Attachment B

Physical Baseline Study

Sediment Characterization

Deep Water Site

By

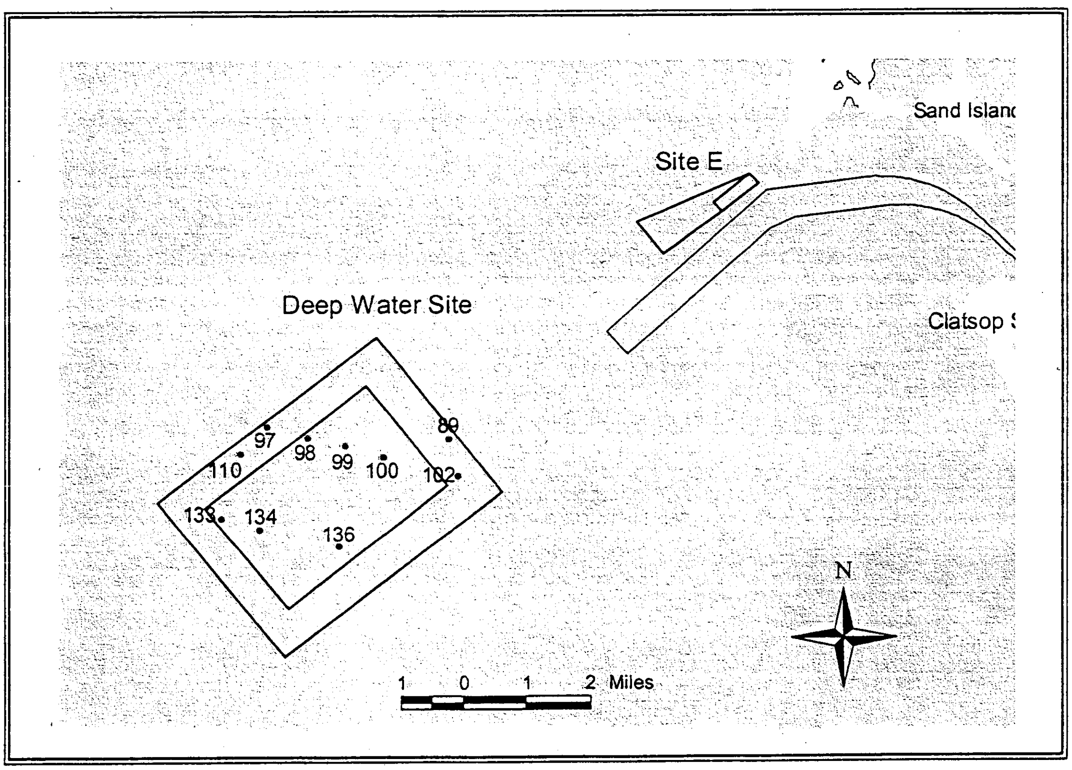
EPA, Region 10 and USACE, Portland District

2001

US Army Corps
of Engineers ®
Portland District

EPA
Region 10

MCR ODMDS DEEP WATER SITE BASELINE SEDIMENT CHARACTERIZATION STUDY



March 2001

MCR ODMDS DEEP WATER SITE

BASELINE SEDIMENT

CHARACTERIZATION STUDY

Portland District

U.S. ARMY CORPS OF ENGINEERS

FINAL REPORT

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MCR ODMDS DEEP WATER SITE
BASELINE SEDIMENT CHARACTERIZATION STUDY

INTRODUCTION:

Sediment and water quality analyses of ocean dredge material disposal sites (ODMDS) are required to adequately address general criterion (b) and specific factors 4, 9, and 10 of 40 CFR 228.5 and 228.6. The lack of adequate baseline data for the MCR Deep Water Site was noted in Appendix H, Volume I: Ocean Dredged Material Disposal Sites Main Report and Technical Exhibits Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement, Columbia and Lower Willamette River Federal Navigation Channel (USACE, 8/99), pg H-5. To supply this lack, ten samples were collected on September 12, 2000 in the Deep Water Site and physical and chemical analyses are performed to establish baseline conditions. Using these analyses, this report provides the baseline conditions for the MCR Deep Water Site, which is being considered as a possible ODMDS site for Columbia River dredge materials. The sediment and water quality analyses of the proposed dredge material are not addressed in this report, since this information is available in other studies.

The Marine Protection, Research and Sanctuaries Act (MPRSA) require that five general criteria and eleven specific factors be addressed during the designation process (40CFR 228.5 and 228.6). These criteria and factors have been interpreted as 27 different "areas of consideration" that cover the proposed ODMDS site and the dredged material it receives. These areas of consideration are listed in an ODMDS conflict matrix, which is used to evaluate each candidate site on its compliance with the requirements for disposal site designation. The conflict matrix is listed in Tables 4-12 of Appendix H of the Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement, Columbia and Lower Willamette River (USACE, 8/99), pg H45-55. The results of the candidate ODMDS conflict matrixes are compared with each other, and are used to select the best ODMDS. The areas of consideration involving sediment quality in this study are:

1. Physical and chemical sediment compatibility,
2. Water column chemistry and physical characteristics,
3. Influence of past disposal,
4. Degraded areas
5. Potential for Cumulative Effects

No past disposal of dredge material has occurred within the boundaries of the Deep Water Site. No degraded areas were identified. No impacts due to sediment quality are expected. Dredged material is expected to mound. This report will discuss the physical and chemical sediment compatibility, and water column chemistry and physical characteristics.

BASELINE SEDIMENT QUALITY STUDIES:

The baseline sediment quality data for the MCR Deep Water Site was collected from seven studies offshore of the Mouth of the Columbia River area spanning from 1974 to September 2000. All seven studies covered various locations offshore, such as ODMDS

Areas A, B, E, F and Southwestern Washington Inner Continental Shelf.

The September 1, 2000 sampling event was conducted specifically to establish baseline physical and chemical conditions at the MCR Deep Water Site. There were ten sample stations strategically located across the Deep Water Site to gain the best coverage of the site, as shown on Figure 3. The samples were tested for all Tier II analyses as defined by the Dredged Material Evaluation Framework (DMEF) (USACE, 1998). The DMEF manual defines the Tier II testing to include physical sediment analysis, and chemical analysis for metals; organometallic compounds; and organics. The organic analyses include chlorinated hydrocarbons, phthalates; phenols; pesticides; polynuclear aromatic hydrocarbons (PAHs); miscellaneous extractables; and other organics. The September 1, 2000 samples' physical and chemical analyses are shown on Tables 2 through 10.

The October/November 1995 and June 1996 studies were conducted to identify the benthic infauna and sediment characteristics offshore from the Columbia River (Hinton, S., 1998). There were a total of 39 stations, each sampled twice for physical analyses and biological analyses.

The August 1994 and July 1993 studies were conducted to identify the benthic infauna and sediment characteristics offshore from the Columbia River (Hinton, S., 1996) There were a total of 30 stations, each sampled twice for physical analyses and biological analyses.

The Tongue Point 1989 – 1992 monitoring program study (Siipola, M, R., 1993) supports these conclusions. The Tongue Point study was performed to assess environmental impacts of disposing dissimilar sediments to the coarser ambient sediments at disposal site F. As shown on Figure 1, disposal site F is very close to the Deep Water Site. The Tongue Point samples at Site F were collected over four years at depths ranging from 147 to 168 ft. All samples showed a low percent fines, TOC, and metals. There were no concentrations above the detection limit for phenols, LPAHs, HPAHs, and phthalates. These results correspond to the results from the six September 1, 2000 samples that were taken at similar depths.

The July 1992 study (Siipola, M, 1992) that the US Army Corps of Engineers (USACE) and National Marine Fisheries Service (NMFS) conducted also supports these conclusions. The July 992 USACE/NMFS study was conducted to identify benthic invertebrate and sediment characteristics over a large area offshore of the Columbia River. Sample 40 was taken at a depth of 255 ft and had higher percent fines (15.6%) and TOC (2.2%), with corresponding higher concentrations of copper (8.9 ppm) than the other July 1992 samples.

The earliest and most extensive sampling event was the 1974-1976 Aquatic Disposal Field Investigations of the Columbia River Disposal conducted as part of the US Army Engineers Dredged Material Research Program (Holton, R. 1978). This study was performed as part of a comprehensive nationwide study to provide more definitive information on the environmental impact of dredging and dredge material disposal operations and to develop new or improved dredged material disposal practices. This multidisciplinary study also was to characterize the baseline physical, chemical, and biological aspects of the nearshore zone. According to Table C-IA from Appendix C of the study, a total of 391 stations were sampled during the field study. Samples were collected at each station and analyzed for physical analyses of the sediments, chemical analyses of the water column and biological analyses.

A summary of tests results for the seven studies are shown on Tables 2 through 10 and will be discussed in the following section. Figures 1 shows a general overview of the MCR ODMDS disposal sites. Figure 2 shows the sample locations for various studies at or near MCR ODMDSs. Figures 3-9 show the sampling station locations for the seven individual studies with stations in or near the Deep Water Site. Basic information about these studies and their maps are listed in summary Table 1 shown below.

