12) sites, Cascade Lock RM 149.2, Rock Creek RM 150.0, Herman Creek RM 150.9, Wind River Boat Ramp/Mouth RM 154.8, Home Valley RM 154.8, Port of Hood River RM 169.0, SD&S Lumber, RM 170.6, Bingen Boat Basin & Marina RM 171.7, Mayer State Park RM 181.0 was conducted. All sites were analyzed for metals, PAHs, pest/PCBs, TOC and AVS, with select sites adding phenols, dioxins/furans and TBT. None of the test sediments exceeded current Dredge Material Evaluation Framework (DMEF) screening guidelines for open water disposal (no PCBs were detected at the method reporting limit (MRL) of 0.04 mg/kg).

In December 2000 and May 2001 sediment and biological tissue samples were collected and analyzed from an area at the Northeast end of Bradford Island, which contained discarded electrical components discovered in the near shore area. Levels of PCB Aroclor 1254 were detected in clam tissue at 3.8 mg/kg, in crayfish at 75.6 mg/kg and in sediment at 8.3 mg/kg. The investigation and cleanup of this former dumpsite is still in progress; discarded electrical components from the in-water areas have been removed. Further sediment testing will take place in the near future.

In Aug 2001, one (1) surface grab sample and eight (8) in-water subsurface (borings), within the proposed plunge pool, consisted of overburden materials and bedrock. In addition to the in-water samples, 41 upland sites (borings and test pits) were also collected from the proposed upland construction site downstream of the Second Powerhouse and contain similar material. The overburden consists of fill (500 CY of riprap), alluvium, slide debris material and a poorly graded alluvial material referred to as "crystal sands" (poorly graded micaceous silty sand to sand). All the samples recovered from the drillings and surface sample is considered native material derived primarily from historical and prehistorical slides in the area. The bedrock unit consists of the sedimentary Weigle Formation.

The samples collected from the in-water area at the site of the proposed plunge pool dredging indicate the majority of the material to be disposed of consists of 80% gravel, 18% sand with fines representing <2% of total material with an estimate of <1% volatile solids.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 Key field personnel

Table 1

Name	Organization	Responsibility
Tim Sherman	US Army Corps of Engineers Portland District	Team Leader Planning and implementation of FSP, Sample collection and handling.
Allison Schaub	US Army Corps of Engineers Portland District	Sample collection and field log data recording.
John Vlastelicia	Contracted Research Vessel Owner	Operate boat and sample deployment and retrieval.

3.0 SCOPE AND OBJECTIVES

3.1 Sampling and Analysis Requirements. This sampling event will attempt to collect a statistically significant number of fine-grained sediment samples to evaluate the level of PCBs, Pb & Hg, as well as conduct grain-size and TOC analyses, in the Bonneville Forebay area, excluding the Bradford Island remediation site and recently sampled areas. The plan will attempt to collected sufficient samples to represent the baseline conditions upstream of the eddy effects of the dam operations and reflect the conditions within the forebay. The plan will attempt to collect at least fourteen (14) fine-grained surface grab samples (see figure 1). The potential fine-grained sediment locations are being selected with the aid of a computer model, which reflects the various flow conditions associated with the dam's operation in near-bottom flows. In-channel samples will be collected on an intersect grid spaced evenly throughout the selected study area where model data indicates higher flows are present under all conditions. It is likely, if sediment is present in these areas, it will contain few fine-grained (<230 sieve) sediments and will be field screened for percent fines, and submitted for grain-size analyses only, if screening indicates <10% fines.

3.2 Number of Samples To Be Collected. A total of up to twenty-four (24) samples will be collected. Several attempts will be made at each station to retrieve fine-grained material at each location. Any *Corbicula* clams collected during this event will be separated and placed in separate zip lock bags for archiving at -20° C for potential future tissue analyses.

4.0 FIELD ACTIVITIES

4.1 Sampling Locations and Numbering. Figure 1 shows the project area and sample locations. Sampling sites are located for the best characterization of the material as possible. Proper QA/QC procedures as outlined in this section will be followed. Any deviation from these procedures shall be noted in the field log. Sample identification shall follow the following convention:

BF-XX-YY

Where, "BF" denotes samples collected from the Bonneville Forebay, "XX" denotes the type of sampling device such as "BC" = Box Core; "YY" denotes the numeric sample sequence number and will consist of two digits for all samples. The QC replicates (blind duplicate) will have a letter designation in place of the numeric designation of the primary sample; e.g. "A" added (BP-BC-A). Duplicate samples will be identified in the field notes.

4.2 Field Sampling Schedule. Sampling is scheduled for August 2002.

4.3 Field Notes. Field notes will be maintained during sampling operations. Included in the field notes will be the following:

- Name and title of author, date and time of entry.
- Name and address of field contact.
- Propose of sample activity.
- Names and responsibilities of all field crewmembers.
- Sample collection method.
- Number and Volume of samples taken.
- Location, description and log of photographs (if taken) of the sampling sites.
- Date and time of collection.
- Field observations.
- Weather conditions.
- Depth of water at each station sampled as measured from the water surface. This will be accomplished using a leadline or corrected depth recorder.
- The sample station number and individual designation numbers assigned for each individual sample.
- Descriptions of sediment.
- Penetration depth of the sampling device.
- Any deviation from the approved sampling plan.

4.3 Photographs. Photographs will not be used to identify each sample location, but will show general areas where samples are collected. (Sample locations will be identified by GPS).

4.4 Investigation-derive wastes (IDW). Any sample material collected beyond the amount collected for analyses will be placed back in the water at the collection site.

4.5 Corrective action. In the event it is determined that a discrepancy in sampling or sample handling is detected, all field notes will be reviewed by team leader and a determination of the appropriate action will be made. Written documentation will be maked and placed in the permanent file and actions will be recorded in the final evaluation report.

Table 2, Proposed Sample Locations (NAD 83, Oregon State Plane North)

BF-BC-01	45° 38' 17.42" 121° 56' 30.23"	BF-BC-09	45° 38' 29.50" 121° 56' 05.43"	BF-BC-17	45° 38' 41.98" 121° 55' 38.25"
BF-BC-02	45° 38' 20.93" 121° 56' 27.18"	BF-BC-10	45° 38' 45.90" 121° 56' 09.42"	BF-BC-18	45° 38' 46.11" 121° 55' 40.40"
BF-BC-03	45° 38' 24.45" 121° 56' 24.13"	BF-BC-11	45° 38' 48.49" 121° 56' 06.74"	BF-BC-19	45° 38' 50.25" 121° 55' 42.54"
BF-BC-04	45° 38' 19.63" 121° 56' 15.49"	BF-BC-12	45° 38' 51.07" 121° 56' 04.06"	BF-BC-20	45° 38' 48.93" 121° 55' 25.54"
BF-BC-05	45° 38' 22.59" 121° 56' 16.11"	BF-BC-13	45° 38' 35.57" 121° 55' 52.56"	BF-BC-21	45° 38' 52.27" 121° 55' 28.16"
BF-BC-06	45° 38' 25.57" 121° 56' 16.75"	BF-BC-14	45° 38' 39.93" 121° 55' 53.31"	BF-BC-22	45° 38' 55.61" 121° 55' 30.77"
BF-BC-07	45° 38' 24.02" 121° 56' 02.17"	BF-BC-15	45° 38' 44.30" 121° 55' 54.05"	BF-BC-23	45° 38' 56.23" 121° 55' 15.20"
BF-BC-08	45° 38' 26.77" 121° 56' 03.80"	BF-BC-16	45° 38' 48.66" 121° 55' 54.79"	BF-BC-24	45° 38' 59.59" 121° 55' 17.81"

4.6 Decontamination. All sampling devices and utensils will be thoroughly cleaned prior to use according to the following procedure:

- Wash with brush and Alconox soap
- Rinse with distilled water
- Rinse with 10% hydrochloric acid solution
- Rinse with distilled water

Utensils used to collect physical samples only or sampling devices such as the surface grab sampler will be washed down before each sampling event. However, they will not require the cleaning procedure listed above as long as samples collected for chemical analyses are not in contact with the core walls. All utensils used to collect chemical samples will require decontamination prior to each use. All handwork for chemical analyses will be conducted with disposable latex gloves that will be rinsed with distilled water before and after handling each individual sample, as appropriate, to prevent

sample contamination. Gloves will be disposed of between samples or composites to prevent cross contamination between samples.

4.7 Field Log Book. The following information will be included in the field logbook entries:

- Sample recovery
- Physical soil description (includes soil type, density/consistency of soil, color)
- Odor (e.g., hydrogen sulfide, petroleum products)
- Visual stratification and lenses
- Vegetation
- Debris
- Biological Activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence of oil sheen
- Any other distinguishing characteristics or features

4.8 Field Compositing. Samples will not composited during this event.

4.9 Field Duplicates. One (1) to 2 duplicate field samples (QC) and 1 to 2 quality assurance samples will be submitted to a separate quality assurance lab for all analyses conducted on the primary project sample. Laboratory QA/QC will be used to evaluated and access data quality.

4.10 Sampling Equipment. All samples will be collected using a box-core surface grab sampler. The box-core has a capacity of approximately 2 cubic feet, with 12 square inch opening and weighs approximately 150 pounds. Up to eight (8) 50 pound weights can be added for up to 550 pounds total weight. The box-core will be deployed off the stern of the contractor's 29-foot boat, using a hydraulically operated "A-frame" lifting device.

5.0 SAMPLE CHAIN-OF-CUSTODY/DOCUMENTATION

5.1 Sample Transport and Chain-of-Custody Procedures. After sample containers have been filled, they will be packed in ice or "blue ice" in coolers. Chain-of-custody procedures will commence in the field and will track delivery of the samples. Sample holding times and storage requirements are presented in the QAPP. Specific procedures are as follows:

- Samples will be packaged and shipped in accordance with U.S. Department of Transportation regulations as specified in 49 CFR 173.6 and 49 CFR 173.24 or delivered directly to the testing laboratory.

- Individual sample containers will be packed to prevent breakage.

- The coolers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the cooler and office name and address) to enable positive identification.

- Chain-of-custody forms will be enclosed in a plastic bag and placed inside cooler.

Upon transfer of sample possession to the laboratory, the persons transferring custody of the coolers will sign the chain-of-custody form. Upon receipt of samples at the laboratory, the coolers will be inspected and the receiver will record the condition of the samples.

- Custody Seals will be used on cooler during shipment.

Table 3, Sample Volume and Storage

Sample Type	Holding Time	Sample Size (a)	Temperature (b)	Container
Particle Size	6 Months	200 g		1-1 Quart Plastic Bag
PCBs	14 Days	125 g	4°C	1-8 oz Glass
Total Organic Carbon	14 Days	125 g	4°C	1-8 oz Glass (combined)
Mercury (Hg)	28 Days	5g	4°C	
Lead (Pb)	6 Months	50 g	4°C	
Corbicula	2 years	All collected	-20°C	1-1 Quart Plastic Bag

a. Required sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retest.
b. During transport to the lab, samples will be stored on ice.

Quality Assurance Project Plan (QAPP)

1.0 LABORATORY PHYSICAL AND CHEMICAL SEDIMENT ANALYSIS

1.1 Laboratory Analyses Protocols. Laboratory testing procedures will be conducted in accordance with the DMEF. The samples will be analyzed for all the parameters listed in sections 1.3 and 1.4 as requested on the chain-of-custody record. Private contract analytical chemical laboratories will conduct all physical and chemical analyses.

1.1.2 Chain-of-Custody: A chain-of-custody record for each set of samples will be maintained throughout all sampling activities and will accompany samples and shipment to the laboratory. Information tracked by the chain-of-custody records in the laboratory includes sample identification number, date and time of sample receipt, analytical parameters required, location and conditions of storage, date and time of removal from and return to storage, signature of person removing and returning the sample, reason for removing from storage, and final disposition of the sample.

1.1.3 Limits of Detection: All reasonable means, including additional cleanup steps and method modifications, will be used to meet target levels tabled below. Detection of analytes between PQL and MDL should be "J" flagged and reported as an estimate. All other analytes should meet detection levels listed in Table 8.2 of the DMEF (See Appendix).

Table 1 Detection Limits for PCB Analysis

Practical Quantitation Limits/ Reporting Limits - Method Detection Limits			
PCBs Method: SW8082 PCB's by GC Low Reporting Level Preparation Method: SW3550			
Analyte	CAS	PQL (mg/kg)	MDL (mg/kg)
Aroclor 1016	12674-11-2	0.01	0.0012
Aroclor 1221	11104-28-2	0.01	0.00176
Aroclor 1232	11141-16-5	0.01	0.00156
Aroclor 1242	53469-21-9	0.01	0.0031
Aroclor 1248	12672-29-6	0.01	0.00101
Aroclor 1254	11097-69-1	0.01	0.0015
Aroclor 1260	11096-82-5	0.01	0.00305

1.1.4 Sediment Chemistry: Private analytical laboratories will conduct all chemical analyses. Chemical analyses will include: metals (6020 & 7471 series), total organic carbon (TOC) method 9060, PCBs by 8082.

1.1.5 Sediment Conventionals: The private analytical laboratories will analyze physical parameters. Particle grain size distribution for each sample will be determined. Sieve analysis will use a geological sieve series, which will include the sieve sizes U.S. NO. 5, 10, 18, 35, 60, 120, and 230. Hydrogen peroxide will not be used in preparations for grain-size analysis. Hydrometer analysis will not be run on particle sizes finer than the 230 mesh.

1.1.6 Holding Times: To the maximum extent practicable all chemical results will be provided within 7-14 days (10 business days) of receipt. All samples for physical and chemical testing will be maintained at the testing laboratory at the temperatures specified in Table 1 and analyzed within the holding times shown in the table.

1.1.7 Quality Assurance/Quality Control: The chemistry QA/QC procedures found in Table 3 will be followed.

1.2 Laboratory Written Report: The analytical laboratory documenting all the activities associated with sample analyses will prepare a written report. As a minimum, the following will be included in the report:

- Results of the laboratory analyses and QA/QC results.
- All protocols used during analyses.
- Chain of custody procedures, including explanation of any deviation from those identified herein.
- Any protocol deviations from the approved sampling plan.
- Location and availability of data.
- As appropriate, this sampling plan may be referenced in describing protocols.

Table 2, Minimum Laboratory QA/QC

Analytical Type	Method Blank[2]	Duplicate[2]	RM[2,4]	Matrix Spikes[2]	Surrogates[7]
PCBs[1]	X	X[3]	X[5]	X	X
Metals	X	X	X[6]	X	
Total Organic Carbon	X	X	X[6]		
Total Solids		X			
Total Volatile Solids		X			
Particle Size		X			

1. Initial calibration required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria. Ongoing calibration required at the beginning of each work shift, every 10-12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.
2. Frequency of Analysis = one per batch
3. Matrix spike duplicate will be run
4. Reference Material
5. Canadian standard SRM-1
6. NIST certified reference material 2704
7. Surrogate spikes will be included with every sample, including matrix-spiked samples, blanks and reference materials

2.0 BIOLOGICAL TESTING

2.1 Bioassays and Bioaccumulation are not planned for this sampling event, unless further characterization is required beyond the Tier IIb level.

3.0 REPORTING

3.1 QA Report: The laboratory QA/QC reports will be incorporated by reference. This report will identify any laboratory activities that deviated from the approved protocols and will make a statement regarding the overall validity of the data collected.

3.2 Sediment Evaluation Report: A written discussion of findings shall be prepared documenting the physical, chemical and biological (if necessary) character of potential material to be dredged. The physical and chemical reports will be included as reference; individual copies will be furnished as requested. As a minimum, the following will be included in the

- Previous sampling and analyses.
- Locations where the sediment samples were collected.
- A plan view of the project showing the actual sampling location.
- Description of sampling.
- Chemical testing data, with comparisons to screening levels guidelines.

APPENDIX A

PARAMETERS AND METHODS

1. Recommended Sample Preparation Methods, Cleanup Methods, Analytical Methods and Detection Limits for Sediment Management Standards, Chapter 173-204 WAC, Draft - July 1996.

2. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound, Puget Sound Estuary Program, March 1986.

3. Recommended Methods for Measuring TOC in Sediments, Kathryn Bragdon-Cook, Clarification Paper, Puget Sound Dredged Disposal Analysis Annual Review, May, 1993.

4. Units: ug = microgram, mg = milligram, kg = kilogram, dw = dry weight, oc = organic carbon.

5. Test Methods for Evaluating Solid Waste. Laboratory manual physical/chemical methods. Method 3050, SW-846, 3rd ed., Vol. 1A, Chapter 3, Sec 3.2, Rev 1. Office of Solid Waste and Emergency Response, Washington, DC.

6. Graphite Furnace Atomic Absorption (GFAA) Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

7. Inductively Coupled Plasma (ICP) Emission Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

8. Test Methods for Evaluating Solid Waste. Laboratory manual physical/chemical methods. Method 7471, SW-846, 3rd ed., Vol. 1A, Chapter 3, Sec 3.3. Office of Solid Waste and Emergency Response, Washington, DC.

9. Sonication Extraction of Sample Solids - Method 3550 (Modified), SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986. Method is modified to add matrix spikes before the dehydration step rather than after the dehydration step.