TABLE 1
SUMMARY OF STUDIES AT THE DEEP WATER SITE

DATE	SAMPLE NAMES in this report	TOTAL # OF SAMPLES	WHO PERFORMED	NAME OF REPORT	MAP
9/1/00	89, 97-100, 102, 110, 133-4, 136	10	USACE	This report.	Figure 3
1997-8	67-8; 46	Attempted 100 stations, but obtained only 95.	USGS; WDOE	Sidescan-sonar Surface Sidement Samples, and Surficial Geologic Interpretation of the SW WA. Inner Continental Shelf Based on Data Collected During Corliss Cruises 97007 and 98014	Figure 4
6/96	32-36	39	USACE and NMFS	Benthic infauna and Sediment Characteristics offshore from the Columbia River, Oct/Nov. 1995 and June 1996 by NMFS. There is additional data is in the raw data file.	Figure 5
10-11/ 95	32-36	39	USACE and NMFS	Benthic infauna and Sediment Characteristics offshore from the Columbia River, Oct/Nov. 1995 and June 1996 by NMFS. There is additional data is in the raw data file.	Figure 5
8/94	52-60; A4 A7& B2	30	USACE and NMFS	Benthic Infauna and Sediment Characteristics offshore from the Columbia River, Aug. 1994 By NMFS. There is additional data is in the raw data file.	Figure 6
7/93	52-60; A4 A7& B2	30	USACE and NMFS	Benthic Infauna and Sediment Characteristics offshore from the Columbia River, Aug. 1994 By NMFS. There is additional data is in the raw data file.	Figure 6
7/92	40-42, 44-46	50	USACE and USEPA	Reconnaissance Level Benthic Infaunal, Sediment, and Fish Study offshore of the Columbia River, July, 1992	Figure 7
1989-92	A1, A4, A7; B2, B3, B5 and B6	29	USACE and NMFS	Tongue Point Monitoring Program 1989-1992 Final Report	Figure 8
1974-76	12-19, 47, 54-56, 69-70	391*	USACE – Waterways Experiment Station	Aquatic Disposal Field Investigations Columbia River Disposal Site, Oregon.	Figure 9

*Based on Table C-IA "Station Data for Smith-McIntyre Grab Samples" from Appendix C

SEDIMENT QUALITY PARAMETERS:

In order to adequately assess the areas of consideration, seven sediment studies were performed over 17 years and in the various locations offshore of the Columbia River and MCR ODMDS. These sediment studies provided information that can be used to establish the baseline conditions for the Deep Water Site. The sediment quality analytical data covers nine general categories:

1. Physical Analyses
2. Metals
3. Phenols
4. Pesticides and Insecticides
5. Low Polynuclear Aromatic hydrocarbons
6. High Polynuclear Aromatic hydrocarbons
7. Chlorinated hydrocarbons
8. Miscellaneous extractables
9. Phthalates

The sediment quality analytical data is summarized in nine tables (Tables 2 through 10). Screening levels (SL) and bioaccumulation triggers (BT) as established in the 1998 DMEF (USACE/USEPA/WDNR/WDOE, 1998) are provided in the tables for references. The nine general categories that cover ODMDS baseline sediment quality analytical data will be discussed below.

PHYSICAL BASELINE:

Physical Analyses:

There is a considerable amount of sediment physical analyses at the Deep Water Site as Table 2 shows. All seven studies have physical analyses of the sediments, which assist in establishing baseline conditions for the site. The physical analyses are addressed in two main categories: The September 1, 2000 data and samples close to each other.

<u>1. September 1, 2000 Data:</u>

The September 1, 2000 sediment physical analyses at the Deep Water Site shows a mean grain size between 0.106 and 0.126 mm, with an average of 0.120 mm. The median grain size ranges from 0.14 to 0.31mm, with an average median grain size of 0.185 mm. This is larger than the estimated 0.15 mm median grain size for in native situ materials at existing ODMDSs described in the Appendix H, Integrated Feasibility Report of Channel Improvements and Environmental Impact Statement (USACE, 8/99).

The September 1, 2000 sample mean and median grain sizes vary from the other six studies' average mean and median grain sizes. The other six studies' shows a mean grain size between 0. 094 and 0.233 mm, with an average mean grain size of 0.16 mm. This shows a wider distribution of grain size and a larger mean grain size than the 0.120 mm associated with the September 1, 2000 samples. Figure 11 shows the relationship of the mean grain size to depth for five studies. As this graphic shows, there is a strong correlation between the mean grain size and the depth. Based on the graphic mean grain size, it becomes smaller with the greater depths. All five studies showed the same trend. The smaller grain size seen in the September 1, 2000 samples reflect an increase in percent fines with greater sample depths. Figure 12 shows the relationship of the median grain size to depth for five studies and it also shows the same trend of smaller grain size increases with depth. Figure 10 shows the relationship between the sample depth and the percent fines for five studies. As this graph shows, there is a strong correlation between sample depth and percent fines. Figure 10 also shows that at about 225 ft, the percent fines significantly increase with the greater depth.

The data on the Deep Water Site shows the site to have fine to medium marine sand, with a moderate percent of silts and clays, varying from station to station, as shown in Table 2. The percent fines increased with the increased distance from shore and depth, as shown on Figure 10. This is understandable since wave action exerts a decreasing influence from shore to 250 ft, depending on the median grain size and extent of the storm. According to Appendix H, Integrated Feasibility Report of Channel Improvements and Environmental Impact Statement (USACE, 8/99 pg 42), the extreme seaward limit for wave-induced sediment motion with a median sediment grain size of 0.15 mm is 250 ft and 200 ft for 0.25 mm grain size. At depths less than 59 ft, the wave current action can transport sediments easily. Wave actions working with ocean currents can wash the sand; suspend fines, carry them away and deposit them in places with calmer, deeper waters.

Previous studies of document these conclusions. The Continental Shelf Study the USGS performed in 1997 found that the amount of silt, clay and very fine sand increased as the distance from shore increased. The report states "The sediment samples, by contrast, show a progressive offshore fining of the surface sediments. On the lower beach face, surface sediments are primarily fine sand. On the inner shelf, the very fine sand fraction increases from 45% in 59 ft to 62% in 58 water depth." (Twichell, D., 2000). This is logical since the beach receives constant wave action, causing fines to go into suspension and carried them toward sea. Once the fines reach the more tranquil water offshore, the fines fall out of suspension and are deposited in various locations. This accounts for areas of progressive higher percent fines from shore, which is documented in Appendix H, Integrated Feasibility Report of Channel Improvements and Environmental Impact Statement (USACE, 8/99 pg H-58, Figure 17), which is included as Figure 13 of this report. As Figure 13 shows, the percent fines increase with distance from shore and from southern to northern direction.

2. Comparison of Sediment Characteristics Over Time:

There are three sets of samples that provide a comparison of sediment characteristics at one location over time. They were collected between 1992 and 1997 and within 800 ft of each other:

A. Sample 40 take on 7/92 shown on Figure 7 and 35 taken on 10/95 and 6/96 shown on Figure 5.
B. Sample 41 taken on 7/92 shown on Figure 7 and samples 17/56 taken in 1974-1975 shown on Figure 9.

C. Sample 68 taken on 9/97 shown on Figure 4 and sample 47 taken in 1974 shown on Figure 9.

A. Sample 40 and 35:
Sample 40 collected in July 1992 as part of the Reconnaissance Level Benthic Infaunal, Sediment, and Fish Study offshore of the Columbia River (Siipola, M., 1992) is within 710 ft of sample 35 collected in October 1995 and again in June 1996 as part of Benthic infauna and Sediment Characteristics offshore from the Columbia River, Oct/Nov. 1995 and June 1996 (Hinton, S, A., 1998). These three samples were taken at about the same depth (255 to 249 respectively) and have very similar physical characteristics: 28 to 32% very fine sand with 16 to 18 % fines. The sand gradation is also very similar, even though there were several years between the samplings. These facts suggest that the sediment in the area is fairly stable and not subject to significant change.

B. Samples 41 and 17/56:
Sample 41 collected in July 1992 as part of the Reconnaissance Level Benthic Infaunal, Sediment, and Fish Study offshore of the Columbia River (Siipola, M., 1992) is within 110 ft of samples 17 and 56, which were sampled during the 1974- 1976 Aquatic Disposal Field Investigations of the Columbia River Disposal Site study. Sample 41 had a 0.16 mm median grain size and a 0.15 mean grain size. As shown on Figure 11, a 0.15 mean grain size is approximately the average at 200 ft. The mean grain size was not reported for samples 17 and 56.

Sample 41 had a 9.1 percent fines, which is slightly higher than the average sample at 200 ft. As shown on Figure 10, percent fines range between 3 and 10 percent, with an average at approximately 6 percent. Sample 17 had 1 percent fines and sample 56 had 10 and 4 percent fines. Although the percent fines for samples 17 and 56 vary from each other and sample 41, the overall average for this location is approximately 5 percent fines, which is close to the average percent fines at 200 ft. In a general sense, these results are in agreement with the trends shown on Figure 10.

C. Samples 68 and 47:
Sample 68 collected in September 1997 as part of the Continental Shelf Study the USGS (Twichell, D, A., 2000) is within 800 ft of sample 47 collected during the 1974- 1976 Aquatic Disposal Field Investigations of the Columbia River Disposal Site study. There is a 59 ft difference between the depth of sample 68 (239ft) and sample 47 (298 ft). Although this may seem like a minor difference in depth, according to Figure 10, its influence would be significant. At 239 ft, Figure 10 shows the percent fines could vary from 4 to 14 percent and at 295 ft, percent fines could vary from 20 to 37 percent. All lab results from sample 68 and 47 are close to the range that Figure 10 predicts. Sample 68 had 16.4 percent fines, which is close to the predicted range of 4 to 14 percent at 239 feet. Sample 47 had 21 and 47 percent fines, which is close to the range of 20 and 37 % at 295 ft.

SEPTEMBER 1, 2000 CHEMICAL BASELINE:

1. Elemental Metals: Concentrations of arsenic, cadmium, copper, lead, nickel, zinc and silver were detected in all ten September 1, 2000 samples. Mercury was detected in only sample C110 at a concentration of 0.038 ppm. As mentioned previous, of all the September 2000 samples, C133 had the highest detected arsenic (7.2 ppm) and the highest nickel (25ppm). Of all the September 2000 samples, C110 had the highest detected copper (15 ppm), lead (8.0 ppm) mercury (0.038) and cadmium (0.89 ppm). Although none of these concentrations are considered high, it is significant that these two samples have the highest concentrations of all available samples collected in the vicinity of the Deep Water Site. Both are among the deepest samples collected during the September 1, 2000 study. The northwest corner of the Deep Water Site which samples C133 and C110 represent has finer sediment.

2. Phenols: Phenols analyses were performed on the Deep Water Site samples and the results are shown on Table 4. Sample C97 showed a concentration of 20 ppb of phenol and 12 ppb of 4-methylphenol. Sample C133 showed a concentration of 140 ppb of phenol and 37 ppb of 4-methylphenol. Sample C110 showed a concentration of 6.2 ppb of 4-methylphenol. Samples C97, C133 and C110 are located in the deepest area of the Deep Water Site. Phenols occur naturally in bark and are associated with decaying vegetation, log rafting and forest product wastes. When these materials degrade, they commonly become part of the fines found in rivers and harbors. From this perspective, rivers and harbors typically have more of these materials than the ocean. But with the higher percent fines, phenols could appear as seen on Table C-4. Phenols are highly soluble in water and in high concentrations are bactericidal, but in lower concentrations may be rapidly degraded by bacteria.