10. GCMS Capillary Column - Method 8270, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

11. Purge and Trap Extraction and GCMS Analysis - Method 8260, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

12. Soxhlet Extraction and Method 8081, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.

13. Total PCBs BT value in mg/kg oc.

QA2 DATA REQUIREMENTS

CHEMICAL VARIABLES

ORGANIC COMPOUNDS

The following documentation is needed for organic compounds:

A cover letter referencing or describing the procedure used and discussing any analytical problems

Reconstructed ion chromatograms for GC/MS analyses for each sample

Mass spectra of detected target compounds (GC/MS) for each sample and associated library spectra

GC/ECD and/or GC/flame ionization detection chromatograms for each sample

Raw data quantification reports for each sample

A calibration data summary reporting calibration range used [and decafluorotriphenylphosphine (DFTPP) and bromofluorobenzene (BFB) spectra and quantification report for GC/MS analyses]

Final dilution volumes, sample size, wet-to-dry ratios, and instrument detection limit

Analyte concentrations with reporting units identified (to two significant figures unless otherwise justified)

Quantification of all analytes in method blanks (ng/sample)

Method blanks associated with each sample

Recovery assessments and a replicate sample summary (laboratories should report all surrogate spike recovery data for each sample; a statement of the range of recoveries should be included in reports using these data)

Data qualification codes and their definitions.

METALS

For metals, the data report package for analyses of each sample should include the following:

Tabulated results in units as specified for each matrix in the analytical protocols, validated and signed in original by the laboratory manager

Any data qualifications and explanation for any variance from the analytical protocols

Results for all of the QA/QC checks initiated by the laboratory

Tabulation of instrument and method detection limits.

All contract laboratories are required to submit metals results that are supported by sufficient backup data and quality assurance results to enable independent QA reviewers to conclusively determine the quality of the data. The laboratories should be able to supply legible photocopies of original data sheets with sufficient information to unequivocally identify:

Calibration results

Calibration and preparation blanks

Samples and dilutions

Duplicates and spikes

Any anomalies in instrument performance or unusual instrumental adjustment

TABLE 6

TESTING METHODS
(Testing Parameter, Preparation Method, Analytical Method, Sediment Method Detection Limit (MDL)

PARAMETER	PREP METHOD (recommended)	ANALYSIS METHOD (recommended)	SEDIMENT MDL (1)
CONVENTIONALS:			
Total Solids (%)	---	Pg.17 (2)	0.1
Total Volatile Solids (%)	---	Pg.20 (2)	0.1
Total Organic Carbon (%)	---	Pg.23 (2, 3)	0.1
Total Sulfides (mg/kg)	---	Pg.32 (2)	1
Ammonia (mg/kg)	---	Plumb 1981 (4)	1
Grain Size	---	Modified ASTM with Hydrometer	---
METALS mg/kg (ppm):			
Antimony	APNDX D (5)	GFAA (6)	2.5
Arsenic	APNDX D (5)	GFAA (6)	2.5
Cadmium	APNDX D (5)	GFAA (6)	0.3
Chromium	APNDX D (5)	GFAA (6)	0.3
Copper	APNDX D (5)	ICP (7)	15.0
Lead	APNDX D (5)	ICP (7)	0.5
Mercury	MER (8)	7471 (8)	0.02
Nickel	APNDX D (5)	ICP (7)	2.5
Silver	APNDX D (5)	GFAA (6)	0.2
Zinc	APNDX D (5)	ICP (7)	15.0
ORGANOMETALLIC COMPOUNDS (ug/L):			
Tributyltin (interstitial water)	NMFS	Krone	0.01

TABLE 8-2 (CONTINUED)

ORGANICS ug/kg (ppb):			
LPAH			
Naphthalene	3550 (9)	8270 (10)	20
Acenaphthylene	3550 (9)	8270 (10)	20
Acenaphthene	3550 (9)	8270 (10)	20
Fluorene	3550 (9)	8270 (10)	20
Phenanthrene	3550 (9)	8270 (10)	20
Anthracene	3550 (9)	8270 (10)	20
2-Methylnaphthalene	3550 (9)	8270 (10)	20
Total LPAH			
HPAH			
Fluoranthene	3550 (9)	8270 (10)	20
Pyrene	3550 (9)	8270 (10)	20
Benzo(a)anthracene	3550 (9)	8270 (10)	20
Chrysene	3550 (9)	8270 (10)	20
Benzofluoranthenes	3550 (9)	8270 (10)	20
Benzo(a)pyrene	3550 (9)	8270 (10)	20
Indeno(1,2,3-c,d)pyrene	3550 (9)	8270 (10)	20
Dibenzo(a,h)anthracene	3550 (9)	8270 (10)	20
Benzo(g,h,i)perylene	3550 (9)	8270 (10)	20
Total HPAH			
CHLORINATED HYDROCARBONS			
1,3-Dichlorobenzene	P&T (12)	8260 (11)	3.2
1,4-Dichlorobenzene	P&T (12)	8260 (11)	3.2
1,2-Dichlorobenzene	P&T (12)	8260 (11)	3.2
1,2,4-Trichlorobenzene	3550 (9)	8270 (10)	6
Hexachlorobenzene (HCB)	3550 (9)	8270 (10)	12

TABLE 8-2 (CONTINUED)

PHTHALATES		ug/kg	
Dimethyl phthalate	3550 (9)	8270 (10)	20
Diethyl phthalate	3550 (9)	8270 (10)	20
Di-n-butyl phthalate	3550 (9)	8270 (10)	20
Butyl benzyl phthalate	3550 (9)	8270 (10)	20
Bis(2-ethylhexyl)phthalate	3550 (9)	8270 (10)	20
Di-n-octyl phthalate	3550 (9)	8270 (10)	20
PHENOLS			
Phenol	3550 (9)	8270 (10)	20
2 Methylphenol	3550 (9)	8270 (10)	6
4 Methylphenol	3550 (9)	8270 (10)	20
2,4-Dimethylphenol	3550 (9)	8270 (10)	6
Pentachlorophenol	3550 (9)	8270 (10)	61
MISCELLANEOUS EXTRACTABLES			
Benzyl alcohol	3550 (9)	8270 (10)	6
Benzoic acid	3550 (9)	8270 (10)	100
Dibenzofuran	3550 (9)	8270 (10)	20
Hexachloroethane	3550 (9)	8270 (10)	20
Hexachlorobutadiene	3550 (9)	8270 (10)	20
N-Nitrosodiphenylamine	3550 (9)	8270 (10)	12
PESTICIDES			
Total DDT	---	---	---
p,p'-DDE	3540 (13)	8081 (13)	2.3
p,p'-DDD	3540 (13)	8081 (13)	3.3
p,p'-DDT	3540 (13)	8081 (13)	6.7
Aldrin	3540 (13)	8081 (13)	1.7
Chlordane	3540 (13)	8081 (13)	1.7
Dieldrin	3540 (13)	8081 (13)	2.3
Heptachlor	3540 (13)	8081 (13)	1.7
Lindane	3540 (13)	8081 (13)	1.7

* Total PCBs BT value in ppm carbon-normalized.

1. Dry Weight Basis.
2. Recommended Protocols for Measuring Conventional Sediment Variables in Puget Sound, Puget Sound Estuary Program, 1997.
3. Recommended Methods for Measuring TOC in Sediments, Kathryn Bragdon-Cook, Clarification Paper, Puget Sound Dredged Disposal Analysis Annual Review, May 1993.
4. Procedures For Handling and Chemical Analysis of Sediment and Water Samples, Russell H. Plumb, Jr., EPA/Corps of Engineers, May 1981.
5. Recommended Protocols for Measuring Metals in Puget Sound Water, Sediment and Tissue Samples, Puget Sound Estuary Program, 1997.
6. Graphite Furnace Atomic Absorption (GFAA) Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
7. Inductively Coupled Plasma (ICP) Emission Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
8. Mercury Digestion and Cold Vapor Atomic Absorption (CVAA) Spectrometry - Method 7471, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
9. Sonication Extraction of Sample Solids - Method 3550 (Modified), SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986. Method is modified to add matrix spikes before the dehydration step rather than after the dehydration step.
10. GCMS Capillary Column - Method 8270, SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
11. GCMS Analysis - Method 8260, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
12. Purge and Trap Extraction and GCMS Analysis - Method 8260, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1986.
13. Soxhlet Extraction and Method 8080, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, EPA 1997.

Figure 1 Proposed Sampling Sites for Bonneville Forebay (Symbol ⊕)

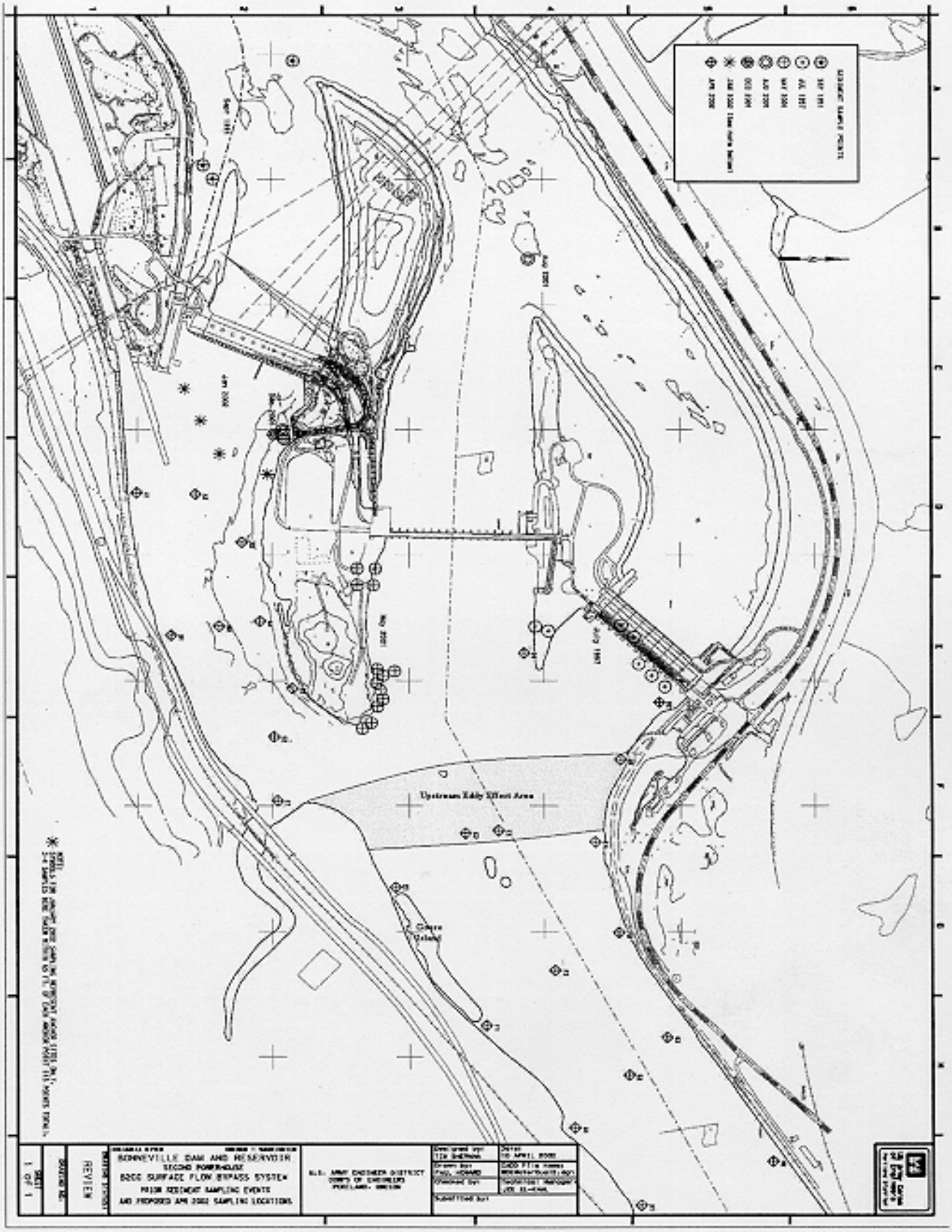


Table 1

Coordinates of Sampling Stations
Bonneville Forebay and Upstream Areas
Event of September 18, 2002

01 BF-BC-01 45° 38' 16.7" 121° 56' 31.5" Water depth 26.5' Two (2) attempts at this location Retrieved a trace of medium-grained sand – not enough for analysis.	**05** BF-BC-05 45° 38' 22.3" 121° 56' 21.9" Water depth 48.3' Two (2) attempts at this location Retrieved one large cobble. No sample submitted.	**09** BF-BC-09 45° 38' 26.6" 121° 56' 59.0" Water depth 4.6' Two (2) attempts at this location Retrieved cobbles and gravel. No sample submitted.	**13** BF-BC-13 45° 38' 42.0" 121° 55' 51.2 " Water depth 41.2' Three (3) attempts at this location Nothing retrieved, rocky area No sample submitted.
02 BF-BC-02 45° 38' 20.1" 121° 56' 31.4" Water depth 54.6' Two (2) attempts at this location Retrieved a trace of medium-grained sand – not enough for analysis.	**06** BF-BC-06 45° 38' 19.4" 121° 56' 14.0" Water depth 40.3' Two (2) attempts at this location Retrieved a trace of medium-grained sand – no analysis. Submitted *Corbicula* (19 grams).	**10** BF-BC-10 45° 38' 45.1" 121° 56' 12.4" Water depth 31.4' Two (2) attempts at this location Retrieved large cobbles. No sample submitted.	**14** BF-BC-14 45° 38' 35.9" 121° 55' 47.2" Water depth 20.5' 8" penetration Medium grained silty sand. Submitted: physical, chemical & *Corbicula* (116 grams).
03 BF-BC-03 45° 38' 23.8" 121° 56' 27.2" Water depth 38.3' 6" penetration silty sand Submitted: physical, chemical & *Corbicula* (112 grams).	**07** BF-BC-07 45° 38' 27.9" 121° 56' 10.0" Water depth 22.3' 2-3" penetration Four (4) attempts at this location medium-grained sand w/silt Submitted: physical, chemical & *Corbicula* (280 grams).	**11** BF-BC-11 45° 38' 53.4" 121° 56' 07.6" Water depth 36.6' One (1) attempt at this location Rocky area No sample submitted.	**15** BF-BC-15 45° 38' 39.3" 121° 55' 40.0" Water depth 21.7' 15" penetration Sandy silt Submitted: physical, chemical & *Corbicula (14grams).*
04 BF-BC-04 45° 38' 26.2" 121° 56' 19.7" Water depth 29.3' 4-5" penetration Med. grained sand w/silt & gravel Submitted: physical, chemical & *Corbicula* (177 grams).	**08** BF-BC-08 45° 38' 25.4" 121° 56' 06.9" Water depth 65.8' One (1) attempt at this location, lots of current, rocky area Retrieved one cobble. No sample submitted.	**12** BF-BC-12 45° 38' 51.4" 121° 56' 01.8" Water depth 26.2' One (1) attempt at this location, lots of current. Rocky area No sample submitted.	**16** BF-BC-16 45° 38' 42.5" 121° 55' 32.5" Water depth 11.8' 2-3" penetration Submitted: physical, chemical & *Corbicula* (5 grams).

Table 1

Coordinates of Sampling Stations
Bonneville Forebay and Upstream Areas
Event of September 18, 2002

17 BF-BC-17 45° 38' 45.9" 121° 55' 28.1" Water depth 30.5' 10" penetration Medium grained silty sand. Submitted: physical, chemical & *Corbicula* (13 grams).	**21** BF-BC-21 45° 38' 52.6" 121° 55' 34.8 " Water depth 69.0' One (1) attempt at this location Nothing retrieved. Rocky area No sample submitted.	**25** BF-BC-25 45° 38' 55.2" 121° 55' 34.1 " Water depth 19.3' One (1) attempt at this location One large cobble retrieved. Rocky area No sample submitted.	
18 BF-BC-18 45° 38' 49.1" 121° 55' 20.6" Water depth 15.8' Four (4) attempts, <1" penetration. Trace of med.-grained sand & gravel. Not enough for analysis. Submitted: *Corbicula* (116 grams).	**22** BF-BC-22 45° 38' 43.5" 121° 55' 43.3" Water depth 36.3' Four (4) attempts at this location Nothing retrieved, rocky area No sample submitted.	**26** BF-BC-26 45° 38' 58.9" 121° 55' 25.8" Water depth 28.9' <1" penetration Seven (7) attempts in this general area – combined all material retrieved Medium grained silty sand. Submitted: physical, chemical & *Corbicula* (378 grams).	
19 BF-BC-19 45° 38' 55.5" 121° 55' 07.2" Water depth 39.2' Three (3) attempts at this location Nothing retrieved. Rocky area No sample submitted.	**23** BF-BC-23 45° 38' 50.8" 121° 55' 44.6" Water depth 45.7' One (1) attempt at this location Nothing retrieved. Rocky area No sample submitted.	**27** BF-BC-27 45° 39' 09.8" 121° 55' 00.9" Water depth 21.7' Four (4) attempts at this location Nothing retrieved. Rocky area No sample submitted.	
20 BF-BC-20 45° 38' 58.9" 121° 55' 13.9" Water depth >100' Unable to sample not enough cable on sampler. No sample Submitted.	**24** BF-BC-24 45° 38' 53.4" 121° 55' 37.8" Water depth 46.5' Two (2) attempts at this location Nothing retrieved. Rocky area No sample submitted.		