3. Pesticides and PCBs: Pesticides and PCBs analyses were performed on Deep Water Site. As shown on Table 5, neither pesticides nor PCBs were detected.

4. Low Polynuclear Aromatic hydrocarbons(LPAH): A concentration of 7.0 ppb of phenanthrene was detected in sample C133 as shown on Table 6. This is the only LPAH detected and sample C133 was the only sample with a concentration above the 0.9 ppb detection limit. Sample C133 was collected at a depth of 295 ft. These results agree with the 1989-1992 Tongue Point (Siipola, M.1993) samples, which had no LPAHs detected.

5. High Polynuclear Aromatic hydrocarbons(HPAH): Sample C133 had concentrations of fluoranthene (9.8 ppb), pyrene (11 ppb), benz(a) anthracene (3.8 ppb), chrysene (3.2 ppb), benzo(a) pyrene (5.2 ppb) and benzo(g,h,I) perylene (4.3 ppb). It had the most detected LPAHs of all the September 2000 samples, with C100 the second most as shown on Table 7. Sample C100 had concentrations of fluoranthene (6.5 ppb), pyrene (8.1 ppb), benz(a) anthracene (4.3 ppb), benzofluoranthenes (b+k) (6.2 ppb), and benzo(a) pyrene (3.8 ppb). Sample C110 had a 3.5 ppb concentration of pyrene. All of these samples were taken at depths between 219 and 295 ft.

6. **Chlorinated Hydrocarbons:** As shown on Table 8, none were detected.

7. **Miscellaneous Extractables:** As shown on Table 9, none were detected.

8. **Phthalate Compounds:** All samples had concentrations of at least one phthalate compound. Bis(2-ethylhexyl) phthalate was detected in all ten samples, with concentrations varying from 27 ppb to 64 ppb are shown on Table 10. Sound Analytical Labs flagged these results with the B1 qualifier, which means, "This analyte was detected in the associated method blank. The analyte concentration was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank)." The same qualifier flagged the Di-nbutyl phthalate concentrations, which ranged between 18 to 27 ppb on seven samples. The Di-nbutyl phthalate concentrations were also flagged with the J qualifier, which means, "The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity." Since the Di-nbutyl phthalate and Bis(2-ethylhexyl) phthalate concentrations are estimated and/or qualified, a clear conclusion can not be drawn from these results. These are common laboratory contaminates.

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TABLE 2
MCR ODMDS DEEP WATER SITE
PHYSICAL ANALYSES

Location	Sample	Date	Grain Size Mean mm	Grain Size Median mm	Grain Size Distribution: Sand % finer (passes 60 s.)	Vf Sand % Fines (passes 120 s.)	Silt % finer (passes 230 s.)	Clay %	TVS %	TOC %	Depth (ft)
BASELINE (Deep Water Site)											
COE Deep Water Site Sampling	C89	9/1/2000	0.12	0.18	96.24	13.17	2.56	1.66	1.10	1.40	183
COE Deep Water Site Sampling	C97	9/1/2000	0.12	0.17	94.52	19.05	9.57	4.22	2.10	4.90	260
COE Deep Water Site Sampling	C98	9/1/2000	0.13	0.18	94.35	16.18	6.41	2.31	0.67	2.20	245
COE Deep Water Site Sampling	C99	9/1/2000	0.12	0.18	95.89	16.16	4.03	1.51	1.36	2.20	233
COE Deep Water Site Sampling	C100	9/1/2000	0.12	0.17	93.93	15.31	5.23	2.97	0.82	2.70	219
COE Deep Water Site Sampling	C102	9/1/2000	0.12	0.19	96.29	13.93	3.41	1.62	1.19	1.90	186
COE Deep Water Site Sampling	C110	9/1/2000	0.11	0.17	92.93	27.09	16.14	5.25	2.71	6.80	280
COE Deep Water Site Sampling	C133	9/1/2000	0.11	0.14	93.93	38.43	18.21	5.12	3.05	6.40	295
COE Deep Water Site Sampling	C134	9/1/2000	0.12	0.17	94.8	26.09	12.3	3.22	2.43	3.80	282
COE Deep Water Site Sampling	C136	9/1/2000	0.12	0.16	96.16	19.47	5.79	3.22	1.70	2.70	250
SW WA Sidescan-Sonar Study	46	9/1/1997	0.13	0.15	99.04	27.97	8.43	1.35	---	---	230
SW WA Sidescan-Sonar Study	67	9/1/1997	0.21	0.21	67.79	4.79	1.315	0.08	---	---	151
SW WA Sidescan-Sonar Study	68	9/1/1997	0.11	0.15	96.98	26.76	16.42	3.72	---	---	239
NMFS's Benthic Infauna Study	32	6/1/1996	0.15	0.16	98.70	23.40	10.20	3.00	1.00	---	180
NMFS's Benthic Infauna Study	33	6/1/1996	0.13	0.15	98.20	31.60	21.70	8.10	1.00	---	200
NMFS's Benthic Infauna Study	34	6/1/1996	0.15	0.16	97.00	23.00	11.20	5.50	1.00	---	225
NMFS's Benthic Infauna Study	35	6/1/1996	0.13	0.15	98.60	31.60	17.90	7.60	1.90	---	249
NMFS's Benthic Infauna Study	36	6/1/1996	0.11	0.12	98.00	50.80	30.90	7.60	2.60	---	294
NMFS's Benthic Infauna Study	32	10/1/1995	0.16	0.16	98.90	22.80	9.50	2.90	1.30	---	180
NMFS's Benthic Infauna Study	33	10/1/1995	0.16	0.16	98.30	23.40	8.90	3.00	1.50	---	200
NMFS's Benthic Infauna Study	34	10/1/1995	0.15	0.16	97.80	24.00	9.40	4.10	1.70	---	225
NMFS's Benthic Infauna Study	35	10/1/1995	0.14	0.15	98.00	28.00	15.70	4.10	1.60	---	249
NMFS's Benthic Infauna Study	36	10/1/1995	0.09	0.09	96.90	65.80	33.70	9.80	3.70	---	294
NMFS's Benthic Inf. & Sed. Study	52	8/1/1994	0.14	0.15	98.00	30.30	15.50	0.00	0.40	---	190
NMFS's Benthic Inf. & Sed. Study	55	8/1/1994	0.15	0.16	98.30	25.10	8.30	0.00	1.20	---	217
NMFS's Benthic Inf. & Sed. Study	56	8/1/1994	0.16	0.16	98.50	25.70	6.60	3.10	0.10	---	161
NMFS's Benthic Inf. & Sed. Study	58	8/1/1994	0.16	0.16	98.60	22.40	7.40	3.00	1.30	---	220
NMFS's Benthic Inf. & Sed. Study	59	8/1/1994	0.16	0.16	99.90	24.90	3.80	1.80	0.60	---	175
NMFS's Benthic Inf. & Sed. Study	A4	8/1/1994	0.23	0.21	65.20	4.80	2.40	0.00	0.80	---	150
NMFS's Benthic Inf. & Sed. Study	A7	8/1/1994	0.16	0.16	97.20	22.30	2.00	0.00	0.50	---	150
NMFS's Benthic Inf. & Sed. Study	B2	8/1/1994	0.16	0.16	95.60	22.90	5.40	0.00	1.00	---	148
NMFS's Benthic Inf. & Sed. Study	B6	8/1/1994	0.21	0.19	76.20	7.50	3.40	0.00	0.50	---	140
NMFS's Benthic Inf. & Sed. Study	52	7/29/1993	0.18	0.16	90.40	25.10	13.80	0.00	3.40	---	190
NMFS's Benthic Inf. & Sed. Study	55	7/29/1993	0.17	0.17	97.60	16.20	4.80	0.00	1.20	---	217
NMFS's Benthic Inf. & Sed. Study	56	7/29/1993	0.16	0.16	98.10	17.10	2.30	0.00	1.10	---	161
NMFS's Benthic Inf. & Sed. Study	58	7/29/1993	0.17	0.17	96.90	15.50	4.10	0.00	1.50	---	220
NMFS's Benthic Inf. & Sed. Study	59	7/29/1993	0.16	0.16	98.90	21.30	2.50	0.00	1.00		175
NMFS's Benthic Inf. & Sed. Study	A4	7/29/1993	0.20	0.19	81.00	10.70	1.50	0.00	1.10	---	150
NMFS's Benthic Inf. & Sed. Study	A7	7/29/1993	0.17	0.17	97.40	16.10	2.20	0.00	1.10	---	150
NMFS's Benthic Inf. & Sed. Study	B2	7/29/1993	0.17	0.17	94.80	17.80	3.20	0.00	1.10	---	148
NMFS's Benthic Inf. & Sed. Study	B6	7/29/1993	0.19	0.19	81.00	11.10	2.10	0.00	0.80	---	140