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-03	sample	64.73	SW6010	Aluminum	11400	26.9	2.43		mg/kg
BF-BC-03	sample	64.73	SW6010	Calcium	7150	269	1.81	B2	mg/kg
BF-BC-03	sample	64.73	SW6010	Iron	23800	26.9	0.216	B2	mg/kg
BF-BC-03	sample	64.73	SW6010	Magnesium	5960	269	2.94		mg/kg
BF-BC-03	sample	64.73	SW6010	Potassium	1000	269	24.2		mg/kg
BF-BC-03	sample	64.73	SW6010	Sodium	345	269	46		mg/kg
BF-BC-07	sample	67.17	SW6010	Aluminum	9870	28.8	2.59		mg/kg
BF-BC-07	sample	67.17	SW6010	Calcium	5560	288	1.93	B2	mg/kg
BF-BC-07	sample	67.17	SW6010	Iron	20700	28.8	0.231	B2	mg/kg
BF-BC-07	sample	67.17	SW6010	Magnesium	5100	288	3.14		mg/kg
BF-BC-07	sample	67.17	SW6010	Potassium	845	288	25.9		mg/kg
BF-BC-07	sample	67.17	SW6010	Sodium	263	288	49.2	J	mg/kg
BF-BC-17	sample	49.73	SW6010	Aluminum	11900	37.8	3.4		mg/kg
BF-BC-17	sample	49.73	SW6010	Calcium	5510	378	2.53	B2	mg/kg
BF-BC-17	sample	49.73	SW6010	Iron	26100	37.8	0.303	B2	mg/kg
BF-BC-17	sample	49.73	SW6010	Magnesium	5170	378	4.12		mg/kg
BF-BC-17	sample	49.73	SW6010	Potassium	1550	378	34		mg/kg
BF-BC-17	sample	49.73	SW6010	Sodium	366	378	64.6	J	mg/kg
BF-BC-26	sample	78.58	SW6010	Aluminum	9500	24	2.16		mg/kg
BF-BC-26	sample	78.58	SW6010	Calcium	6500	240	1.61	B2	mg/kg
BF-BC-26	sample	78.58	SW6010	Iron	25200	24	0.192	B2	mg/kg
BF-BC-26	sample	78.58	SW6010	Magnesium	6980	240	2.62		mg/kg
BF-BC-26	sample	78.58	SW6010	Potassium	878	240	21.6		mg/kg
BF-BC-26	sample	78.58	SW6010	Sodium	275	240	41		mg/kg
BF-BC-A	sample	59.33	SW6010	Aluminum	8970	29.5	2.66		mg/kg
BF-BC-A	sample	59.33	SW6010	Calcium	5840	295	1.98	B2	mg/kg
BF-BC-A	sample	59.33	SW6010	Iron	19600	29.5	0.236	B2	mg/kg
BF-BC-A	sample	59.33	SW6010	Magnesium	4550	295	3.22		mg/kg
BF-BC-A	sample	59.33	SW6010	Potassium	675	295	26.6		mg/kg
BF-BC-A	sample	59.33	SW6010	Sodium	224	295	50.5	J	mg/kg
BF-BC-03	dup	64.73	SW6010	Aluminum	12500	26.9	2.42		mg/kg
BF-BC-03	dup	64.73	SW6010	Calcium	7280	269	1.8	B2	mg/kg
BF-BC-03	dup	64.73	SW6010	Iron	28200	26.9	0.215	B2	mg/kg
BF-BC-03	dup	64.73	SW6010	Magnesium	6530	269	2.93		mg/kg
BF-BC-03	dup	64.73	SW6010	Potassium	1130	269	24.1		mg/kg
BF-BC-03	dup	64.73	SW6010	Sodium	316	269	45.9		mg/kg
BF-BC-03	ms	64.73	SW6010	Aluminum	12600	26.9	2.42		mg/kg
BF-BC-03	ms	64.73	SW6010	Calcium	14000	269	1.8	B2	mg/kg
BF-BC-03	ms	64.73	SW6010	Iron	30700	26.9	0.215	B2	mg/kg
BF-BC-03	ms	64.73	SW6010	Magnesium	12000	269	2.93		mg/kg
BF-BC-03	ms	64.73	SW6010	Potassium	6210	269	24.1		mg/kg
BF-BC-03	ms	64.73	SW6010	Sodium	5720	269	45.9		mg/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-03	sample	64.73	SW6010	Aluminum	11400	26.9			mg/kg
BF-BC-03	sample	64.73	SW6010	Barium	146	1.35			mg/kg
BF-BC-03	sample	64.73	SW6010	Calcium	7150	269			mg/kg
BF-BC-03	sample	64.73	SW6010	Chromium	20.4	2.69			mg/kg
BF-BC-03	sample	64.73	SW6010	Copper	38	2.69			mg/kg
BF-BC-03	sample	64.73	SW6010	Iron	23800	26.9			mg/kg
BF-BC-03	sample	64.73	SW6010	Magnesium	5960	269			mg/kg
BF-BC-03	sample	64.73	SW6010	Manganese	528	2.69			mg/kg
BF-BC-03	sample	64.73	SW6010	Potassium	1000	269			mg/kg
BF-BC-03	sample	64.73	SW6010	Sodium	345	269			mg/kg
BF-BC-03	dup	64.73	SW6010	Aluminum	12500	26.9			mg/kg
BF-BC-03	dup	64.73	SW6010	Barium	159	1.34			mg/kg
BF-BC-03	dup	64.73	SW6010	Calcium	7280	269			mg/kg
BF-BC-03	dup	64.73	SW6010	Chromium	23	2.69			mg/kg
BF-BC-03	dup	64.73	SW6010	Copper	36.1	2.69			mg/kg
BF-BC-03	dup	64.73	SW6010	Iron	28200	26.9			mg/kg
BF-BC-03	dup	64.73	SW6010	Magnesium	6530	269			mg/kg
BF-BC-03	dup	64.73	SW6010	Manganese	526	2.69			mg/kg
BF-BC-03	dup	64.73	SW6010	Potassium	1130	269			mg/kg
BF-BC-03	dup	64.73	SW6010	Sodium	316	269			mg/kg
BF-BC-03	ms	64.73	SW6010	Aluminum	12500	26.8			mg/kg
BF-BC-03	ms	64.73	SW6010	Barium	1220	1.34			mg/kg
BF-BC-03	ms	64.73	SW6010	Calcium	14000	268			mg/kg
BF-BC-03	ms	64.73	SW6010	Chromium	135	2.68			mg/kg
BF-BC-03	ms	64.73	SW6010	Copper	155	2.68			mg/kg
BF-BC-03	ms	64.73	SW6010	Iron	30700	26.8			mg/kg
BF-BC-03	ms	64.73	SW6010	Magnesium	12000	268			mg/kg
BF-BC-03	ms	64.73	SW6010	Manganese	860	2.68			mg/kg
BF-BC-03	ms	64.73	SW6010	Potassium	6200	268			mg/kg
BF-BC-03	ms	64.73	SW6010	Sodium	5720	268			mg/kg
BF-BC-03	sample	64.73	SW6020	Arsenic	4.57	1.35	0.146		mg/kg
BF-BC-03	sample	64.73	SW6020	Antimony	0.407	4.04	0.0302	J	mg/kg
BF-BC-03	sample	64.73	SW6020	Barium	152	1.35	0.00728	B2	mg/kg
BF-BC-03	sample	64.73	SW6020	Beryllium	0.396	0.674	0.0191	J	mg/kg
BF-BC-03	sample	64.73	SW6020	Cadmium	0.207	0.674	0.00957	J	mg/kg
BF-BC-03	sample	64.73	SW6020	Chromium	20.3	1.35	0.0477		mg/kg
BF-BC-03	sample	64.73	SW6020	Cobalt	11.6	0.674	0.00525		mg/kg
BF-BC-03	sample	64.73	SW6020	Copper	37.2	1.35	0.0194		mg/kg
BF-BC-03	sample	64.73	SW6020	Lead	12	0.674	0.00606	B2	mg/kg
BF-BC-03	sample	64.73	SW6020	Manganese	510	0.674	0.0113	B2	mg/kg
BF-BC-03	sample	64.73	SW6020	Nickel	18.5	1.35	0.0381	B2	mg/kg
BF-BC-03	sample	64.73	SW6020	Selenium	ND	4.04	0.518		mg/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-03	sample	64.73	SW6020	Silver	0.162	0.674	0.00808	J	mg/kg
BF-BC-03	sample	64.73	SW6020	Thallium	0.334	0.674	0.00755	J B2	mg/kg
BF-BC-03	sample	64.73	SW6020	Vanadium	59.9	1.35	0.102		mg/kg
BF-BC-03	sample	64.73	SW6020	Zinc	111	4.04	0.0441		mg/kg
BF-BC-04	sample	63.47	SW6020	Lead	13.1	0.724	0.00652	B2	mg/kg
BF-BC-07	sample	67.17	SW6020	Arsenic	2.42	1.44	0.156		mg/kg
BF-BC-07	sample	67.17	SW6020	Antimony	0.4	4.32	0.0323	J	mg/kg
BF-BC-07	sample	67.17	SW6020	Barium	118	1.44	0.00778	B2	mg/kg
BF-BC-07	sample	67.17	SW6020	Beryllium	0.372	0.72	0.0205	J	mg/kg
BF-BC-07	sample	67.17	SW6020	Cadmium	0.0605	0.72	0.0102	J	mg/kg
BF-BC-07	sample	67.17	SW6020	Chromium	17	1.44	0.051		mg/kg
BF-BC-07	sample	67.17	SW6020	Cobalt	9.87	0.72	0.00562		mg/kg
BF-BC-07	sample	67.17	SW6020	Copper	25.5	1.44	0.0207		mg/kg
BF-BC-07	sample	67.17	SW6020	Lead	8.31	0.72	0.00648	B2	mg/kg
BF-BC-07	sample	67.17	SW6020	Manganese	399	0.72	0.0121	B2	mg/kg
BF-BC-07	sample	67.17	SW6020	Nickel	15.4	1.44	0.0408	B2	mg/kg
BF-BC-07	sample	67.17	SW6020	Selenium	ND	4.32	0.554		mg/kg
BF-BC-07	sample	67.17	SW6020	Silver	0.115	0.72	0.00864	J	mg/kg
BF-BC-07	sample	67.17	SW6020	Thallium	0.187	0.72	0.00807	J B1	mg/kg
BF-BC-07	sample	67.17	SW6020	Vanadium	51.3	1.44	0.109		mg/kg
BF-BC-07	sample	67.17	SW6020	Zinc	84.4	4.32	0.0471		mg/kg
BF-BC-14	sample	70.06	SW6020	Lead	13	0.666	0.006	B2	mg/kg
BF-BC-15	sample	47.92	SW6020	Lead	17	0.918	0.00826	B2	mg/kg
BF-BC-16	sample	49.67	SW6020	Lead	14.9	0.936	0.00842	B2	mg/kg
BF-BC-17	sample	49.73	SW6020	Arsenic	5.51	1.89	0.205		mg/kg
BF-BC-17	sample	49.73	SW6020	Antimony	0.806	5.67	0.0424	J	mg/kg
BF-BC-17	sample	49.73	SW6020	Barium	153	1.89	0.0102	B2	mg/kg
BF-BC-17	sample	49.73	SW6020	Beryllium	0.482	0.945	0.0269	J	mg/kg
BF-BC-17	sample	49.73	SW6020	Cadmium	0.52	0.945	0.0134	J	mg/kg
BF-BC-17	sample	49.73	SW6020	Chromium	21.5	1.89	0.0669		mg/kg
BF-BC-17	sample	49.73	SW6020	Cobalt	12.4	0.945	0.00737		mg/kg
BF-BC-17	sample	49.73	SW6020	Copper	28.3	1.89	0.0272		mg/kg
BF-BC-17	sample	49.73	SW6020	Lead	16.3	0.945	0.00851	B2	mg/kg
BF-BC-17	sample	49.73	SW6020	Manganese	716	0.945	0.0159	B2	mg/kg
BF-BC-17	sample	49.73	SW6020	Nickel	19.1	1.89	0.0535	B2	mg/kg
BF-BC-17	sample	49.73	SW6020	Selenium	ND	5.67	0.727		mg/kg
BF-BC-17	sample	49.73	SW6020	Silver	0.221	0.945	0.0113	J	mg/kg
BF-BC-17	sample	49.73	SW6020	Thallium	0.27	0.945	0.0106	J B1	mg/kg
BF-BC-17	sample	49.73	SW6020	Vanadium	68.9	1.89	0.144		mg/kg
BF-BC-17	sample	49.73	SW6020	Zinc	147	5.67	0.0618		mg/kg
BF-BC-26	sample	78.58	SW6020	Arsenic	5.77	1.2	0.131		mg/kg
BF-BC-26	sample	78.58	SW6020	Antimony	0.342	3.61	0.0269	J	mg/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-26	sample	78.58	SW6020	Barium	199	1.2	0.00649	B2	mg/kg
BF-BC-26	sample	78.58	SW6020	Beryllium	0.373	0.601	0.0171	J	mg/kg
BF-BC-26	sample	78.58	SW6020	Cadmium	0.0649	0.601	0.00853	J	mg/kg
BF-BC-26	sample	78.58	SW6020	Chromium	15.7	1.2	0.0425		mg/kg
BF-BC-26	sample	78.58	SW6020	Cobalt	14.5	0.601	0.00469		mg/kg
BF-BC-26	sample	78.58	SW6020	Copper	33.7	1.2	0.0173		mg/kg
BF-BC-26	sample	78.58	SW6020	Lead	8.85	0.601	0.00541	B2	mg/kg
BF-BC-26	sample	78.58	SW6020	Manganese	499	0.601	0.0101	B2	mg/kg
BF-BC-26	sample	78.58	SW6020	Nickel	18.7	1.2	0.034	B2	mg/kg
BF-BC-26	sample	78.58	SW6020	Selenium	ND	3.61	0.462		mg/kg
BF-BC-26	sample	78.58	SW6020	Silver	0.109	0.601	0.00721	J	mg/kg
BF-BC-26	sample	78.58	SW6020	Thallium	0.22	0.601	0.00673	J B1	mg/kg
BF-BC-26	sample	78.58	SW6020	Vanadium	49.2	1.2	0.0913		mg/kg
BF-BC-26	sample	78.58	SW6020	Zinc	103	3.61	0.0393		mg/kg
BF-BC-A	sample	59.33	SW6020	Arsenic	3.14	1.48	0.16		mg/kg
BF-BC-A	sample	59.33	SW6020	Antimony	0.474	4.43	0.0331	J	mg/kg
BF-BC-A	sample	59.33	SW6020	Barium	124	1.48	0.00798	B2	mg/kg
BF-BC-A	sample	59.33	SW6020	Beryllium	0.266	0.738	0.021	J	mg/kg
BF-BC-A	sample	59.33	SW6020	Cadmium	0.0945	0.738	0.0105	J	mg/kg
BF-BC-A	sample	59.33	SW6020	Chromium	17	1.48	0.0523		mg/kg
BF-BC-A	sample	59.33	SW6020	Cobalt	11.1	0.738	0.00576		mg/kg
BF-BC-A	sample	59.33	SW6020	Copper	24.9	1.48	0.0213		mg/kg
BF-BC-A	sample	59.33	SW6020	Lead	8.69	0.738	0.00665	B2	mg/kg
BF-BC-A	sample	59.33	SW6020	Manganese	343	0.738	0.0124	B2	mg/kg
BF-BC-A	sample	59.33	SW6020	Nickel	16.9	1.48	0.0418	B2	mg/kg
BF-BC-A	sample	59.33	SW6020	Selenium	ND	4.43	0.568		mg/kg
BF-BC-A	sample	59.33	SW6020	Silver	0.162	0.738	0.00886	J	mg/kg
BF-BC-A	sample	59.33	SW6020	Thallium	0.185	0.738	0.00827	J B1	mg/kg
BF-BC-A	sample	59.33	SW6020	Vanadium	58.8	1.48	0.112		mg/kg
BF-BC-A	sample	59.33	SW6020	Zinc	89.8	4.43	0.0483		mg/kg
BF-BC-03	dup	64.73	SW6020	Arsenic	5.2	1.52	0.165		mg/kg
BF-BC-03	dup	64.73	SW6020	Antimony	0.507	4.57	0.0341	J	mg/kg
BF-BC-03	dup	64.73	SW6020	Barium	179	1.52	0.00822	B2	mg/kg
BF-BC-03	dup	64.73	SW6020	Beryllium	0.409	0.761	0.0216	J	mg/kg
BF-BC-03	dup	64.73	SW6020	Cadmium	0.236	0.761	0.0108	J	mg/kg
BF-BC-03	dup	64.73	SW6020	Chromium	23.8	1.52	0.0539		mg/kg
BF-BC-03	dup	64.73	SW6020	Cobalt	14.1	0.761	0.00594		mg/kg
BF-BC-03	dup	64.73	SW6020	Copper	41.8	1.52	0.0219		mg/kg
BF-BC-03	dup	64.73	SW6020	Lead	14.1	0.761	0.00685	B2	mg/kg
BF-BC-03	dup	64.73	SW6020	Manganese	600	0.761	0.0128	B2	mg/kg
BF-BC-03	dup	64.73	SW6020	Nickel	21.8	1.52	0.0431	B2	mg/kg
BF-BC-03	dup	64.73	SW6020	Selenium	ND	4.57	0.585		mg/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-03	dup	64.73	SW6020	Silver	0.215	0.761	0.00913	J	mg/kg
BF-BC-03	dup	64.73	SW6020	Thallium	0.406	0.761	0.00852	J B2	mg/kg
BF-BC-03	dup	64.73	SW6020	Vanadium	71.3	1.52	0.116		mg/kg
BF-BC-03	dup	64.73	SW6020	Zinc	131	4.57	0.0498		mg/kg
BF-BC-03	ms	64.73	SW6020	Arsenic	1150	5.8	0.63		mg/kg
BF-BC-03	ms	64.73	SW6020	Antimony	855	17.4	0.13		mg/kg
BF-BC-03	ms	64.73	SW6020	Barium	1310	5.8	0.0313	B2	mg/kg
BF-BC-03	ms	64.73	SW6020	Beryllium	28.1	2.9	0.0824		mg/kg
BF-BC-03	ms	64.73	SW6020	Cadmium	29.6	2.9	0.0412		mg/kg
BF-BC-03	ms	64.73	SW6020	Chromium	133	5.8	0.205		mg/kg
BF-BC-03	ms	64.73	SW6020	Cobalt	304	2.9	0.0226		mg/kg
BF-BC-03	ms	64.73	SW6020	Copper	170	5.8	0.0835		mg/kg
BF-BC-03	ms	64.73	SW6020	Lead	320	2.9	0.0261	B2	mg/kg
BF-BC-03	ms	64.73	SW6020	Manganese	742	2.9	0.0487	B2	mg/kg
BF-BC-03	ms	64.73	SW6020	Nickel	305	5.8	0.164	B2	mg/kg
BF-BC-03	ms	64.73	SW6020	Selenium	1130	17.4	2.23		mg/kg
BF-BC-03	ms	64.73	SW6020	Silver	182	2.9	0.0348		mg/kg
BF-BC-03	ms	64.73	SW6020	Thallium	1130	2.9	0.0325	B2	mg/kg
BF-BC-03	ms	64.73	SW6020	Vanadium	349	5.8	0.441		mg/kg
BF-BC-03	ms	64.73	SW6020	Zinc	428	17.4	0.19		mg/kg
BF-BC-03	sample	64.73	SW7471	Mercury	0.0674	0.0289	0.019		mg/kg
BF-BC-04	sample	63.47	SW7471	Mercury	0.136	0.0269	0.0176		mg/kg
BF-BC-07	sample	67.17	SW7471	Mercury	0.0451	0.0288	0.0189		mg/kg
BF-BC-14	sample	70.06	SW7471	Mercury	0.0739	0.0273	0.018		mg/kg
BF-BC-15	sample	47.92	SW7471	Mercury	0.197	0.0337	0.0222		mg/kg
BF-BC-16	sample	49.67	SW7471	Mercury	0.117	0.0331	0.0218		mg/kg
BF-BC-17	sample	49.73	SW7471	Mercury	0.188	0.0373	0.0245		mg/kg
BF-BC-26	sample	78.58	SW7471	Mercury	0.0498	0.0214	0.0141		mg/kg
BF-BC-A	sample	59.33	SW7471	Mercury	0.0329	0.0286	0.0188		mg/kg
BF-BC-14	dup	70.06	SW7471	Mercury	0.0659	0.0275	0.0181		mg/kg
BF-BC-14	ms	70.06	SW7471	Mercury	0.309	0.0279	0.0183		mg/kg
BF-BC-03	sample	64.73	SW8082	Tetrachloro-m-xylene	90.2				%
BF-BC-03	sample	64.73	SW8082	Decachlorobiphenyl	87.5				%
BF-BC-03	sample	64.73	SW8082	Aroclor 1016	ND	0.0306	0.00337		mg/kg
BF-BC-03	sample	64.73	SW8082	Aroclor 1221	ND	0.0306	0.0144		mg/kg
BF-BC-03	sample	64.73	SW8082	Aroclor 1232	ND	0.0306	0.0115		mg/kg
BF-BC-03	sample	64.73	SW8082	Aroclor 1242	ND	0.0306	0.00616		mg/kg
BF-BC-03	sample	64.73	SW8082	Aroclor 1248	ND	0.0306	0.0153		mg/kg
BF-BC-03	sample	64.73	SW8082	Aroclor 1254	ND	0.0306	0.00478		mg/kg
BF-BC-03	sample	64.73	SW8082	Aroclor 1260	ND	0.0306	0.00478		mg/kg
BF-BC-04	sample	63.47	SW8082	Tetrachloro-m-xylene	89.4				%
BF-BC-04	sample	63.47	SW8082	Decachlorobiphenyl	88.8				%

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-04	sample	63.47	SW8082	Aroclor 1016	ND	0.0312	0.00343		mg/kg
BF-BC-04	sample	63.47	SW8082	Aroclor 1221	ND	0.0312	0.0147		mg/kg
BF-BC-04	sample	63.47	SW8082	Aroclor 1232	ND	0.0312	0.0117		mg/kg
BF-BC-04	sample	63.47	SW8082	Aroclor 1242	ND	0.0312	0.00627		mg/kg
BF-BC-04	sample	63.47	SW8082	Aroclor 1248	ND	0.0312	0.0156		mg/kg
BF-BC-04	sample	63.47	SW8082	Aroclor 1254	ND	0.0312	0.00487		mg/kg
BF-BC-04	sample	63.47	SW8082	Aroclor 1260	ND	0.0312	0.00487		mg/kg
BF-BC-07	sample	67.17	SW8082	Tetrachloro-m-xylene	85.4				%
BF-BC-07	sample	67.17	SW8082	Decachlorobiphenyl	84.4				%
BF-BC-07	sample	67.17	SW8082	Aroclor 1016	ND	0.0284	0.00313		mg/kg
BF-BC-07	sample	67.17	SW8082	Aroclor 1221	ND	0.0284	0.0134		mg/kg
BF-BC-07	sample	67.17	SW8082	Aroclor 1232	ND	0.0284	0.0107		mg/kg
BF-BC-07	sample	67.17	SW8082	Aroclor 1242	ND	0.0284	0.00571		mg/kg
BF-BC-07	sample	67.17	SW8082	Aroclor 1248	ND	0.0284	0.0142		mg/kg
BF-BC-07	sample	67.17	SW8082	Aroclor 1254	0.0192	0.0284	0.00443	J C1	mg/kg
BF-BC-07	sample	67.17	SW8082	Aroclor 1260	ND	0.0284	0.00443		mg/kg
BF-BC-14	sample	70.06	SW8082	Tetrachloro-m-xylene	89				%
BF-BC-14	sample	70.06	SW8082	Decachlorobiphenyl	88				%
BF-BC-14	sample	70.06	SW8082	Aroclor 1016	ND	0.0276	0.00304		mg/kg
BF-BC-14	sample	70.06	SW8082	Aroclor 1221	ND	0.0276	0.013		mg/kg
BF-BC-14	sample	70.06	SW8082	Aroclor 1232	ND	0.0276	0.0104		mg/kg
BF-BC-14	sample	70.06	SW8082	Aroclor 1242	ND	0.0276	0.00555		mg/kg
BF-BC-14	sample	70.06	SW8082	Aroclor 1248	ND	0.0276	0.0138		mg/kg
BF-BC-14	sample	70.06	SW8082	Aroclor 1254	ND	0.0276	0.0043		mg/kg
BF-BC-14	sample	70.06	SW8082	Aroclor 1260	ND	0.0276	0.0043		mg/kg
BF-BC-15	sample	47.92	SW8082	Tetrachloro-m-xylene	89.1				%
BF-BC-15	sample	47.92	SW8082	Decachlorobiphenyl	89				%
BF-BC-15	sample	47.92	SW8082	Aroclor 1016	ND	0.0411	0.00452		mg/kg
BF-BC-15	sample	47.92	SW8082	Aroclor 1221	ND	0.0411	0.0193		mg/kg
BF-BC-15	sample	47.92	SW8082	Aroclor 1232	ND	0.0411	0.0154		mg/kg
BF-BC-15	sample	47.92	SW8082	Aroclor 1242	ND	0.0411	0.00825		mg/kg
BF-BC-15	sample	47.92	SW8082	Aroclor 1248	ND	0.0411	0.0205		mg/kg
BF-BC-15	sample	47.92	SW8082	Aroclor 1254	ND	0.0411	0.00641		mg/kg
BF-BC-15	sample	47.92	SW8082	Aroclor 1260	ND	0.0411	0.00641		mg/kg
BF-BC-16	sample	49.67	SW8082	Tetrachloro-m-xylene	89.6				%
BF-BC-16	sample	49.67	SW8082	Decachlorobiphenyl	90.9				%
BF-BC-16	sample	49.67	SW8082	Aroclor 1016	ND	0.0392	0.00431		mg/kg
BF-BC-16	sample	49.67	SW8082	Aroclor 1221	ND	0.0392	0.0184		mg/kg
BF-BC-16	sample	49.67	SW8082	Aroclor 1232	ND	0.0392	0.0147		mg/kg
BF-BC-16	sample	49.67	SW8082	Aroclor 1242	ND	0.0392	0.00787		mg/kg
BF-BC-16	sample	49.67	SW8082	Aroclor 1248	ND	0.0392	0.0196		mg/kg
BF-BC-16	sample	49.67	SW8082	Aroclor 1254	ND	0.0392	0.00611		mg/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-16	sample	49.67	SW8082	Aroclor 1260	ND	0.0392	0.00611		mg/kg
BF-BC-17	sample	49.73	SW8082	Tetrachloro-m-xylene	90.5				%
BF-BC-17	sample	49.73	SW8082	Decachlorobiphenyl	89.4				%
BF-BC-17	sample	49.73	SW8082	Aroclor 1016	ND	0.0378	0.00416		mg/kg
BF-BC-17	sample	49.73	SW8082	Aroclor 1221	ND	0.0378	0.0178		mg/kg
BF-BC-17	sample	49.73	SW8082	Aroclor 1232	ND	0.0378	0.0142		mg/kg
BF-BC-17	sample	49.73	SW8082	Aroclor 1242	ND	0.0378	0.0076		mg/kg
BF-BC-17	sample	49.73	SW8082	Aroclor 1248	ND	0.0378	0.0189		mg/kg
BF-BC-17	sample	49.73	SW8082	Aroclor 1254	ND	0.0378	0.0059		mg/kg
BF-BC-17	sample	49.73	SW8082	Aroclor 1260	ND	0.0378	0.0059		mg/kg
BF-BC-26	sample	78.58	SW8082	Tetrachloro-m-xylene	91.7				%
BF-BC-26	sample	78.58	SW8082	Decachlorobiphenyl	90.2				%
BF-BC-26	sample	78.58	SW8082	Aroclor 1016	ND	0.0247	0.00272		mg/kg
BF-BC-26	sample	78.58	SW8082	Aroclor 1221	ND	0.0247	0.0116		mg/kg
BF-BC-26	sample	78.58	SW8082	Aroclor 1232	ND	0.0247	0.0093		mg/kg
BF-BC-26	sample	78.58	SW8082	Aroclor 1242	ND	0.0247	0.00497		mg/kg
BF-BC-26	sample	78.58	SW8082	Aroclor 1248	ND	0.0247	0.0124		mg/kg
BF-BC-26	sample	78.58	SW8082	Aroclor 1254	ND	0.0247	0.00386		mg/kg
BF-BC-26	sample	78.58	SW8082	Aroclor 1260	ND	0.0247	0.00386		mg/kg
BF-BC-A	sample	59.33	SW8082	Tetrachloro-m-xylene	92				%
BF-BC-A	sample	59.33	SW8082	Decachlorobiphenyl	90.5				%
BF-BC-A	sample	59.33	SW8082	Aroclor 1016	ND	0.033	0.00363		mg/kg
BF-BC-A	sample	59.33	SW8082	Aroclor 1221	ND	0.033	0.0155		mg/kg
BF-BC-A	sample	59.33	SW8082	Aroclor 1232	ND	0.033	0.0124		mg/kg
BF-BC-A	sample	59.33	SW8082	Aroclor 1242	ND	0.033	0.00663		mg/kg
BF-BC-A	sample	59.33	SW8082	Aroclor 1248	ND	0.033	0.0165		mg/kg
BF-BC-A	sample	59.33	SW8082	Aroclor 1254	ND	0.033	0.00514		mg/kg
BF-BC-A	sample	59.33	SW8082	Aroclor 1260	ND	0.033	0.00514		mg/kg
BF-BC-03	ms	64.73	SW8082	Tetrachloro-m-xylene	91				%
BF-BC-03	ms	64.73	SW8082	Decachlorobiphenyl	92.5				%
BF-BC-03	ms	64.73	SW8082	Aroclor 1260	0.326	0.029	0.00453	C1	mg/kg
BF-BC-03	msd	64.73	SW8082	Tetrachloro-m-xylene	91.3				%
BF-BC-03	msd	64.73	SW8082	Decachlorobiphenyl	90.1				%
BF-BC-03	msd	64.73	SW8082	Aroclor 1260	0.318	0.0284	0.00442	C1	mg/kg
BF-BC-03	sample	64.73	SW8270C	2 - Fluorophenol	90.7				%
BF-BC-03	sample	64.73	SW8270C	Phenol - d5	87.6				%
BF-BC-03	sample	64.73	SW8270C	Nitrobenzene - d5	94.9				%
BF-BC-03	sample	64.73	SW8270C	2 - Fluorobiphenyl	97.5				%
BF-BC-03	sample	64.73	SW8270C	2,4,6 - Tribromophenol	84.8				%
BF-BC-03	sample	64.73	SW8270C	p - Terphenyl - d14	94.8				%
BF-BC-03	sample	64.73	SW8270C	Phenol	11.9	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	1,3-Dichlorobenzene	ND	19.7	9.83	9.83	ug/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-03	sample	64.73	SW8270C	1,4-Dichlorobenzene	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Benzyl Alcohol	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	1,2-Dichlorobenzene	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	2-Methylphenol	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	3-&4-Methylphenol	ND	39.3	19.7	19.7	ug/kg
BF-BC-03	sample	64.73	SW8270C	Hexachloroethane	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	2,4-Dimethylphenol	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Benzoic Acid	ND	98.3	49.1	49.1	ug/kg
BF-BC-03	sample	64.73	SW8270C	1,2,4-Trichlorobenzene	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Naphthalene	ND	4.91	2.46	2.46	ug/kg
BF-BC-03	sample	64.73	SW8270C	Hexachlorobutadiene	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	2-Methylnaphthalene	ND	4.91	2.46	2.46	ug/kg
BF-BC-03	sample	64.73	SW8270C	Dimethylphthalate	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Acenaphthylene	ND	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Acenaphthene	ND	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Dibenzofuran	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Diethylphthalate	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Fluorene	1.38	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	N-Nitrosodiphenylamine	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Hexachlorobenzene	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Pentachlorophenol	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Phenanthrene	ND	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Anthracene	ND	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Di-n-butylphthalate	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Fluoranthene	2.08	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Pyrene	1.77	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Butylbenzylphthalate	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Benzo(a)anthracene	1.12	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Chrysene	1.19	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	bis(2-Ethylhexyl)phthalate	28	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Di-n-octylphthalate	ND	19.7	9.83	9.83	ug/kg
BF-BC-03	sample	64.73	SW8270C	Benzofluoranthenes	3.47	3.93	1.97	1.97	ug/kg
BF-BC-03	sample	64.73	SW8270C	Benzo(a)pyrene	ND	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Indeno(1,2,3-cd)pyrene	ND	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Dibenz(a,h)anthracene	ND	1.97	0.983	0.983	ug/kg
BF-BC-03	sample	64.73	SW8270C	Benzo(g,h,i)perylene	ND	1.97	0.983	0.983	ug/kg
BF-BC-07	sample	67.17	SW8270C	2 - Fluorophenol	93.6				%
BF-BC-07	sample	67.17	SW8270C	Phenol - d5	93.6				%
BF-BC-07	sample	67.17	SW8270C	Nitrobenzene - d5	85.2				%
BF-BC-07	sample	67.17	SW8270C	2 - Fluorobiphenyl	74.7				%
BF-BC-07	sample	67.17	SW8270C	2,4,6 - Tribromophenol	63.4				%
BF-BC-07	sample	67.17	SW8270C	p - Terphenyl - d14	88.2				%