TABLE 2- Continuation
MCR ODMDS DEEP WATER SITE
PHYSICAL ANALYSES

Location	Sample	Date	Grain Size		Grain Size Distribution						
			Mean mm	Median mm	Sand % finer (passes s.60)	Vf Sand % Fines (passes s.120)	Silt % finer (passes s.230)	Clay %	TVS %	TOC %	Depth (ft)
BASELINE (Deep Water Site)											
Tongue Pt - ODMDS Site F	A1	7/1/1992	0.16	0.16	98.20	23.50	8.10	2.50	1.00	0.57	168
Tongue Pt - ODMDS Site F	A4	7/1/1992	0.16	0.16	97.90	17.50	1.30	0.00	1.00	0.17	162
Tongue Pt - ODMDS Site F	A7	7/1/1992	0.16	0.15	96.70	30.70	0.10	0.00	1.00	1.20	156
Tongue Pt - ODMDS Site F	B2	7/1/1992	0.17	0.16	95.20	18.70	1.60	0.00	0.70	0.17	153
Tongue Pt - ODMDS Site F	B3	7/1/1992	0.14	0.14	97.50	41.00	0.90	0.00	0.60	0.11	150
Tongue Pt - ODMDS Site F	B5	7/1/1992	0.16	0.16	97.60	20.40	1.00	0.00	0.80	0.13	150
Tongue Pt - ODMDS Site F	B6	7/1/1992	0.16	0.16	97.80	23.10	0.90	0.00	0.40	0.10	147
NMFS's Benthic Infauna Study	40	7/27/1992	0.14	0.15	98.70	30.10	15.60	5.30	0.71	2.2	255
NMFS's Benthic Infauna Study	41	7/27/1992	0.15	0.16	98.80	24.60	9.10	3.60	1.50	0.64	202
NMFS's Benthic Infauna Study	42	7/27/1992	0.18	0.17	86.90	18.00	0.50	0.00	0.50	0.06	85
NMFS's Benthic Infauna Study	44	7/27/1992	0.14	0.13	98.60	44.50	7.40	3.30	1.30	0.27	220
NMFS's Benthic Infauna Study	45	7/27/1992	0.16	0.16	98.70	24.30	0.50	0.00	0.70	0.2	159
NMFS's Benthic Infauna Study	46	7/27/1992	0.14	0.13	98.20	43.50	0.40	0.00	0.60	0.09	104
Tongue Pt - ODMDS Site F	A1	7/9/1991	0.17	0.17	95.60	16.40	2.20	0.00	0.90	1.30	168
Tongue Pt - ODMDS Site F	A4	7/9/1991	0.15	0.14	97.50	38.80	0.70	0.00	1.00	0.95	162
Tongue Pt - ODMDS Site F	A7	7/9/1991	0.16	0.16	98.10	19.50	0.30	0.00	0.90	1.20	156
Tongue Pt - ODMDS Site F	B2	7/9/1991	0.15	0.14	92.50	37.60	2.00	0.00	0.90	1.00	153
Tongue Pt - ODMDS Site F	B3	7/9/1991	0.14	0.13	96.70	44.10	0.90	0.00	0.80	0.94	150
Tongue Pt - ODMDS Site F	B5	7/9/1991	0.16	0.15	95.60	31.70	0.50	0.00	0.70	1.10	150
Tongue Pt - ODMDS Site F	B6	7/9/1991	0.16	0.16	96.80	21.70	1.20	0.00	0.80	1.30	147
Tongue Pt - ODMDS Site F	A1	6/27/1990	0.16	0.16	97.90	17.50	0.90	0.00	1.00	---	168
Tongue Pt - ODMDS Site F	A4	6/27/1990	0.16	0.16	97.40	26.80	2.50	0.00	1.00	0.16	162
Tongue Pt - ODMDS Site F	A7	6/27/1990	0.16	0.16	97.80	24.60	0.40	0.00	0.80	---	156
Tongue Pt - ODMDS Site F	B2	6/27/1990	0.17	0.16	91.60	24.70	1.30	0.00	0.70	0.06	153
Tongue Pt - ODMDS Site F	B3	6/27/1990	0.16	0.16	97.70	25.20	0.60	0.00	0.80	---	150
Tongue Pt - ODMDS Site F	B5	6/27/1990	0.15	0.15	97.20	33.00	0.60	0.00	0.80	---	150
Tongue Pt - ODMDS Site F	B6	6/27/1990	0.15	0.15	97.80	34.70	0.40	0.00	0.90	0.04	147
Tongue Pt - ODMDS Site F	A1	3/1/1990	0.16	0.16	97.40	23.40	1.70	0.00	0.90	---	168
Tongue Pt - ODMDS Site F	A4	3/1/1990	0.16	0.16	98.00	18.30	0.60	0.00	0.70	0.07	162
Tongue Pt - ODMDS Site F	A7	3/1/1990	0.16	0.16	96.70	20.80	0.60	0.00	0.80	---	156
Tongue Pt - ODMDS Site F	B2	3/1/1990	---	0.11	97.50	54.30	26.00	0.00	1.90	0.29	153
Tongue Pt - ODMDS Site F	B3	3/1/1990	0.17	0.17	95.90	15.80	0.30	0.00	0.60	---	150
Tongue Pt - ODMDS Site F	B5	3/1/1990	0.16	0.16	97.80	28.40	3.10	0.00	1.10	---	150
Tongue Pt - ODMDS Site F	B6	3/1/1990	0.16	0.16	98.60	23.70	0.60	0.00	0.70	0.07	147
Tongue Pt - ODMDS Site F	A7	7/10/1989	0.16	0.16	98.30	22.50	0.40	0.00	0.80	---	156
Tongue Pt - ODMDS Site F	B2	7/10/1989	0.16	0.16	98.10	25.00	1.20	0.00	0.60	0.06	153
Tongue Pt - ODMDS Site F	B3	7/10/1989	0.16	0.15	98.40	27.10	0.80	0.00	0.60	---	150
Tongue Pt - ODMDS Site F	B5	7/10/1989	0.15	0.14	97.90	40.30	0.70	0.00	0.60	---	150
Tongue Pt - ODMDS Site F	B6	7/10/1989	0.15	0.14	98.10	36.10	0.50	0.00	0.60	0.08	147

TABLE 2-Continuation
MCR ODMDS DEEP WATER SITE
PHYSICAL ANALYSES

Location	Sample	Date	Grain Size Mean mm	Grain Size Median mm	Grain Size Distribution: Sand % finer (passes 60 s.)	Vf Sand % Fines (passes 120 s.)	Silt % finer (passes 230 s.)	Clay %	TVS %	TOC %	Depth (ft)
BASELINE (Deep Water Site)											
Aquatic Disposal Field Investigation.	12	12/8/1974	---	---	99.00	41.00	2.00	1.00	---	---	115
Aquatic Disposal Field Investigation.	12	12/11/1975	---	---	99.00	40.00	2.00	1.00	---	---	115
Aquatic Disposal Field Investigation.	13	9/12/1975	---	---	98.00	40.00	1.00	1.00	---	---	167
Aquatic Disposal Field Investigation.	13	12/11/1975	---	---	97.00	38.00	1.00	1.00	---	---	167
Aquatic Disposal Field Investigation.	14	9/12/1975	---	---	99.00	42.00	2.00	1.00	---	---	230
Aquatic Disposal Field Investigation.	14	10/1/1975	---	---	99.00	42.00	2.00	1.00	---	---	230
Aquatic Disposal Field Investigation.	15	9/12/1975	---	---	99.00	48.00	1.00	0.00	---	---	266
Aquatic Disposal Field Investigation.	15	10/1/1975	---	---	99.00	43.00	2.00	1.00	---	---	266
Aquatic Disposal Field Investigation.	15	12/11/1975	---	---	98.00	40.00	2.00	1.00	---	---	266
Aquatic Disposal Field Investigation.	16	12/1/1974	---	---	99.00	43.00	2.00	1.00	---	---	252
Aquatic Disposal Field Investigation.	16	9/12/1975	---	---	99.00	45.00	2.00	1.00	---	---	252
Aquatic Disposal Field Investigation.	16	10/1/1975	---	---	99.00	46.00	2.00	1.00	---	---	252
Aquatic Disposal Field Investigation.	17	12/8/1974	---	---	99.00	42.00	1.00	1.00	---	---	203
Aquatic Disposal Field Investigation.	17	12/11/1975	---	---	94.00	26.00	1.00	1.00	---	---	203
Aquatic Disposal Field Investigation.	18	12/8/1974	---	---	97.00	35.00	1.00	1.00	---	---	131
Aquatic Disposal Field Investigation.	18	12/12/1974	---	---	99.00	35.00	2.00	1.00	---	---	131
Aquatic Disposal Field Investigation.	18	7/8/1975	---	---	99.00	44.00	2.00	1.00	---	---	131
Aquatic Disposal Field Investigation.	18	12/11/1975	---	---	96.00	32.00	1.00	1.00	---	---	131
Aquatic Disposal Field Investigation.	19	12/8/1974	---	---	98.00	29.00	1.00	1.00	---	---	85
Aquatic Disposal Field Investigation.	19	7/8/1975	---	---	97.00	29.00	2.00	2.00	---	---	85
Aquatic Disposal Field Investigation.	47	9/28/1974	---	---	96.00	53.00	46.00	15.00	---	---	298
Aquatic Disposal Field Investigation.	47	11/1/1974	---	---	88.00	40.00	21.00	4.00	---	---	298
Aquatic Disposal Field Investigation.	54	9/28/1974	---	---	97.00	75.00	58.00	16.00			282
Aquatic Disposal Field Investigation.	54	11/1/1974	---	---	99.00	92.00	59.00	6.00	---	---	282
Aquatic Disposal Field Investigation.	54	8/1/1975	---	---	98.00	96.00	81.00	12.00	---	---	282
Aquatic Disposal Field Investigation.	55	1/25/1975	---	---	99.00	65.00	13.00	1.00	---	---	252
Aquatic Disposal Field Investigation.	55	4/19/1975	---	---	99.00	75.00	26.00	2.00	---	---	252
Aquatic Disposal Field Investigation.	55	7/23/1975	---	---	100.00	85.00	32.00	22.00	---	---	252
Aquatic Disposal Field Investigation.	55	9/12/1975	---	---	100.00	97.00	79.00	13.00	---	---	252
Aquatic Disposal Field Investigation.	56	12/8/1974	---	---	99.00	70.00	10.00	1.00	---	---	203
Aquatic Disposal Field Investigation.	56	1/25/1975	---	---	96.00	57.00	4.00	1.00	---	---	203
Aquatic Disposal Field Investigation.	56	12/11/1975	---	---	96.00	50.00	3.00	1.00	---	---	203
Aquatic Disposal Field Investigation.	69	9/28/1974	---	---	100.00	74.00	14.00	1.00	---	---	223
Aquatic Disposal Field Investigation.	69	1/25/1975	---	---	100.00	88.00	28.00	1.00	---	---	223
Aquatic Disposal Field Investigation.	69	4/19/1975	---	---	100.00	80.00	18.00	1.00	---	---	223
Aquatic Disposal Field Investigation.	69	7/23/1975	---	---	100.00	82.00	15.00	1.00	---	---	223
Aquatic Disposal Field Investigation.	69	9/12/1975	---	---	100.00	83.00	26.00	4.00	---	---	223
Aquatic Disposal Field Investigation.	70	9/28/1974	---	---	100.00	76.00	13.00	1.00	---	---	167
Aquatic Disposal Field Investigation.	70	1/25/1975	---	---	100.00	69.00	11.00	1.00	---	---	167