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-07	sample	67.17	SW8270C	Phenol	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	1,3-Dichlorobenzene	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	1,4-Dichlorobenzene	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Benzyl Alcohol	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	1,2-Dichlorobenzene	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	2-Methylphenol	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	3-&4-Methylphenol	ND	35.5	17.7	17.7	ug/kg
BF-BC-07	sample	67.17	SW8270C	Hexachloroethane	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	2,4-Dimethylphenol	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Benzoic Acid	ND	88.7	44.4	44.4	ug/kg
BF-BC-07	sample	67.17	SW8270C	1,2,4-Trichlorobenzene	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Naphthalene	ND	4.44	2.22	2.22	ug/kg
BF-BC-07	sample	67.17	SW8270C	Hexachlorobutadiene	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	2-Methylnaphthalene	ND	4.44	2.22	2.22	ug/kg
BF-BC-07	sample	67.17	SW8270C	Dimethylphthalate	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Acenaphthylene	ND	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Acenaphthene	0.923	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Dibenzofuran	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Diethylphthalate	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Fluorene	ND	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	N-Nitrosodiphenylamine	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Hexachlorobenzene	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Pentachlorophenol	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Phenanthrene	4.57	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Anthracene	1.02	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Di-n-butylphthalate	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Fluoranthene	13.6	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Pyrene	15.4	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Butylbenzylphthalate	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Benzo(a)anthracene	7.99	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Chrysene	9.64	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	bis(2-Ethylhexyl)phthalate	20.2	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Di-n-octylphthalate	ND	17.7	8.87	8.87	ug/kg
BF-BC-07	sample	67.17	SW8270C	Benzofluoranthenes	9.27	3.55	1.77	1.77	ug/kg
BF-BC-07	sample	67.17	SW8270C	Benzo(a)pyrene	5.81	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Indeno(1,2,3-cd)pyrene	4.09	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Dibenz(a,h)anthracene	ND	1.77	0.887	0.887	ug/kg
BF-BC-07	sample	67.17	SW8270C	Benzo(g,h,i)perylene	4.42	1.77	0.887	0.887	ug/kg
BF-BC-17	sample	49.73	SW8270C	2 - Fluorophenol	88.5				%
BF-BC-17	sample	49.73	SW8270C	Phenol - d5	94.9				%
BF-BC-17	sample	49.73	SW8270C	Nitrobenzene - d5	89.9				%
BF-BC-17	sample	49.73	SW8270C	2 - Fluorobiphenyl	76.9				%

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-17	sample	49.73	SW8270C	2,4,6 - Tribromophenol	81.4				%
BF-BC-17	sample	49.73	SW8270C	p - Terphenyl - d14	103				%
BF-BC-17	sample	49.73	SW8270C	Phenol	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	1,3-Dichlorobenzene	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	1,4-Dichlorobenzene	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Benzyl Alcohol	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	1,2-Dichlorobenzene	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	2-Methylphenol	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	3-&4-Methylphenol	ND	48.5	24.2	24.2	ug/kg
BF-BC-17	sample	49.73	SW8270C	Hexachloroethane	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	2,4-Dimethylphenol	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Benzoic Acid	ND	121	60.6	60.6	ug/kg
BF-BC-17	sample	49.73	SW8270C	1,2,4-Trichlorobenzene	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Naphthalene	ND	6.06	3.03	3.03	ug/kg
BF-BC-17	sample	49.73	SW8270C	Hexachlorobutadiene	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	2-Methylnaphthalene	ND	6.06	3.03	3.03	ug/kg
BF-BC-17	sample	49.73	SW8270C	Dimethylphthalate	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Acenaphthylene	ND	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Acenaphthene	ND	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Dibenzofuran	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Diethylphthalate	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Fluorene	1.27	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	N-Nitrosodiphenylamine	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Hexachlorobenzene	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Pentachlorophenol	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Phenanthrene	5.36	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Anthracene	1.23	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Di-n-butylphthalate	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Fluoranthene	13.9	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Pyrene	9.76	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Butylbenzylphthalate	37	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Benzo(a)anthracene	6.82	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Chrysene	8.57	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	bis(2-Ethylhexyl)phthalate	24.2	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Di-n-octylphthalate	ND	24.2	12.1	12.1	ug/kg
BF-BC-17	sample	49.73	SW8270C	Benzofluoranthenes	14.3	4.85	2.42	2.42	ug/kg
BF-BC-17	sample	49.73	SW8270C	Benzo(a)pyrene	7.29	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Indeno(1,2,3-cd)pyrene	4.77	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Dibenz(a,h)anthracene	ND	2.42	1.21	1.21	ug/kg
BF-BC-17	sample	49.73	SW8270C	Benzo(g,h,i)perylene	6.63	2.42	1.21	1.21	ug/kg
BF-BC-26	sample	78.58	SW8270C	2 - Fluorophenol	95.3				%
BF-BC-26	sample	78.58	SW8270C	Phenol - d5	93.6				%

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-26	sample	78.58	SW8270C	Nitrobenzene - d5	87				%
BF-BC-26	sample	78.58	SW8270C	2 - Fluorobiphenyl	70.4				%
BF-BC-26	sample	78.58	SW8270C	2,4,6 - Tribromophenol	77.1				%
BF-BC-26	sample	78.58	SW8270C	p - Terphenyl - d14	89.5				%
BF-BC-26	sample	78.58	SW8270C	Phenol	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	1,3-Dichlorobenzene	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	1,4-Dichlorobenzene	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Benzyl Alcohol	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	1,2-Dichlorobenzene	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	2-Methylphenol	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	3-&4-Methylphenol	ND	30	15	15	ug/kg
BF-BC-26	sample	78.58	SW8270C	Hexachloroethane	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	2,4-Dimethylphenol	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Benzoic Acid	ND	74.9	37.5	37.5	ug/kg
BF-BC-26	sample	78.58	SW8270C	1,2,4-Trichlorobenzene	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Naphthalene	ND	3.75	1.87	1.87	ug/kg
BF-BC-26	sample	78.58	SW8270C	Hexachlorobutadiene	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	2-Methylnaphthalene	ND	3.75	1.87	1.87	ug/kg
BF-BC-26	sample	78.58	SW8270C	Dimethylphthalate	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Acenaphthylene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Acenaphthene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Dibenzofuran	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Diethylphthalate	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Fluorene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	N-Nitrosodiphenylamine	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Hexachlorobenzene	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Pentachlorophenol	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Phenanthrene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Anthracene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Di-n-butylphthalate	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Fluoranthene	1.21	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Pyrene	3.75	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Butylbenzylphthalate	9.9	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Benzo(a)anthracene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Chrysene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	bis(2-Ethylhexyl)phthalate	8.7	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Di-n-octylphthalate	ND	15	7.49	7.49	ug/kg
BF-BC-26	sample	78.58	SW8270C	Benzofluoranthenes	ND	3	1.5	1.5	ug/kg
BF-BC-26	sample	78.58	SW8270C	Benzo(a)pyrene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Indeno(1,2,3-cd)pyrene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Dibenz(a,h)anthracene	ND	1.5	0.749	0.749	ug/kg
BF-BC-26	sample	78.58	SW8270C	Benzo(g,h,i)perylene	ND	1.5	0.749	0.749	ug/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-A	sample	59.33	SW8270C	2 - Fluorophenol	108				%
BF-BC-A	sample	59.33	SW8270C	Phenol - d5	77.9				%
BF-BC-A	sample	59.33	SW8270C	Nitrobenzene - d5	81.2				%
BF-BC-A	sample	59.33	SW8270C	2 - Fluorobiphenyl	75.7				%
BF-BC-A	sample	59.33	SW8270C	2,4,6 - Tribromophenol	75.7				%
BF-BC-A	sample	59.33	SW8270C	p - Terphenyl - d14	105				%
BF-BC-A	sample	59.33	SW8270C	Phenol	71.5	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	1,3-Dichlorobenzene	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	1,4-Dichlorobenzene	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Benzyl Alcohol	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	1,2-Dichlorobenzene	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	2-Methylphenol	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	3-&4-Methylphenol	ND	41.9	20.9	20.9	ug/kg
BF-BC-A	sample	59.33	SW8270C	Hexachloroethane	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	2,4-Dimethylphenol	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Benzoic Acid	64.9	105	52.4	52.4	ug/kg
BF-BC-A	sample	59.33	SW8270C	1,2,4-Trichlorobenzene	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Naphthalene	ND	5.24	2.62	2.62	ug/kg
BF-BC-A	sample	59.33	SW8270C	Hexachlorobutadiene	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	2-Methylnaphthalene	ND	5.24	2.62	2.62	ug/kg
BF-BC-A	sample	59.33	SW8270C	Dimethylphthalate	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Acenaphthylene	ND	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Acenaphthene	ND	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Dibenzofuran	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Diethylphthalate	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Fluorene	1.35	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	N-Nitrosodiphenylamine	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Hexachlorobenzene	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Pentachlorophenol	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Phenanthrene	1.6	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Anthracene	ND	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Di-n-butylphthalate	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Fluoranthene	6.48	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Pyrene	4.08	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Butylbenzylphthalate	62.6	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Benzo(a)anthracene	ND	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Chrysene	ND	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	bis(2-Ethylhexyl)phthalate	21.7	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Di-n-octylphthalate	ND	20.9	10.5	10.5	ug/kg
BF-BC-A	sample	59.33	SW8270C	Benzofluoranthenes	4.07	4.19	2.09	2.09	ug/kg
BF-BC-A	sample	59.33	SW8270C	Benzo(a)pyrene	3.29	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Indeno(1,2,3-cd)pyrene	ND	2.09	1.05	1.05	ug/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
BF-BC-A	sample	59.33	SW8270C	Dibenz(a,h)anthracene	ND	2.09	1.05	1.05	ug/kg
BF-BC-A	sample	59.33	SW8270C	Benzo(g,h,i)perylene	ND	2.09	1.05	1.05	ug/kg
BF-BC-26	ms	78.58	SW8270C	2 - Fluorophenol	88.1				%
BF-BC-26	ms	78.58	SW8270C	Phenol - d5	85				%
BF-BC-26	ms	78.58	SW8270C	Nitrobenzene - d5	94.1				%
BF-BC-26	ms	78.58	SW8270C	2 - Fluorobiphenyl	81.1				%
BF-BC-26	ms	78.58	SW8270C	2,4,6 - Tribromophenol	77.5				%
BF-BC-26	ms	78.58	SW8270C	p - Terphenyl - d14	99.4				%
BF-BC-26	ms	78.58	SW8270C	Phenol	98.6	15.5	7.74	7.74	ug/kg
BF-BC-26	ms	78.58	SW8270C	1,4-Dichlorobenzene	66.6	15.5	7.74	7.74	ug/kg
BF-BC-26	ms	78.58	SW8270C	1,2,4-Trichlorobenzene	69.8	15.5	7.74	7.74	ug/kg
BF-BC-26	ms	78.58	SW8270C	Acenaphthene	65.4	1.55	0.774	0.774	ug/kg
BF-BC-26	ms	78.58	SW8270C	Pentachlorophenol	118	15.5	7.74	7.74	ug/kg
BF-BC-26	ms	78.58	SW8270C	Pyrene	69.3	1.55	0.774	0.774	ug/kg
BF-BC-26	msd	78.58	SW8270C	2 - Fluorophenol	102				%
BF-BC-26	msd	78.58	SW8270C	Phenol - d5	95.2				%
BF-BC-26	msd	78.58	SW8270C	Nitrobenzene - d5	89.2				%
BF-BC-26	msd	78.58	SW8270C	2 - Fluorobiphenyl	89.7				%
BF-BC-26	msd	78.58	SW8270C	2,4,6 - Tribromophenol	76.4				%
BF-BC-26	msd	78.58	SW8270C	p - Terphenyl - d14	114				%
BF-BC-26	msd	78.58	SW8270C	Phenol	102	15.4	7.71	7.71	ug/kg
BF-BC-26	msd	78.58	SW8270C	1,4-Dichlorobenzene	49.7	15.4	7.71	7.71	ug/kg
BF-BC-26	msd	78.58	SW8270C	1,2,4-Trichlorobenzene	46.3	15.4	7.71	7.71	ug/kg
BF-BC-26	msd	78.58	SW8270C	Acenaphthene	62.8	1.54	0.771	0.771	ug/kg
BF-BC-26	msd	78.58	SW8270C	Pentachlorophenol	97.2	15.4	7.71	7.71	ug/kg
BF-BC-26	msd	78.58	SW8270C	Pyrene	65.8	1.54	0.771	0.771	ug/kg
BF-BC-03	sample	64.73	SW9060	TOC	6270	122	48.8		mg/kg
BF-BC-04	sample	63.47	SW9060	TOC	7120	125	50		mg/kg
BF-BC-07	sample	67.17	SW9060	TOC	3660	118	47.2		mg/kg
BF-BC-14	sample	70.06	SW9060	TOC	5200	138	55		mg/kg
BF-BC-15	sample	47.92	SW9060	TOC	16000	128	51.3		mg/kg
BF-BC-16	sample	49.67	SW9060	TOC	13600	125	50		mg/kg
BF-BC-17	sample	49.73	SW9060	TOC	12900	114	45.5		mg/kg
BF-BC-26	sample	78.58	SW9060	TOC	2210	115	46.2		mg/kg
BF-BC-A	sample	59.33	SW9060	TOC	16400	144	57.7		mg/kg
BF-BC-03	ms	64.73	SW9060	TOC	40300	122	48.8		mg/kg
BF-BC-03	msd	64.73	SW9060	TOC	38900	118	47.2		mg/kg
	blank		SW6010	Aluminum	ND	20	1.8		mg/kg
	blank		SW6010	Calcium	3.06	200	1.34	J	mg/kg
	blank		SW6010	Iron	0.257	20	0.16	J	mg/kg
	blank		SW6010	Magnesium	ND	200	2.18		mg/kg
	blank		SW6010	Potassium	ND	200	18		mg/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
	blank		SW6010	Sodium	ND	200	34.2		mg/kg
	bs		SW6010	Aluminum	795	20	1.8		mg/kg
	bs		SW6010	Calcium	4580	200	1.34	B2	mg/kg
	bs		SW6010	Iron	4770	20	0.16	B2	mg/kg
	bs		SW6010	Magnesium	4490	200	2.18		mg/kg
	bs		SW6010	Potassium	4110	200	18		mg/kg
	bs		SW6010	Sodium	3930	200	34.2		mg/kg
	bsd		SW6010	Aluminum	744	20	1.8		mg/kg
	bsd		SW6010	Calcium	4310	200	1.34	B2	mg/kg
	bsd		SW6010	Iron	4470	20	0.16	B2	mg/kg
	bsd		SW6010	Magnesium	4250	200	2.18		mg/kg
	bsd		SW6010	Potassium	3810	200	18		mg/kg
	bsd		SW6010	Sodium	3720	200	34.2		mg/kg
	blank		SW6010	Aluminum	ND	20			mg/kg
	blank		SW6010	Barium	ND	1			mg/kg
	blank		SW6010	Calcium	ND	200			mg/kg
	blank		SW6010	Chromium	ND	2			mg/kg
	blank		SW6010	Copper	ND	2			mg/kg
	blank		SW6010	Iron	ND	20			mg/kg
	blank		SW6010	Magnesium	ND	200			mg/kg
	blank		SW6010	Manganese	ND	2			mg/kg
	blank		SW6010	Potassium	ND	200			mg/kg
	blank		SW6010	Sodium	ND	200			mg/kg
	bs		SW6010	Aluminum	795	20			mg/kg
	bs		SW6010	Barium	828	1			mg/kg
	bs		SW6010	Calcium	4580	200			mg/kg
	bs		SW6010	Chromium	89.3	2			mg/kg
	bs		SW6010	Copper	93.6	2			mg/kg
	bs		SW6010	Iron	4770	20			mg/kg
	bs		SW6010	Magnesium	4490	200			mg/kg
	bs		SW6010	Manganese	218	2			mg/kg
	bs		SW6010	Potassium	4110	200			mg/kg
	bs		SW6010	Sodium	3930	200			mg/kg
	bsd		SW6010	Aluminum	744	20			mg/kg
	bsd		SW6010	Barium	772	1			mg/kg
	bsd		SW6010	Calcium	4310	200			mg/kg
	bsd		SW6010	Chromium	83.3	2			mg/kg
	bsd		SW6010	Copper	88.7	2			mg/kg
	bsd		SW6010	Iron	4470	20			mg/kg
	bsd		SW6010	Magnesium	4250	200			mg/kg
	bsd		SW6010	Manganese	204	2			mg/kg
	bsd		SW6010	Potassium	3810	200			mg/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
	bsd		SW6010	Sodium	3720	200			mg/kg
	blank		SW6020	Arsenic	ND	0.2	0.0217		mg/kg
	blank		SW6020	Antimony	ND	0.6	0.00448		mg/kg
	blank		SW6020	Barium	0.105	0.2	0.00108	J	mg/kg
	blank		SW6020	Beryllium	ND	0.1	0.00284		mg/kg
	blank		SW6020	Cadmium	ND	0.1	0.00142		mg/kg
	blank		SW6020	Chromium	ND	0.2	0.00708		mg/kg
	blank		SW6020	Cobalt	ND	0.1	0.00078		mg/kg
	blank		SW6020	Copper	ND	0.2	0.00288		mg/kg
	blank		SW6020	Lead	0.0134	0.1	0.0009	J	mg/kg
	blank		SW6020	Manganese	0.0164	0.1	0.00168	J	mg/kg
	blank		SW6020	Nickel	0.0114	0.2	0.00566	J	mg/kg
	blank		SW6020	Selenium	ND	0.6	0.0769		mg/kg
	blank		SW6020	Silver	ND	0.1	0.0012		mg/kg
	blank		SW6020	Thallium	0.0046	0.1	0.00112	J	mg/kg
	blank		SW6020	Vanadium	ND	0.2	0.0152		mg/kg
	blank		SW6020	Zinc	ND	0.6	0.00654		mg/kg
	blank		SW7471	Mercury	ND	0.02	0.0131		mg/kg
	bs		SW7471	Mercury	0.189	0.02	0.0131		mg/kg
	bsd		SW7471	Mercury	0.165	0.02	0.0131		mg/kg
	blank		SW8082	Tetrachloro-m-xylene	90				%
	blank		SW8082	Decachlorobiphenyl	86.5				%
	blank		SW8082	Aroclor 1016	ND	0.02	0.0022		mg/kg
	blank		SW8082	Aroclor 1221	ND	0.02	0.00942		mg/kg
	blank		SW8082	Aroclor 1232	ND	0.02	0.00752		mg/kg
	blank		SW8082	Aroclor 1242	ND	0.02	0.00402		mg/kg
	blank		SW8082	Aroclor 1248	ND	0.02	0.01		mg/kg
	blank		SW8082	Aroclor 1254	ND	0.02	0.00312		mg/kg
	blank		SW8082	Aroclor 1260	ND	0.02	0.00312		mg/kg
	bs		SW8082	Tetrachloro-m-xylene	87				%
	bs		SW8082	Decachlorobiphenyl	86.6				%
	bs		SW8082	Aroclor 1260	0.211	0.02	0.00312	C1	mg/kg
	bsd		SW8082	Tetrachloro-m-xylene	88.7				%
	bsd		SW8082	Decachlorobiphenyl	86.7				%
	bsd		SW8082	Aroclor 1260	0.217	0.02	0.00312	C1	mg/kg
	blank		SW8270C	2 - Fluorophenol	91.2				%
	blank		SW8270C	Phenol - d5	70.8				%
	blank		SW8270C	Nitrobenzene - d5	93.5				%
	blank		SW8270C	2 - Fluorobiphenyl	77.8				%
	blank		SW8270C	2,4,6 - Tribromophenol	66.7				%
	blank		SW8270C	p - Terphenyl - d14	89.4				%
	blank		SW8270C	Phenol	ND	13.3	6.67	6.67	ug/kg