TABLE 3
MCR ODMDS DEEP WATER SITE
TOTAL METALS ANALYSES OF SEDIMENTS in ppm

Location	Sample	Date	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Silver
BASELINE (Deep Water Site)											
COE Deep Water Site Sampling	C89	9/1/2000	3.90	0.39	---	7.70	4.30	<0.02	14.00	44.00	0.07
COE Deep Water Site Sampling	C97	9/1/2000	4.70	0.69	---	10.00	5.40	<0.02	14.00	45.00	0.1
COE Deep Water Site Sampling	C98	9/1/2000	4.70	0.52	---	8.30	4.70	<0.02	15.00	45.00	0.081
COE Deep Water Site Sampling	C99	9/1/2000	5.00	0.43	---	7.70	4.30	<0.02	15.00	42.00	0.067
COE Deep Water Site Sampling	C100	9/1/2000	5.60	0.38	---	9.30	5.10	<0.02	16.00	48.00	0.098
COE Deep Water Site Sampling	C102	9/1/2000	3.90	0.40	---	8.00	4.10	<0.02	14.00	40.00	0.065
COE Deep Water Site Sampling	C110	9/1/2000	6.20	0.89	---	15.00	8.00	0.038	18.00	55.00	0.16
COE Deep Water Site Sampling	C133	9/1/2000	7.20	0.85	---	13.00	7.60	<0.02	25.00	57.00	0.12
COE Deep Water Site Sampling	C134	9/1/2000	6.40	0.73	---	11.00	6.80	<0.02	18.00	50.00	0.12
COE Deep Water Site Sampling	C136	9/1/2000	5.40	0.54	---	8.90	5.50	<0.02	17.00	45.00	0.081
NMFS's Benthic Infauna Study	40	7/1/1992	3.70	0.06	29.00	8.90	4.50	0.02	14.00	58.00	<0.01
NMFS's Benthic Infauna Study	41	7/1/1992	2.10	0.04	30.00	5.10	4.00	0.015	13.00	54.00	<0.01
NMFS's Benthic Infauna Study	42	7/1/1992	1.20	0.01	35.00	4.40	<2.00	0.011	15.00	62.00	<0.01
NMFS's Benthic Infauna Study	44	7/1/1992	2.20	0.02	32.00	2.90	4.00	<0.013	15.00	47.00	0.01
NMFS's Benthic Infauna Study	45	7/1/1992	2.30	0.02	32.00	2.80	<2.0	<0.013	14.00	45.00	<0.01
NMFS's Benthic Infauna Study	46	7/1/1992	1.10	0.01	84.00	5.70	<2.0	<0.009	18.00	120.00	<0.01
Tongue Point - Site F	B2	########	5.40	<0.050	27.00	6.30	5.00	0.04	0.00	52.00	---
Tongue Point - Site F	B6	########	5.40	<0.030	25.00	6.30	3.70	<0.030	0.00	45.00	---
Tongue Point - Site F	A4	3/1/1990	2.70	0.04	19.50	4.75	4.59	0.02	14.50	38.90	<0.01
Tongue Point - Site F	B2	3/1/1990	4.20	0.02	18.50	10.70	4.83	0.03	14.00	50.80	0.02
Tongue Point - Site F	B6	3/1/1990	4.30	0.02	19.70	4.60	4.87	0.02	14.00	37.80	<0.01
Tongue Point - Site F	B2	7/1/1992	3.00	<0.050	18.00	7.00	4.00	<0.02	14.00	42.00	<0.01
Tongue Point - Site F	B6	7/1/1992	3.00	<0.050	22.00	6.00	5.00	<0.02	15.00	43.00	<0.01
Screening Levels			**57**	**5.1**		**390**	**450**	**0.41**	**140**	**410**	---
Bioaccum. Trigger			**507.1**	---	---	---	---	**1.5**	**370**	---	---

TABLE 4
MCR ODMDS DEEP WATER SITE
PHENOLS COMPOUNDS ANALYSES in ppb

Location	Sample	Date	Phenol	2-methylphenol	4-methylphenol	2,4-dimethylphenol	Pentachlorophenol
BASELINE (Deep Water Site)							
COE Deep Water Site Sampling	C89	9/1/2000	<4.7	<1.9	<3.4	<3.3	<1.7
COE Deep Water Site Sampling	C97	9/1/2000	**20.00**	<2.0	**12.00**	<3.5	<1.8
COE Deep Water Site Sampling	C98	9/1/2000	<5.0	<2.0	<3.6	<3.6	<1.8
COE Deep Water Site Sampling	C99	9/1/2000	<4.7	<1.9	<3.4	<3.3	<1.7
COE Deep Water Site Sampling	C100	9/1/2000	<5.0	<2.0	<3.6	<3.5	<1.8
COE Deep Water Site Sampling	C102	9/1/2000	<4.5	<1.8	<3.2	<3.2	<1.7
COE Deep Water Site Sampling	C110	9/1/2000	<5.4	<2.2	**6.20**	<3.8	<2.0
COE Deep Water Site Sampling	C133	9/1/2000	**140.00**	<2.2	**37.00**	<3.8	<1.9
COE Deep Water Site Sampling	C134	9/1/2000	<4.7	<1.9	<3.4	<3.3	<1.7
COE Deep Water Site Sampling	C136	9/1/2000	<4.7	<1.9	<3.4	<3.3	<1.7
Screening level			420	63	670	29	400
Bioacc. Trigger			876	---	---	---	504

TABLE 5
MCR ODMDS DEEP WATER SITE
PESTICIDES AND PCBs ANALYSIS in ppb

Location	Sample	Date	Total BHC	Aldrin	Alpha-Chlordane	Dieldrin	DDD	DDE	DDT	Endosulfan I, II & Sulfate	Endrin	Endrin aldehyde	Heptachlor	Heptachlor epoxide	Lindane g-BHC	Methoxychlor	Toxaphene	Total PCB
BASELINE (Deep Water Site)																		
COE Deep Water Site Sampling	C89	9/1/2000	<0.28	<0.12	<8.5	<0.38	<0.14	<0.17	<0.21	<0.36	<0.38	<0.45	<0.13	<0.22	<0.23	<1.0	<15	<8.3
COE Deep Water Site Sampling	C97	9/1/2000	<0.33	<0.15	<10	<0.35	<0.17	<0.20	<0.25	<0.43	<0.45	<0.53	<0.16	<0.26	<0.27	<1.2	<17	<9.9
COE Deep Water Site Sampling	C98	9/1/2000	<0.31	<0.14	<9.5	<0.33	<0.16	<0.19	<0.24	<0.40	<0.42	<0.50	<0.15	<0.24	<0.26	<1.1	<16	<9.3
COE Deep Water Site Sampling	C99	9/1/2000	<0.18	<0.13	<9.2	<0.32	<0.15	<0.19	<0.23	<0.39	<0.41	<0.48	<0.15	<0.24	<0.25	<1.1	<16	<8.7
COE Deep Water Site Sampling	C100	9/1/2000	<0.19	<0.13	<9.3	<0.33	<0.16	<0.19	<0.23	<0.40	<0.42	<0.49	<0.15	<0.24	<0.25	<1.1	<16	<9.1
COE Deep Water Site Sampling	C102	9/1/2000	<0.29	<0.13	<8.8	<0.31	<0.15	<0.18	<0.22	<0.37	<0.39	<0.47	<0.14	<0.23	<0.24	<1.1	<15	<8.6
COE Deep Water Site Sampling	C110	9/1/2000	<0.33	<0.15	<10.0	<0.36	<0.17	<0.21	<0.25	<0.43	<0.46	<0.54	<0.16	<0.26	<0.28	<1.2	<18	<15.0
COE Deep Water Site Sampling	C133	9/1/2000	<0.19	<0.13	<9.4	<0.33	<0.16	<0.19	<0.23	<0.40	<0.42	<0.49	<0.15	<0.24	<0.25	<1.1	<16	<9.1
COE Deep Water Site Sampling	C134	9/1/2000	<0.18	<0.13	<9.1	<0.32	<0.15	<0.18	<0.23	<0.39	<0.41	<0.48	<0.14	<0.23	<0.25	<1.1	<16	<8.9
COE Deep Water Site Sampling	C136	9/1/2000	<0.19	<0.13	<9.2	<0.32	<0.16	<0.19	<0.23	<0.39	<0.41	<0.49	<0.15	<0.24	<0.25	<1.1	<16	<8.8
NMFS's Benthic Infauna Study	42	7/1/1992	---	<0.53	<0.53	<0.71	<0.89	<0.71	<1.8	---	---	---	<0.53	---	**0.96**	---	---	<8.8
NMFS's Benthic Infauna Study	44	7/1/1992	---	<0.60	<0.60	<0.80	<1.0	<0.80	<2.0	---	---	---	<0.60	---	**0.64**	---	---	<10
NMFS's Benthic Infauna Study	45	7/1/1992	---	<0.58	<0.58	<0.78	<0.97	<0.78	<1.9	---	---	---	<0.58	---	**1.4**	---	---	<9.7
NMFS's Benthic Infauna Study	46	7/1/1992	---	<0.53	<0.53	<0.70	<0.88	<0.70	<1.8	---	---	---	<0.53	---	**0.89**	---	---	<8.8
Tongue Point - Site F	B2	#######	---	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<1.0	<2.0	---	<1.0	---	<1.0	<4.0	<150	<20.0
Tongue Point - Site F	B3	#######	---	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<1.0	<2.0	---	<1.0	---	<1.0	<4.0	<150	<20.0
Tongue Point - Site F	A4	3/1/1990	---	<3.0	<4.0	<6.0	<6.0	<6.0	<6.0	<3.0	<6.0	---	<3.0	---	<3.0	<12.0	<450.0	<60.0
Tongue Point - Site F	B2	3/1/1990	---	<3.0	<4.0	<6.0	<6.0	<6.0	<6.0	<3.0	<6.0	---	<3.0	---	<3.0	<12.0	<450.0	<60.0
Tongue Point - Site F	B6	3/1/1990	---	<3.0	<4.0	<6.0	<6.0	<6.0	<6.0	<3.0	<6.0	---	<3.0	---	<3.0	<12.0	<450.0	<60.0
Tongue Point - Site F	B2	7/1/1992	---	<2.0	<10	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	---	<2.0	---	<2.0	<4.0	<30.0	<10.0
Tongue Point - Site F	B6	7/1/1992	---	<2.0	<10	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	---	<2.0	---	<2.0	<4.0	<30.0	<10.0
Screening level				**10**	**10**	**10**								**10**	**10**			**130**
Bioacc. Trigger				37	37	37								37	---			38

TABLE 6
MCR ODMDS DEEP WATER SITE
LOW POLYNUCLEAR AROMATIC HYDROCARBONS ANALYSES in ppb

Location	Sample	Date	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	2- Methyl-naphthalene	Total LPAHs
BASELINE (Deep Water Site)										
COE Deep Water Site Sampling	C89	9/1/2000	<2.5	<1.0	<0.91	<1.0	<0.85	<1.2	<1.8	ND
COE Deep Water Site Sampling	C97	9/1/2000	<2.6	<1.1	<0.94	<1.1	<0.88	<1.3	<1.9	ND
COE Deep Water Site Sampling	C98	9/1/2000	<2.7	<1.1	<0.97	<1.1	<0.9	<1.3	<2.0	ND
COE Deep Water Site Sampling	C99	9/1/2000	<2.5	<1.0	<0.90	<1.0	<0.84	<1.2	<1.8	ND
COE Deep Water Site Sampling	C100	9/1/2000	<2.7	<1.1	<0.98	<1.1	<0.9	<1.3	<1.9	ND
COE Deep Water Site Sampling	C102	9/1/2000	<2.4	<1.0	<0.87	<1.0	<0.81	<1.2	<1.8	ND
COE Deep Water Site Sampling	C110	9/1/2000	<2.9	<1.2	<1.0	<1.2	<0.97	<1.4	<2.2	ND
COE Deep Water Site Sampling	C133	9/1/2000	<2.9	<1.2	<1.0	<1.2	**7.0**	<1.4	<2.2	**7.0**
COE Deep Water Site Sampling	C134	9/1/2000	<2.5	<1.0	<0.90	<1.0	<0.84	<1.2	<1.9	ND
COE Deep Water Site Sampling	C136	9/1/2000	<2.5	<1.0	<0.91	<1.0	<0.85	<1.2	<1.8	ND
Tongue Point - Site F	B2	7/10/1989	<30.0	<30.0	<30.0	<30.0	<30.0	<30.0	---	ND
Tongue Point - Site F	B3	7/10/1989	<30.0	<30.0	<30.0	<30.0	<30.0	<30.0	---	ND
Tongue Point - Site F	A4	3/1/1990	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	---	ND
Tongue Point - Site F	B2	3/1/1990	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	---	ND
Tongue Point - Site F	B6	3/1/1990	<50.0	<50.0	<50.0	<50.0	<50.0	<50.0	---	ND
Tongue Point - Site F	B2	7/1/1992	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	---	ND
Tongue Point - Site F	B6	7/1/1992	<20.0	<20.0	<20.0	<20.0	<20.0	<20.0	---	ND
Screening level			**2,100**	**560**	**500**	**540**	**1,500**	**960**	**670**	**5,200**
Bioacc. Trigger			---	---	---	---	---	---	---	---

TABLE 7
MCR ODMDS DEEP WATER SITE
HIGH POLYNUCLEAR AROMATIC HYDROCARBONS ANALYSES in ppb

Location	Sample	Date	Fluoranthene	Pyrene	benz(a) - anthracene	Chrysene	Benzofluor- anthenes (b+k)	Benzo (a) - pyrene	Indeno (1,2,3-c,d) pyrene	Dibenz(a,h) anthracene	Benzo(g,h,i) perylene	Total HPHAH
BASELINE (Deep Water Site)												
COE Deep Water Site Sampling	C89	9/1/2000	<0.82	<0.73	<0.82	<1.1	<0.86	<1.1	<0.96	<0.6	<0.39	ND
COE Deep Water Site Sampling	C97	9/1/2000	<0.85	<0.76	<0.85	<1.1	<0.76	<1.1	<1.0	<0.62	<0.4	ND
COE Deep Water Site Sampling	C98	9/1/2000	<0.88	<0.78	<0.88	<1.1	<0.78	<1.1	<1.0	<0.64	<0.41	ND
COE Deep Water Site Sampling	C99	9/1/2000	<0.82	<0.73	<0.82	<1.1	<0.73	<1.1	<0.96	<0.6	<0.39	ND
COE Deep Water Site Sampling	C100	9/1/2000	**6.5**	**8.1**	**4.3**	<1.1	**6.2**	**3.8**	<1.0	<0.63	<0.41	**28.9**
COE Deep Water Site Sampling	C102	9/1/2000	<0.79	<0.70	<0.79	<1.0	<0.70	<1.0	<0.92	<0.57	<0.37	ND
COE Deep Water Site Sampling	C110	9/1/2000	<0.94	**3.5**	<0.94	<1.2	<0.84	<1.2	<1.1	<0.69	<0.44	**3.5**
COE Deep Water Site Sampling	C133	9/1/2000	**9.8**	**11**	**3.8**	**3.2**	<0.83	**5.2**	<1.1	<0.68	**4.3**	**37.3**
COE Deep Water Site Sampling	C134	9/1/2000	<0.81	<0.72	<0.81	<1.1	<0.72	<1.1	<0.95	<0.59	<0.38	ND
COE Deep Water Site Sampling	C136	9/1/2000	<0.82	<0.73	<0.82	<1.1	<0.85	<1.1	<0.96	<0.6	<0.36	ND
Tongue Point - Site F	B2	7/10/1989	<30.0	<30.0	<30.0	<30.0	<50.0	<60.0	<130.0	<130.0	<130.0	ND
Tongue Point - Site F	B3	7/10/1989	<30.0	<30.0	<30.0	<30.0	<50.0	<60.0	<130.0	<130.0	<130.0	ND
Tongue Point - Site F	A4	3/1/1990	<150.0	<50.0	<50.0	<50.0	<150.0	<150.0	<200.0	<200.0	<200.0	ND
Tongue Point - Site F	B2	3/1/1990	<150.0	<50.0	<50.0	<50.0	<150.0	<150.0	<200.0	<200.0	<200.0	ND
Tongue Point - Site F	B6	3/1/1990	<150.0	<50.0	<50.0	<50.0	<150.0	<150.0	<200.0	<200.0	<200.0	ND
Tongue Point - Site F	B2	7/1/1992	<20.0	<20.0	<20.0	<20.0	<40.0	<20.0	<20.0	<20.0	<20.0	ND
Tongue Point - Site F	B6	7/1/1992	<20.0	<20.0	<20.0	<20.0	<40.0	<20.0	<20.0	<20.0	<20.0	ND
Screening level			1,700	2,600	1,300	1,400	3,200	1,600	600	230	670	12,000
Bioacc. Trigger			4,600	---	---	---	---	3,600	---	---	---	---

TABLE 8
MCR ODMDS DEEP WATER SITE
CHLORINATED HYDROCARBONS ANALYSES in ppb

Location	Sample	Date	1,3-Dichlorobenzene	1,4- Dichlorobenzene	1,2-Dichlorobenzene	1,2,4- Trichlorobenzene	Hexachlorobenzene (HCB)
BASELINE (Deep Water Site)							
COE Deep Water Site Sampling	C89	9/1/2000	<3.6	<3.0	<2.6	<1.7	<2.8
COE Deep Water Site Sampling	C97	9/1/2000	<3.8	<3.1	<2.7	<1.8	<3.4
COE Deep Water Site Sampling	C98	9/1/2000	<3.9	<3.2	<2.7	<1.8	<3.5
COE Deep Water Site Sampling	C99	9/1/2000	<3.6	<3.0	<2.6	<1.7	<3.2
COE Deep Water Site Sampling	C100	9/1/2000	<3.8	<3.2	<2.7	<1.8	<3.4
COE Deep Water Site Sampling	C102	9/1/2000	<3.5	<2.9	<2.5	<1.6	<2.7
COE Deep Water Site Sampling	C110	9/1/2000	<4.2	<3.5	<3.0	<2.0	<3.7
COE Deep Water Site Sampling	C133	9/1/2000	<4.1	<3.4	<2.9	<1.9	<3.7
COE Deep Water Site Sampling	C134	9/1/2000	<3.6	<3.0	<2.5	<1.7	<3.2
COE Deep Water Site Sampling	C136	9/1/2000	<3.6	<3.0	<2.6	<2.5	<3.2
Screening level			170	110	35	31	22
Bioacc. Trigger			1,241	120	37	---	168