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
	blank		SW8270C	1,3-Dichlorobenzene	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	1,4-Dichlorobenzene	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Benzyl Alcohol	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	1,2-Dichlorobenzene	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	2-Methylphenol	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	3-&4-Methylphenol	ND	26.7	13.3	13.3	ug/kg
	blank		SW8270C	Hexachloroethane	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	2,4-Dimethylphenol	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Benzoic Acid	ND	66.7	33.3	33.3	ug/kg
	blank		SW8270C	1,2,4-Trichlorobenzene	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Naphthalene	ND	3.33	1.67	1.67	ug/kg
	blank		SW8270C	Hexachlorobutadiene	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	2-Methylnaphthalene	ND	3.33	1.67	1.67	ug/kg
	blank		SW8270C	Dimethylphthalate	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Acenaphthylene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Acenaphthene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Dibenzofuran	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Diethylphthalate	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Fluorene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	N-Nitrosodiphenylamine	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Hexachlorobenzene	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Pentachlorophenol	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Phenanthrene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Anthracene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Di-n-butylphthalate	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Fluoranthene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Pyrene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Butylbenzylphthalate	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Benzo(a)anthracene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Chrysene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	bis(2-Ethylhexyl)phthalate	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Di-n-octylphthalate	ND	13.3	6.67	6.67	ug/kg
	blank		SW8270C	Benzofluoranthenes	ND	2.67	1.33	1.33	ug/kg
	blank		SW8270C	Benzo(a)pyrene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Indeno(1,2,3-cd)pyrene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Dibenz(a,h)anthracene	ND	1.33	0.667	0.667	ug/kg
	blank		SW8270C	Benzo(g,h,i)perylene	ND	1.33	0.667	0.667	ug/kg
	bs		SW8270C	2 - Fluorophenol	85.6				%
	bs		SW8270C	Phenol - d5	81.5				%
	bs		SW8270C	Nitrobenzene - d5	96.4				%
	bs		SW8270C	2 - Fluorobiphenyl	87.2				%
	bs		SW8270C	2,4,6 - Tribromophenol	83.5				%

Client ID	QC Type	% Solids	Method #	Parameter	Result	PQL	MDL	Flags	Units
	bs		SW8270C	p - Terphenyl - d14	92.9				%
	bs		SW8270C	Phenol	91.8	13.3	6.67	6.67	ug/kg
	bs		SW8270C	1,4-Dichlorobenzene	59.7	13.3	6.67	6.67	ug/kg
	bs		SW8270C	1,2,4-Trichlorobenzene	54.6	13.3	6.67	6.67	ug/kg
	bs		SW8270C	Acenaphthene	61.2	1.33	0.667	0.667	ug/kg
	bs		SW8270C	Pentachlorophenol	71.8	13.3	6.67	6.67	ug/kg
	bs		SW8270C	Pyrene	64.2	1.33	0.667	0.667	ug/kg
	blank		SW9060	TOC	ND	100	40		mg/kg

Bonneville Forebay Sep 18, 2002

AQUATIC RESEARCH INCORPORATED

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A1

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-1 -BF-BC-03

TOTAL WET WEIGHT (g) 94.67
TOTAL DRY WEIGHT (g) 49.47

PERCENT SOLIDS @ 105C 52.25%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 1

SIEVE FRACTION

BEAKER TARE:	118.1200
TOTAL DRY WT (g)	168.3400
SAMPLE WT (g)	50.2200

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	0.0000	0.00%	100.00%	
0.375	9.50	0.0000	0.00%	100.00%	
0.25	6.30	0.0000	0.00%	100.00%	
4	4.75	8.8011	17.79%	82.21%	ROCKS
10	2.00	7.2695	14.70%	67.51%	ROCKS,PLANTS
40	0.425	7.9601	16.09%	51.42%	SAND,ROCKS,PLANTS
60	0.250	5.2960	10.71%	40.71%	SAND,PLANTS
120	0.125	11.2160	22.67%	18.04%	SAND,PLANTS
230	0.063	5.8789	11.88%	6.15%	SAND,PLANTS
<230	<0.063	4.0154			SAND,PLANTS
TOTAL WT		50.4370			
RECOVERY (%)		100.43%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	6.0	21.0	0.0137	0.0378	4.5000	9.57%	9.57%
5	6.0		0.0137	0.0239	4.5000	0.00%	9.57%
15	5.0		0.0137	0.0139	3.5000	2.13%	7.44%
30	4.0		0.0137	0.0099	2.5000	2.13%	5.32%
60	3.0		0.0137	0.0070	1.5000	2.13%	3.19%
250	3.0	21.0	0.0137	0.0034	1.5000	0.00%	3.19%
1440	2.5	21.0	0.0137	0.0014	1.0000	1.06%	2.13%

PHYSICAL PROPERTIES

DISTRIBUTION **% GRAVEL 17.79%** **% SAND 76.05%** **% CLAY/SILT 6.15%** **MEAN (mm) 1.2744** **MEDIAN 0.42**

% SOLIDS **52.25%** % WATER 47.75%

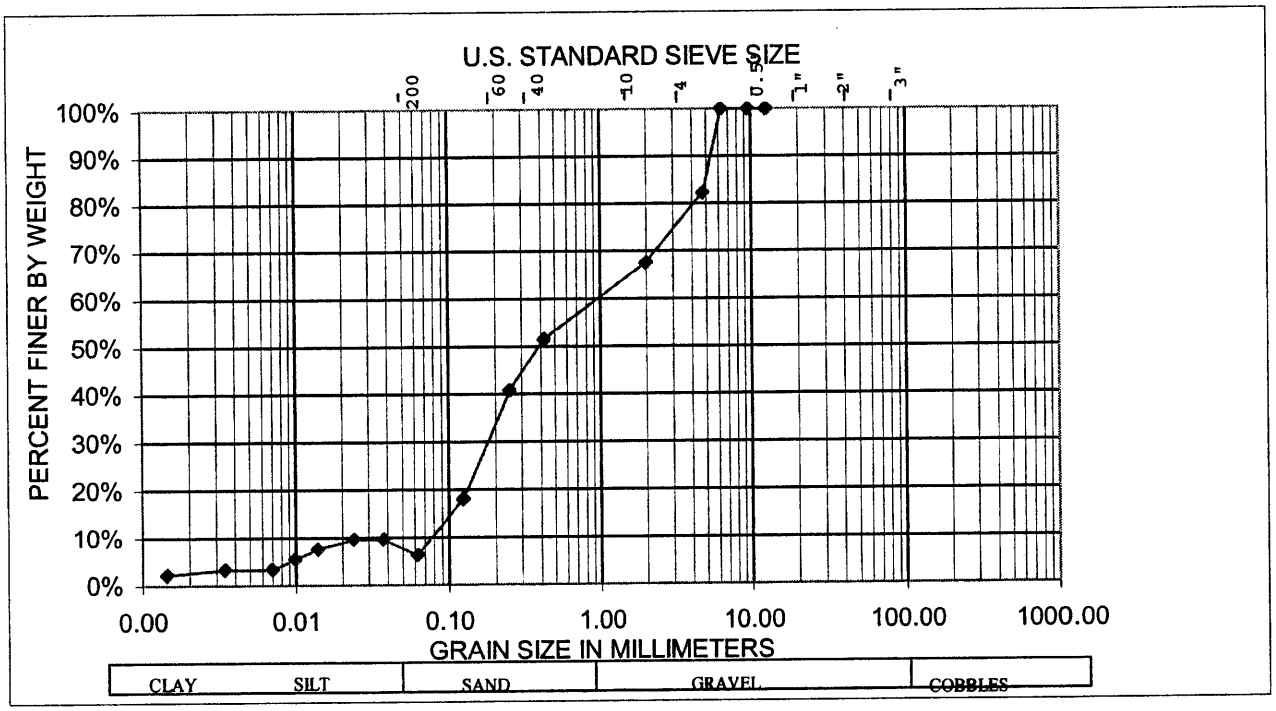
AQUATIC RESEARCH INCORPORATED

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CLIENT SAMPLE ID: **108785-1** BF-BC-03



Bonneville Forebay Sep 18, 2002

AQUATIC RESEARCH INCORPORATED

LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A2

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-2 BF-BC-04

TOTAL WET WEIGHT (g) 98.71

TOTAL DRY WEIGHT (g) 61.77

PERCENT SOLIDS @ 105C 62.58%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 2

SIEVE FRACTION

BEAKER TARE: 118.3300

TOTAL DRY WT (g) 176.5100

SAMPLE WT (g) 58.1800

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	15.9753	25.86%	74.14%	SHELLS,A ROCK
0.375	9.50	0.0000	0.00%	74.14%	
0.25	6.30	0.0000	0.00%	74.14%	
4	4.75	0.6261	1.01%	73.13%	ROCKS
10	2.00	0.4096	0.66%	72.46%	SHELLS,ROCKS,PLANTS
40	0.425	1.2496	2.02%	70.44%	SAND,ROCKS,PLANTS
60	0.250	1.2650	2.05%	68.39%	SAND,PLANT
120	0.125	14.7633	23.90%	44.49%	SAND,PLANT
230	0.063	15.6231	25.29%	19.20%	SAND,PLANT
<230	<0.063	8.5020			
TOTAL WT		58.4140			
RECOVERY (%)		100.40%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	11.0	21.0	0.0137	0.0367	9.5000	19.97%	19.97%
5	10.0		0.0137	0.0234	8.5000	2.10%	17.87%
15	8.5		0.0137	0.0136	7.0000	3.15%	14.72%
30	7.0		0.0137	0.0097	5.5000	3.15%	11.56%
60	6.0		0.0137	0.0069	4.5000	2.10%	9.46%
250	5.0	21.0	0.0137	0.0034	3.5000	2.10%	7.36%
1440	4.0	21.0	0.0137	0.0014	2.5000	2.10%	5.26%

PHYSICAL PROPERTIES

DISTRIBUTION % GRAVEL 26.87% % SAND 53.92% % CLAY/SILT 19.20% MEAN (mm) 3.3625 MEDIAN 0.16

% SOLIDS 62.58% % WATER 37.42%

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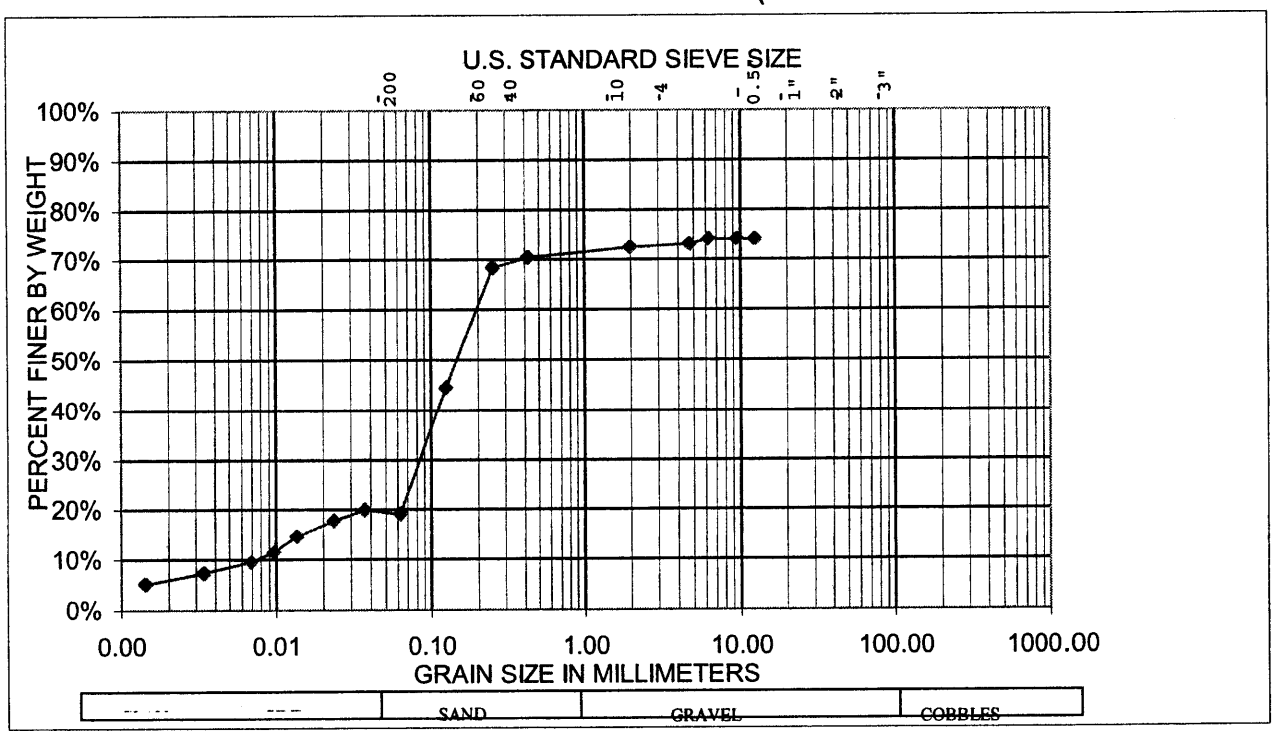
CLIENT SAMPLE ID: **108785-2** BF - BC-04



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PHONE: (206) 632-2715 FAX: (206) 632-2417

ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A3

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-3 BF-BC-07

TOTAL WET WEIGHT (g) 93.32
TOTAL DRY WEIGHT (g) 67.68

PERCENT SOLIDS @ 105C 72.53%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 3

SIEVE FRACTION

BEAKER TARE:	110.8500
TOTAL DRY WT (g)	172.9400
SAMPLE WT (g)	62.0900

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	2.8810	4.26%	95.74%	SHELLS
0.375	9.50	1.3643	2.02%	93.73%	SHELLS
0.25	6.30	1.1858	1.75%	91.98%	ROCKS
4	4.75	1.2093	1.79%	90.19%	ROCKS
10	2.00	6.6290	9.79%	80.40%	ROCKS,SHELLS
40	0.425	10.1512	15.00%	65.40%	SAND,ROCK,SHELLS
60	0.250	19.2105	28.38%	37.02%	SAND,SHELL
120	0.125	12.6726	18.72%	18.29%	SAND,SHELL
230	0.063	3.8226	5.65%	12.64%	
<230	<0.063	3.1705			
TOTAL WT		62.2968			
RECOVERY (%)		100.33%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	8.0	21.0	0.0137	0.0374	6.5000	13.79%	13.79%
5	7.0		0.0137	0.0238	5.5000	2.12%	11.67%
15	7.0		0.0137	0.0137	5.5000	0.00%	11.67%
30	6.0		0.0137	0.0098	4.5000	2.12%	9.55%
60	7.0		0.0137	0.0069	5.5000	-2.12%	11.67%
250	5.0	21.0	0.0137	0.0034	3.5000	4.24%	7.42%
1440	4.0	21.0	0.0137	0.0014	2.5000	2.12%	5.30%

PHYSICAL PROPERTIES

DISTRIBUTION % GRAVEL 9.81% % SAND 77.54% % CLAY/SILT 12.64% MEAN (mm) 1.2823 MEDIAN 0.31

% SOLIDS 72.53% % WATER 27.47%

200

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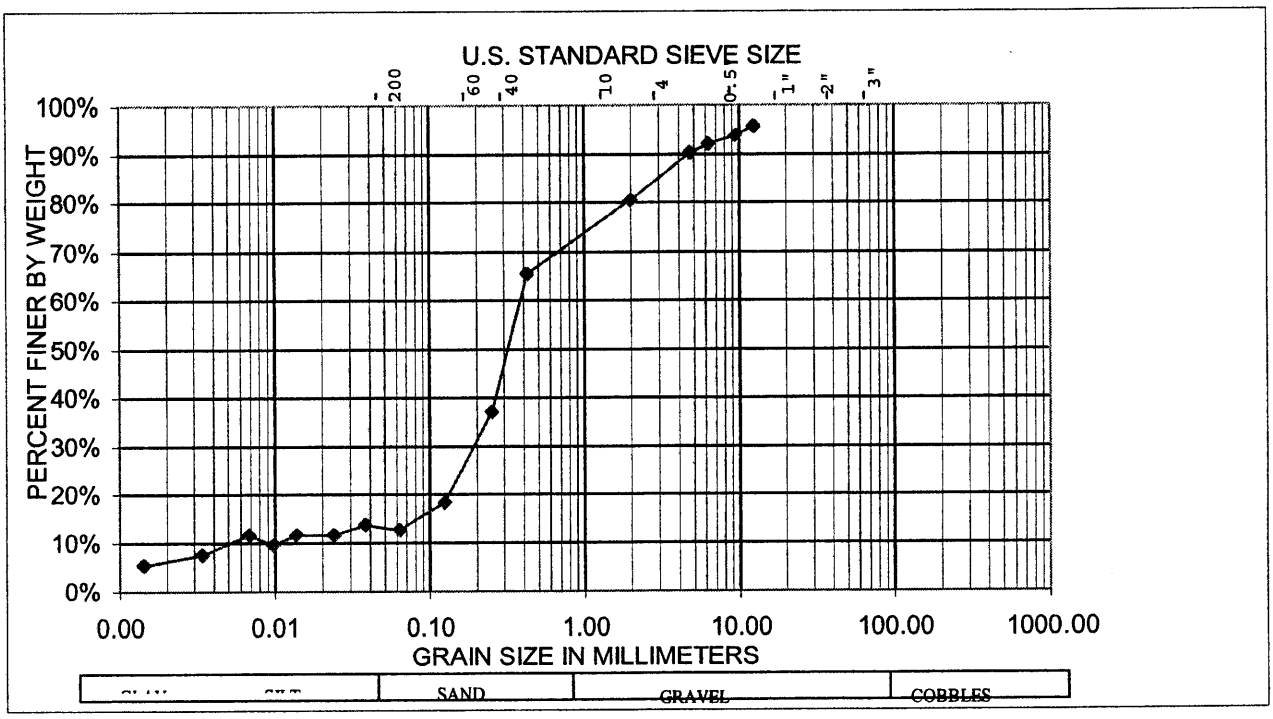
CLIENT SAMPLE ID: **108785-3** BF-BC-07



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ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A4

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-4 BF-BC-14

TOTAL WET WEIGHT (g) 99.49
TOTAL DRY WEIGHT (g) 66.81

PERCENT SOLIDS @ 105C 67.15%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 4

SIEVE FRACTION

BEAKER TARE:	112.5200
TOTAL DRY WT (g)	176.2500
SAMPLE WT (g)	63.7300

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	0.0000	0.00%	100.00%	
0.375	9.50	0.0000	0.00%	100.00%	
0.25	6.30	0.0000	0.00%	100.00%	
4	4.75	0.0000	0.00%	100.00%	
10	2.00	0.0076	0.01%	99.99%	PLANT
40	0.425	0.2638	0.39%	99.59%	SAND,PLANT
60	0.250	1.1055	1.65%	97.94%	SAND,PLANT
120	0.125	34.1839	51.17%	46.77%	SAND,PLANT
230	0.063	21.9706	32.89%	13.88%	
<230	<0.063	6.3918			
TOTAL WT		63.9232			
RECOVERY (%)		100.30%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	7.5	21.0	0.0137	0.0375	6.0000	13.26%	13.26%
5	7.0		0.0137	0.0238	5.5000	1.10%	12.15%
15	6.0		0.0137	0.0138	4.5000	2.21%	9.94%
30	6.0		0.0137	0.0098	4.5000	0.00%	9.94%
60	6.0		0.0137	0.0069	4.5000	0.00%	9.94%
250	5.0	21.0	0.0137	0.0034	3.5000	2.21%	7.73%
1440	4.0	21.0	0.0137	0.0014	2.5000	2.21%	5.52%

PHYSICAL PROPERTIES

DISTRIBUTION % GRAVEL 0.00% % SAND 86.12% % CLAY/SILT 13.88% MEAN (mm) 0.0964 MEDIAN 0.13

% SOLIDS 67.15% % WATER 32.85%

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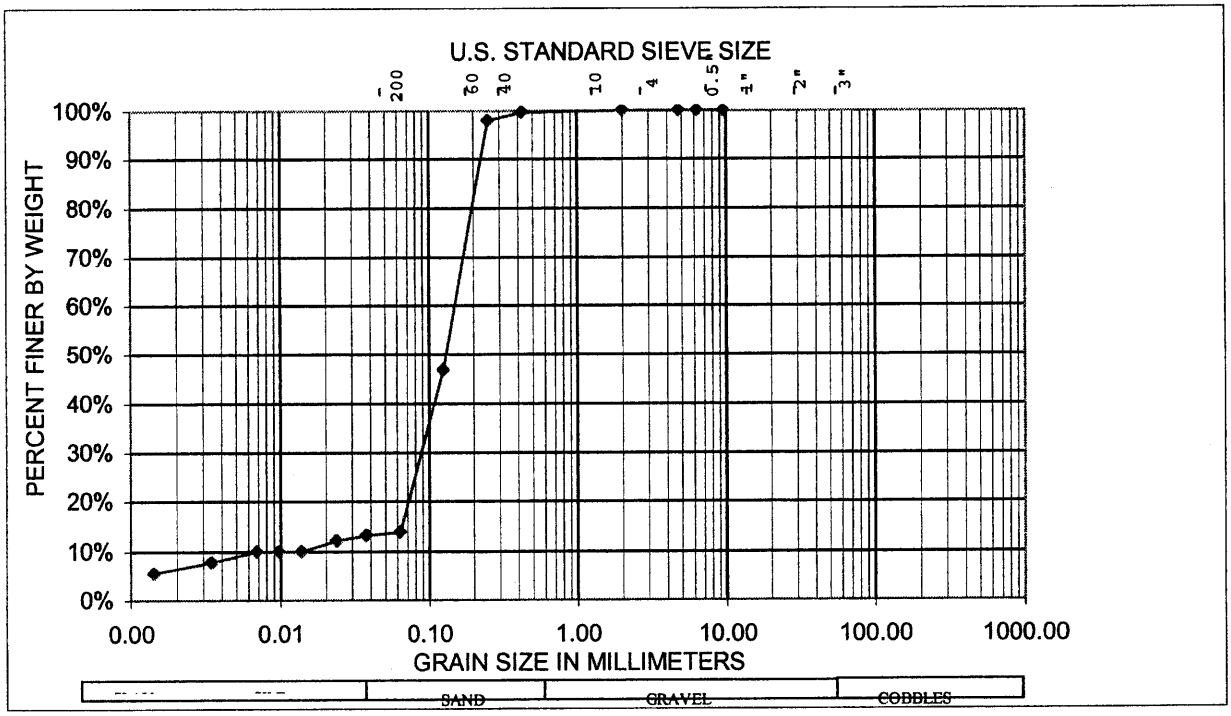
CLIENT SAMPLE ID: **108785-4** BF-BC-14



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ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A5

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-5 BF-BC-15

TOTAL WET WEIGHT (g) 97.87

TOTAL DRY WEIGHT (g) 49.59

PERCENT SOLIDS @ 105C 50.67%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 5

SIEVE FRACTION

BEAKER TARE: 113.2300

TOTAL DRY WT (g) 156.7600

SAMPLE WT (g) 43.5300

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	0.0000	0.00%	100.00%	
0.375	9.50	0.0000	0.00%	100.00%	
0.25	6.30	0.0000	0.00%	100.00%	
4	4.75	0.0000	0.00%	100.00%	
10	2.00	0.0000	0.00%	100.00%	
40	0.425	0.1763	0.36%	99.64%	SAND,PLANT
60	0.250	0.0184	0.04%	99.61%	SAND,PLANT
120	0.125	3.0046	6.06%	93.55%	SAND,PLANT
230	0.063	20.3721	41.08%	52.47%	SAND,PLANT
<230	<0.063	20.2304			
TOTAL WT		43.8018			
RECOVERY (%)		100.62%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	10.0	21.0	0.0137	0.0370	8.5000	26.45%	26.45%
5	9.0		0.0137	0.0235	7.5000	3.11%	23.34%
15	8.0		0.0137	0.0136	6.5000	3.11%	20.23%
30	7.0		0.0137	0.0097	5.5000	3.11%	17.12%
60	6.0		0.0137	0.0069	4.5000	3.11%	14.00%
250	5.0	21.0	0.0137	0.0034	3.5000	3.11%	10.89%
1440	4.0	21.0	0.0137	0.0014	2.5000	3.11%	7.78%

PHYSICAL PROPERTIES

DISTRIBUTION **% GRAVEL 0.00%** **% SAND 47.53%** **% CLAY/SILT 52.47%** **MEAN (mm) 0.0467** **MEDIAN 0.06**

% SOLIDS **50.67%** % WATER 49.33%

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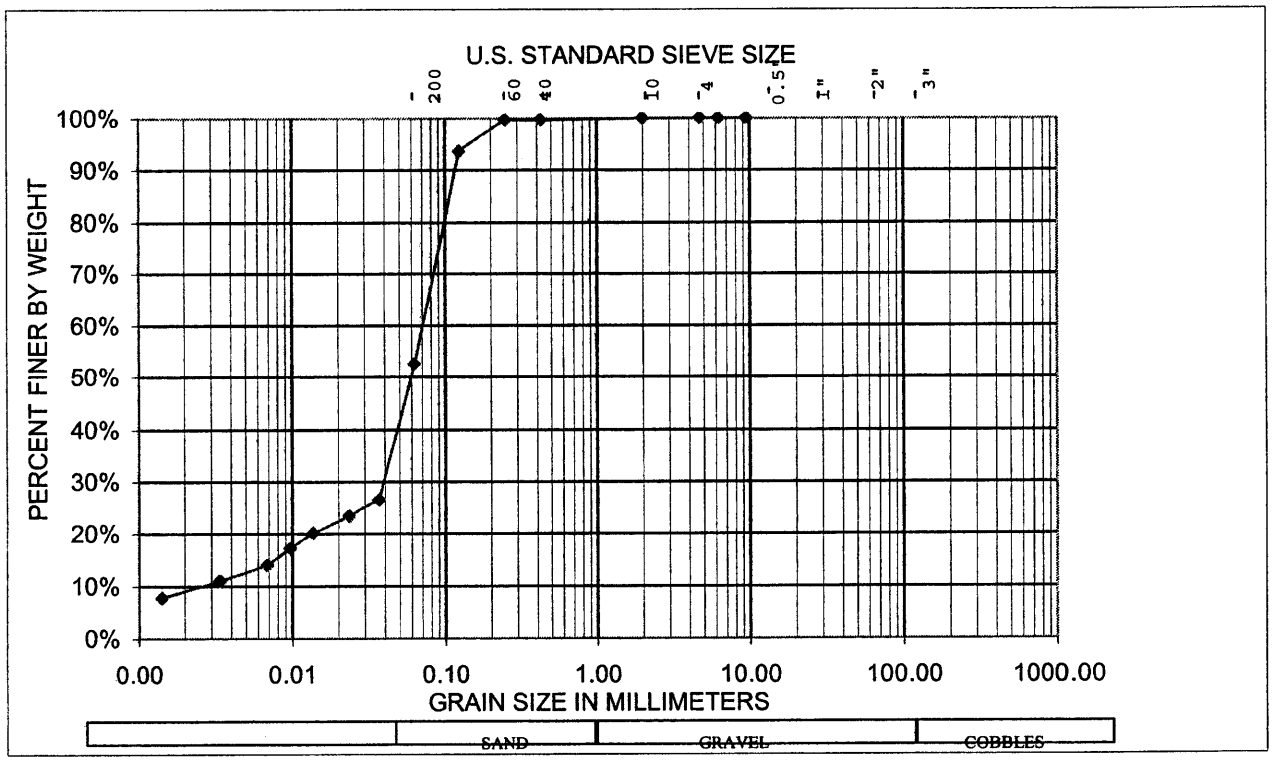
CLIENT SAMPLE ID: **108785-5** BF-BC-15



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ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A6

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-6 BF-BC-16

TOTAL WET WEIGHT (g) 101.03

TOTAL DRY WEIGHT (g) 50.45

PERCENT SOLIDS @ 105C 49.94%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 6

SIEVE FRACTION

BEAKER TARE:	112.9000
TOTAL DRY WT (g)	157.9300
SAMPLE WT (g)	45.0300

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	0.0000	0.00%	100.00%	
0.375	9.50	0.0000	0.00%	100.00%	
0.25	6.30	0.0000	0.00%	100.00%	
4	4.75	0.0000	0.00%	100.00%	
10	2.00	0.0124	0.02%	99.98%	PLANT
40	0.425	0.1113	0.22%	99.75%	SAND,PLANT,SHELLS
60	0.250	0.0959	0.19%	99.56%	SAND,PLANT
120	0.125	1.8109	3.59%	95.98%	SAND,PLANT
230	0.063	15.5589	30.84%	65.14%	
<230	<0.063	27.8087			
TOTAL WT		45.3981			
RECOVERY (%)		100.82%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	12.0	21.0	0.0137	0.0365	10.5000	29.60%	29.60%
5	10.0		0.0137	0.0234	8.5000	5.64%	23.97%
15	9.0		0.0137	0.0136	7.5000	2.82%	21.15%
30	8.0		0.0137	0.0096	6.5000	2.82%	18.33%
60	7.0		0.0137	0.0069	5.5000	2.82%	15.51%
250	5.0	21.0	0.0137	0.0034	3.5000	5.64%	9.87%
1440	4.0	21.0	0.0137	0.0014	2.5000	2.82%	7.05%

PHYSICAL PROPERTIES

DISTRIBUTION **% GRAVEL 0.00%** **% SAND 34.86%** **% CLAY/SILT 65.14%** **MEAN (mm) 0.0391** **MEDIAN 0.05**

% SOLIDS **49.94%** % WATER 50.06%

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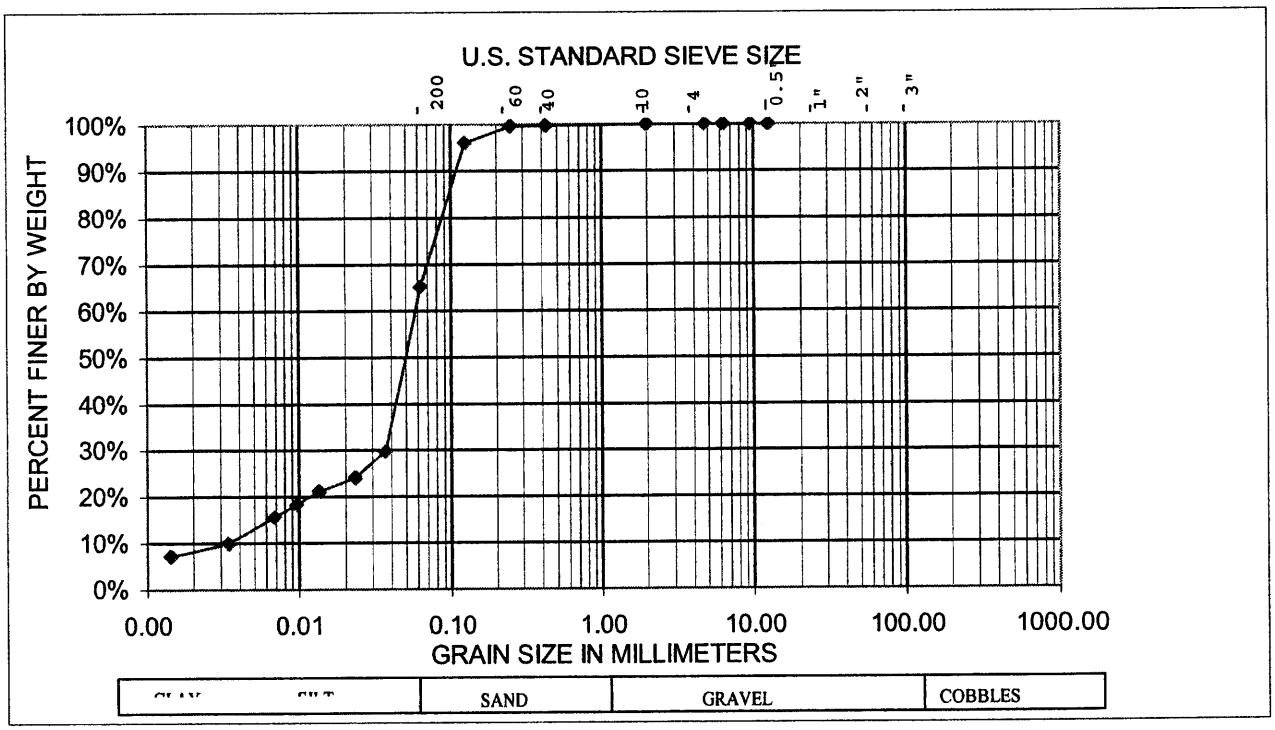
CLIENT SAMPLE ID: **108785-6** BF-BC-16