TABLE 9
MCR ODMDS DEEP WATER SITE
MISCELLANEOUS EXTRACTABLES ANALYSES in ppb

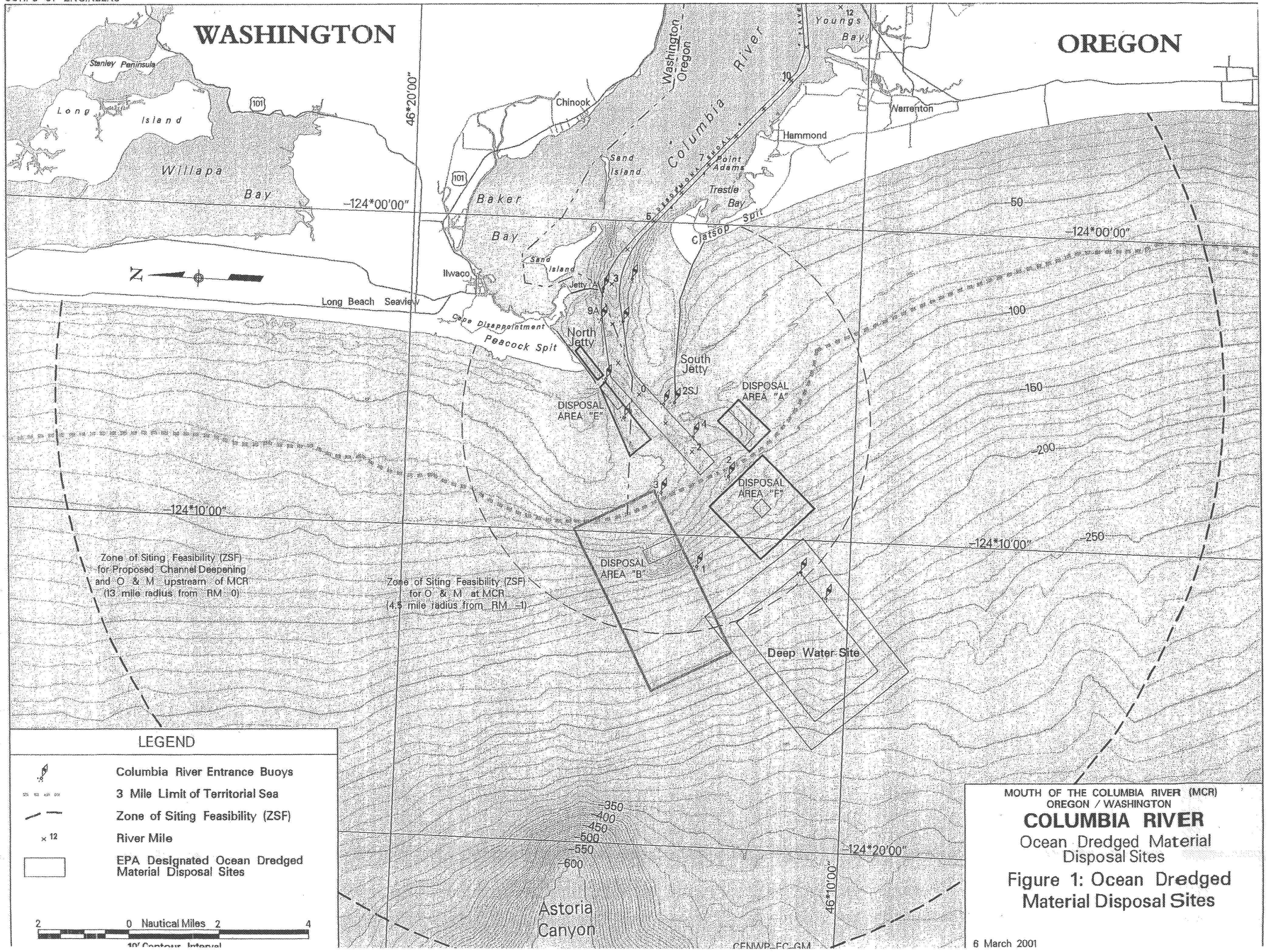
Location	Sample	Date	Benzyl alchohol	Benzoic Acid	Dibenzo furan	Hexachloro-ethane	Hexachloro-Butadiene	N-Nitrosodi-phenylamine
BASELINE (Deep Water Site)								
COE Deep Water Site Sampling	C89	9/1/2000	<3.9	<1.4	<2.6	<3.2	<2.8	<0.95
COE Deep Water Site Sampling	C97	9/1/2000	<4.0	<1.5	<2.7	<4.0	<2.9	<0.99
COE Deep Water Site Sampling	C98	9/1/2000	<4.1	<1.5	<2.8	<4.1	<3.0	<1.0
COE Deep Water Site Sampling	C99	9/1/2000	<3.9	<1.4	<2.6	<3.8	<2.8	<0.95
COE Deep Water Site Sampling	C100	9/1/2000	<4.1	<1.5	<2.7	<4.1	<2.9	<1.0
COE Deep Water Site Sampling	C102	9/1/2000	<3.7	<1.4	<2.5	<3.1	<2.7	<0.92
COE Deep Water Site Sampling	C110	9/1/2000	<4.5	<1.6	<3.0	<4.4	<3.2	<1.1
COE Deep Water Site Sampling	C133	9/1/2000	<4.4	<1.6	<2.9	<4.4	<3.1	<1.1
COE Deep Water Site Sampling	C134	9/1/2000	<3.8	<1.4	<2.7	<3.8	<2.7	<0.94
COE Deep Water Site Sampling	C136	9/1/2000	<3.9	<1.4	<2.6	<3.9	<2.8	<0.95
Screening level			**57**	**650**	**540**	**1,400**	**29**	**28**
Bioacc. Trigger			**---**	**---**	**---**	**10,220**	**212**	**130**

TABLE 10
MCR ODMDS DEEP WATER SITE
PHTHALATES ANALYSES in ppb

Location	Sample	Date	Dimethyl phthalate	Diethyl phthalate	Di-n-butyl phthalate	Butyl Benzyl phthalate	bis(2-Ethylhexyl) phthalate	Di-n-octyl phthalate
BASELINE (Deep Water Site)								
COE Deep Water Site Sampling	C89	9/1/2000	<4.0	<2.7	**18-J B1**	<1.9	**31-B1**	<3.1
COE Deep Water Site Sampling	C97	9/1/2000	<4.2	<2.8	**19-J B1**	<2.0	**27-B1**	<3.2
COE Deep Water Site Sampling	C98	9/1/2000	<4.3	<2.9	**24-J B1**	<2.0	**37-B1**	<3.3
COE Deep Water Site Sampling	C99	9/1/2000	<4.0	<2.7	<16	<1.9	**37-B1**	<3.1
COE Deep Water Site Sampling	C100	9/1/2000	<4.3	<2.9	**23-J B1**	<2.0	**27-B1**	<3.2
COE Deep Water Site Sampling	C102	9/1/2000	<3.9	<2.6	**23-J B1**	**5.9**	**64-B1**	<2.9
COE Deep Water Site Sampling	C110	9/1/2000	<4.6	<3.1	<18	<2.2	**42-B1**	<3.5
COE Deep Water Site Sampling	C133	9/1/2000	<4.6	<3.1	**23-J B1**	<2.1	**38-B1**	<3.5
COE Deep Water Site Sampling	C134	9/1/2000	<4.0	<2.7	<16	<1.9	**39-B1**	<3.0
COE Deep Water Site Sampling	C136	9/1/2000	<4.0	<2.7	**27-B1**	<1.9	**31-B1**	<3.1
Screening level			**1,400**	**1,200**	**5,100**	**970**	**8,300**	**6,200**
Bioacc. Trigger			**1,400**	---	**10,220**	---	**13,870**	---

B1 = This analyte was detected in the associated method blank. The analyte concentration was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank).

J = The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quanity.


WASHINGTON
OREGON
Stanley Peninsula
Long Island
Willapa Bay
101
Chinook
Baker Bay
Sand Island
Ilwaco
Long Beach
Seaview
Cape Disappointment
Peacock Spit
North Jetty
Jetty A
Washington
Oregon
Columbia River
Youngs Bay
Warrenton
Hammond
Point Adams
Trestle Bay
Clatsop Spit
South Jetty
2SJ
9A
46*20'00"
-124*00'00"
-124*10'00"
-124*20'00"
46*10'00"
-50
-100
-150
-200
-250
-350
-400
-450
-500
-550
-600
DISPOSAL AREA "A"
DISPOSAL AREA "B"
DISPOSAL AREA "E"
DISPOSAL AREA "F"
Deep Water Site
Zone of Siting Feasibility (ZSF) for Proposed Channel Deepening and O & M upstream of MCR (13 mile radius from RM 0)
Zone of Siting Feasibility (ZSF) for O & M at MCR (4.5 mile radius from RM -1)
Astoria Canyon
LEGEND
Columbia River Entrance Buoys
3 Mile Limit of Territorial Sea
Zone of Siting Feasibility (ZSF)
River Mile
EPA Designated Ocean Dredged Material Disposal Sites
2 0 Nautical Miles 2 4
10' Contour Interval
MOUTH OF THE COLUMBIA RIVER (MCR)
OREGON / WASHINGTON
COLUMBIA RIVER
Ocean Dredged Material Disposal Sites
Figure 1: Ocean Dredged Material Disposal Sites
6 March 2001
CENWP-EC-GM