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ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A7

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-7 BF-BC-17

TOTAL WET WEIGHT (g) 102.20

TOTAL DRY WEIGHT (g) 56.72

PERCENT SOLIDS @ 105C 55.50%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 7

SIEVE FRACTION

BEAKER TARE: 105.8200

TOTAL DRY WT (g) 159.3000

SAMPLE WT (g) 53.4800

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	0.0000	0.00%	100.00%	
0.375	9.50	0.0000	0.00%	100.00%	
0.25	6.30	0.0000	0.00%	100.00%	
4	4.75	0.0000	0.00%	100.00%	
10	2.00	0.0000	0.00%	100.00%	
40	0.425	0.3195	0.56%	99.44%	SAND,PLANT,ROCKS,SHELL
60	0.250	0.2795	0.49%	98.94%	SAND,PLANT
120	0.125	13.6010	23.98%	74.97%	
230	0.063	21.1117	37.22%	37.74%	
<230	<0.063	18.2339			
TOTAL WT		53.5456			
RECOVERY (%)		100.12%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	10.0	21.0	0.0137	0.0370	8.5000	26.63%	26.63%
5	9.0		0.0137	0.0235	7.5000	3.13%	23.49%
15	8.0		0.0137	0.0136	6.5000	3.13%	20.36%
30	7.0		0.0137	0.0097	5.5000	3.13%	17.23%
60	7.0		0.0137	0.0069	5.5000	0.00%	17.23%
250	5.0	21.0	0.0137	0.0034	3.5000	6.26%	10.96%
1440	4.0	21.0	0.0137	0.0014	2.5000	3.13%	7.83%

PHYSICAL PROPERTIES

DISTRIBUTION **% GRAVEL 0.00%** **% SAND 62.26%** **% CLAY/SILT 37.74%** **MEAN (mm) 0.0687** **MEDIAN 0.08**

% SOLIDS **55.50%** % WATER 44.50%

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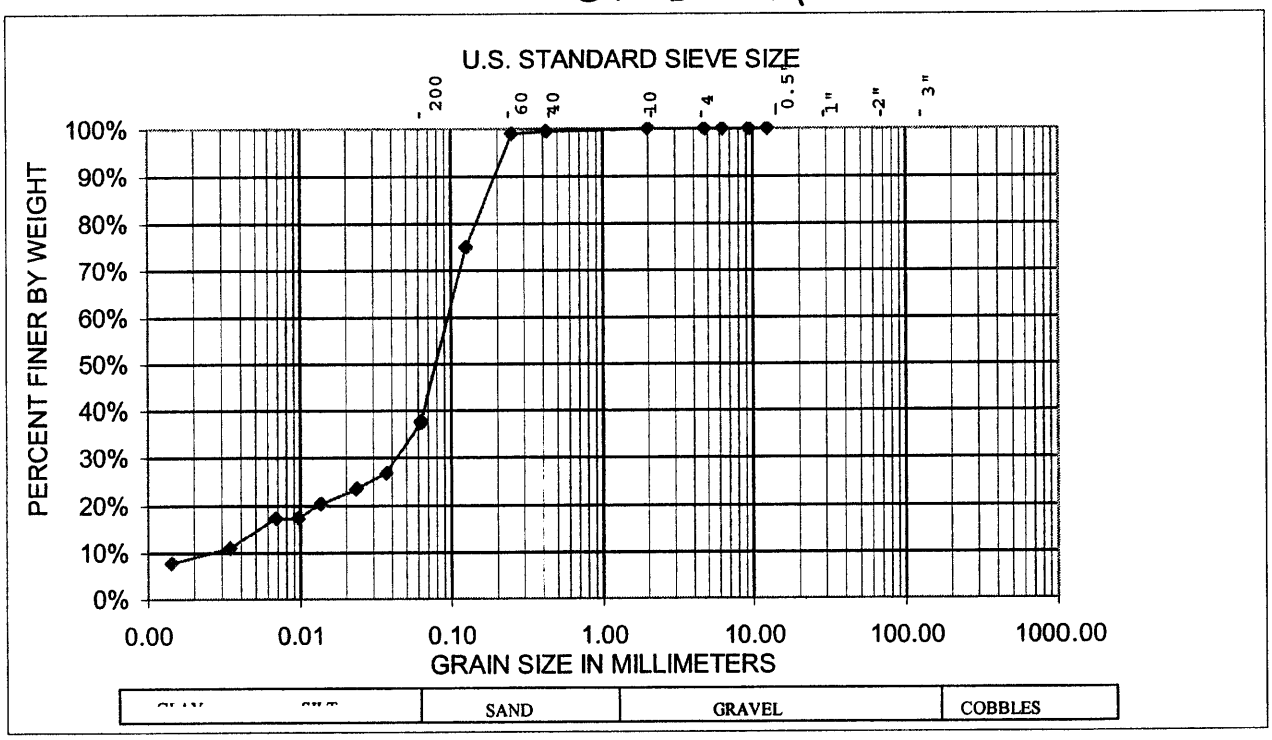
CLIENT SAMPLE ID: **108785-7** BF-BC-17



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PHONE: (206) 632-2715 FAX: (206) 632-2417

ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A7-DUP

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-7-DUP BF-BC-17 Lab dup

TOTAL WET WEIGHT (g)	103.90
TOTAL DRY WEIGHT (g)	57.66

PERCENT SOLIDS @ 105C 55.50%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 7-DUP

SIEVE FRACTION

BEAKER TARE:	115.8500
TOTAL DRY WT (g)	164.8100
SAMPLE WT (g)	48.9600

SIEVE SIZE	(mm)	(g)	(%)	% FINER	COMMENTS
0.5	12.5	0.0000	0.00%	100.00%	
0.375	9.50	0.0000	0.00%	100.00%	
0.25	6.30	0.0000	0.00%	100.00%	
4	4.75	0.0000	0.00%	100.00%	
10	2.00	0.0000	0.00%	100.00%	
40	0.425	0.0987	0.17%	99.83%	SAND,PLANT
60	0.250	0.2907	0.50%	99.32%	SAND,PLANT
120	0.125	12.7999	22.20%	77.13%	SAND,PLANT
230	0.063	19.5667	33.93%	43.20%	
<230	<0.063	16.2451			
TOTAL WT		49.0011			
RECOVERY (%)		100.08%			

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C) BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	10.0	21.0	0.0137	0.0370	8.5000	25.94%	25.94%
5	9.0		0.0137	0.0235	7.5000	3.05%	22.89%
15	8.0		0.0137	0.0136	6.5000	3.05%	19.84%
30	7.0		0.0137	0.0097	5.5000	3.05%	16.79%
60	7.0		0.0137	0.0069	5.5000	0.00%	16.79%
250	5.0	21.0	0.0137	0.0034	3.5000	6.10%	10.68%
1440	4.0	21.0	0.0137	0.0014	2.5000	3.05%	7.63%

PHYSICAL PROPERTIES

DISTRIBUTION % GRAVEL 0.00% % SAND 56.80% % CLAY/SILT 43.20% MEAN (mm) 0.0624 MEDIAN 0.07

% SOLIDS 55.50% % WATER 44.50%

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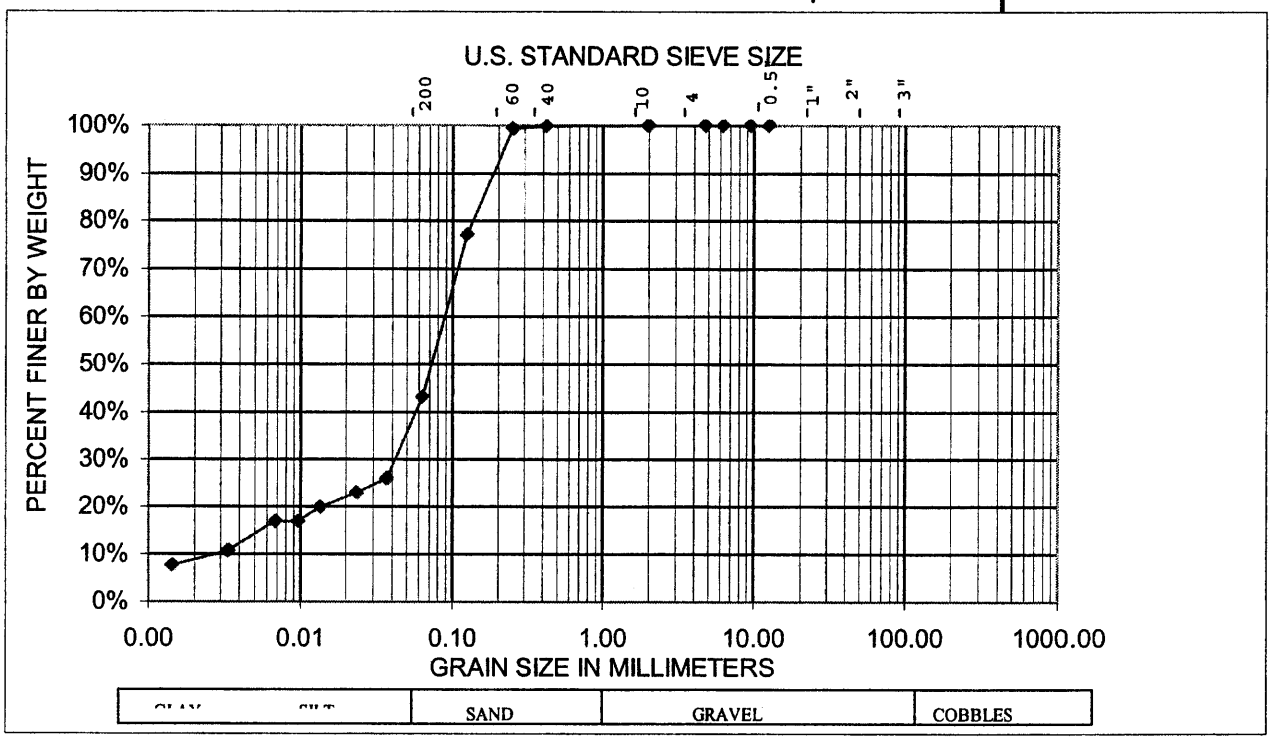
CLIENT SAMPLE ID: **108785-7-DUP** BF-BC-17 Lab dup



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ASTM D422 PARTICLE SIZE

ANALYSIS DATE: 10/20/2002

LAB SAMPLE ID: SOU00226A8

ANALYST: S NIELSON

CLIENT SAMPLE ID: 108785-8 BF-BC-26

TOTAL WET WEIGHT (g) 99.15

TOTAL DRY WEIGHT (g) 73.23

PERCENT SOLIDS @ 105C 73.86%

SIEVE FRACTION - SAND GRAVEL

BEAKER # 8

SIEVE FRACTION

BEAKER TARE: 115.0700

TOTAL DRY WT (g) 187.2300

SAMPLE WT (g) 72.1600

SIEVE SIZE	(mm)	(g)	(%)	% FINER
0.5	12.5	0.0000	0.00%	100.00%
0.375	9.50	0.0000	0.00%	100.00%
0.25	6.30	0.0000	0.00%	100.00%
4	4.75	8.1669	11.15%	88.85%
10	2.00	15.8910	21.70%	67.15%
40	0.425	7.7530	10.59%	56.56%
60	0.250	1.6525	2.26%	54.31%
120	0.125	23.0642	31.49%	22.81%
230	0.063	13.2653	18.11%	4.70%
<230	<0.063	2.6467		
TOTAL WT		72.4396		
RECOVERY (%)		100.39%		

COMMENTS

HYDROMETER FRACTION - SILT CLAY

SAMPLE TIME (20C)

BLANK 1.5

TIME MIN	HYDROMETER	TEMP C	K	DIAM (mm)	Δ wt (g)	(%)	% FINER
2	5.0	21.0	0.0137	0.0380	3.5000	7.07%	7.07%
5	4.0		0.0137	0.0241	2.5000	2.02%	5.05%
15	4.0		0.0137	0.0139	2.5000	0.00%	5.05%
30	4.0		0.0137	0.0099	2.5000	0.00%	5.05%
60	4.0		0.0137	0.0070	2.5000	0.00%	5.05%
250	3.0	21.0	0.0137	0.0034	1.5000	2.02%	3.03%
1440	3.0	21.0	0.0137	0.0014	1.5000	0.00%	3.03%

PHYSICAL PROPERTIES

DISTRIBUTION **% GRAVEL 11.15%** **% SAND 84.15%** **% CLAY/SILT 4.70%** **MEAN (mm) 1.0684** **MEDIAN 0.22**

% SOLIDS **73.86%** % WATER 26.14%

AQUATIC RESEARCH INCORPORATED

LABORATORY & CONSULTING SERVICES

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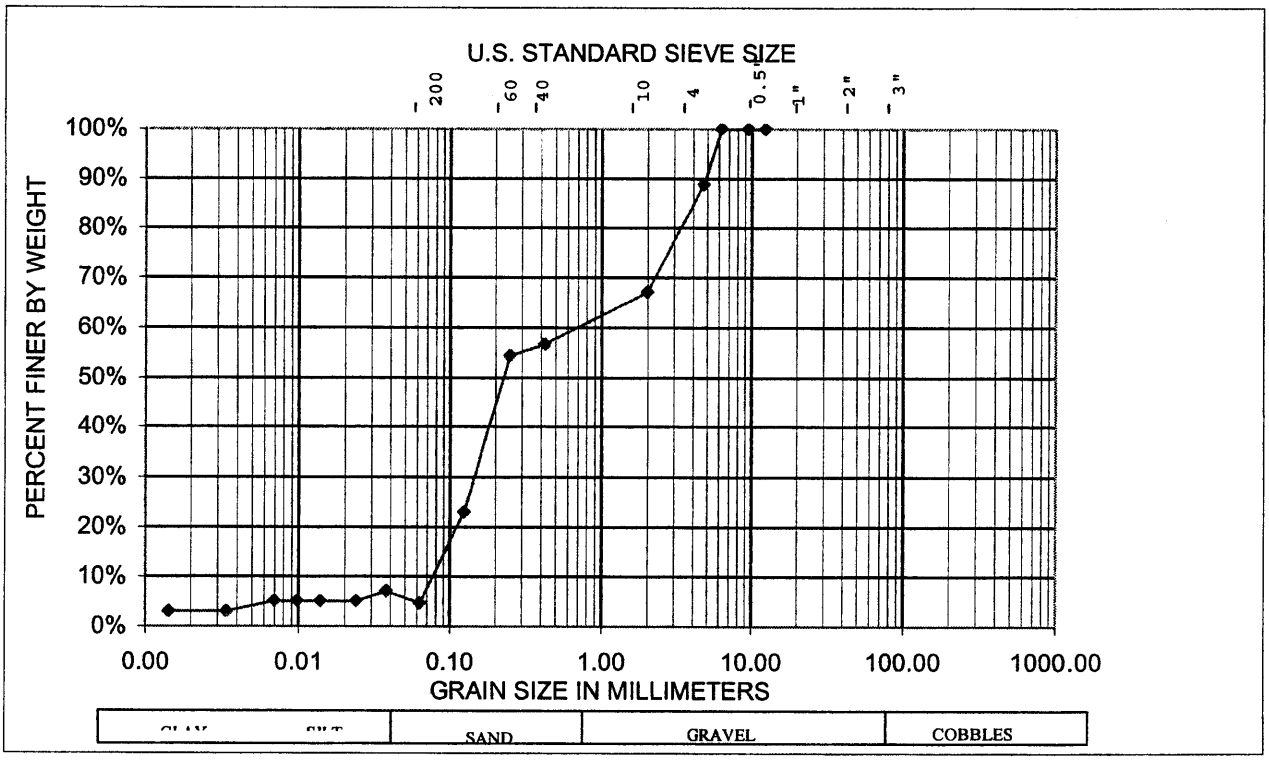
CLIENT SAMPLE ID: **108785-8** BF-BC-26