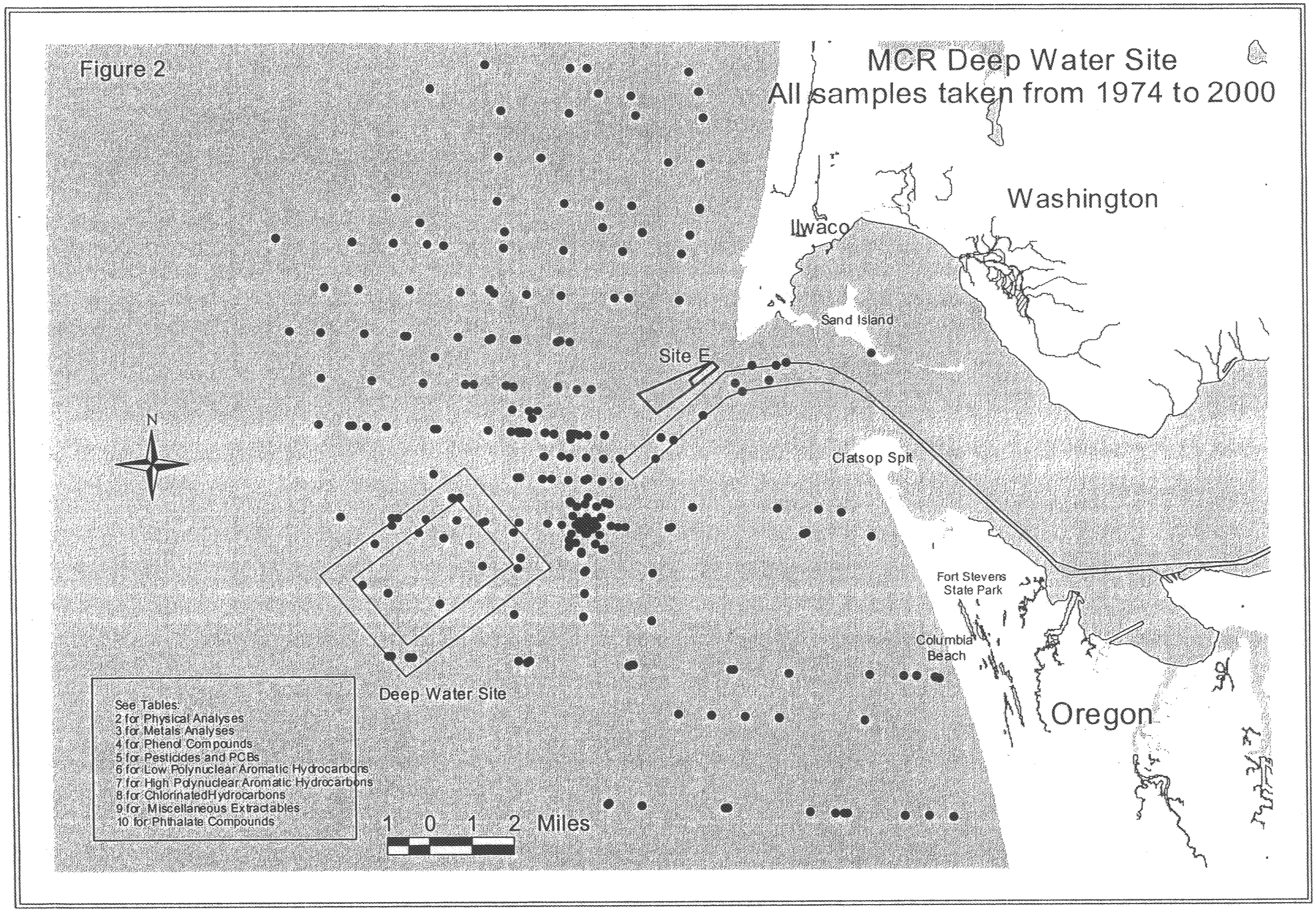


Figure 2
MCR Deep Water Site
All samples taken from 1974 to 2000
Washington
Ilwaco
Sand Island
Site E
N
Clatsop Spit
Deep Water Site
Fort Stevens
State Park
Columbia
Beach
Oregon
See Tables:
2 for Physical Analyses
3 for Metals Analyses
4 for Phenol Compounds
5 for Pesticides and PCBs
6 for Low Polynuclear Aromatic Hydrocarbons
7 for High Polynuclear Aromatic Hydrocarbons
8 for ChlorinatedHydrocarbons
9 for Miscellaneous Extractables
10 for Phthalate Compounds
1 0 1 2 Miles

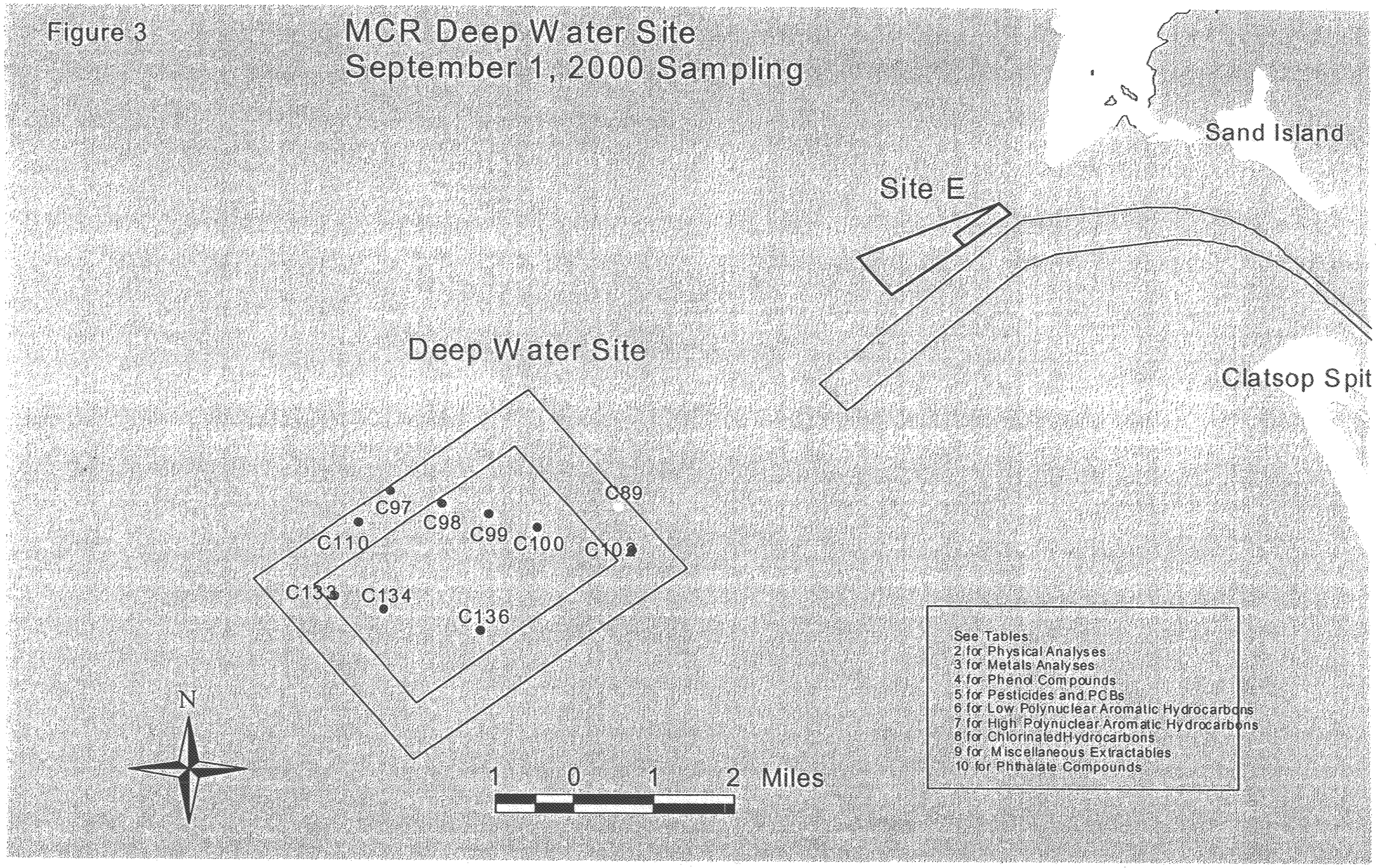


Figure 3
MCR Deep Water Site
September 1, 2000 Sampling
Sand Island
Site E
Deep Water Site
Clatsop Spit
C89
C97
C98
C99
C100
C102
C110
C133
C134
C136
N
1 0 1 2 Miles
See Tables
2 for Physical Analyses
3 for Metals Analyses
4 for Phenol Compounds
5 for Pesticides and PCBs
6 for Low Polynuclear Aromatic Hydrocarbons
7 for High Polynuclear Aromatic Hydrocarbons
8 for ChlorinatedHydrocarbons
9 for Miscellaneous Extractables
10 for Phthalate Compounds

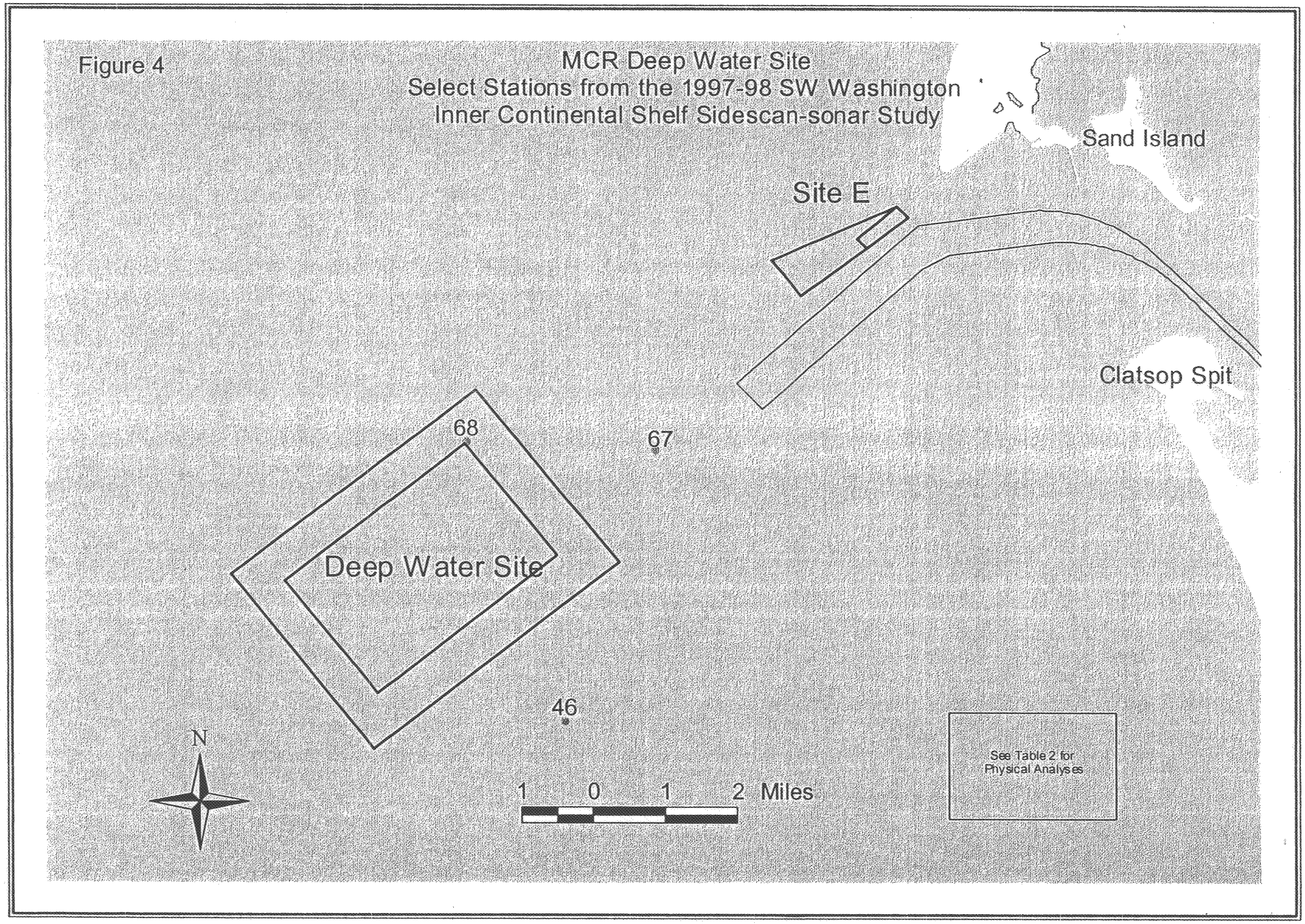


Figure 4
MCR Deep Water Site
Select Stations from the 1997-98 SW Washington
Inner Continental Shelf Sidescan-sonar Study
Sand Island
Site E
Clatsop Spit
68
67
Deep Water Site
46
N
1 0 1 2 Miles
See Table 2 for
Physical Analyses

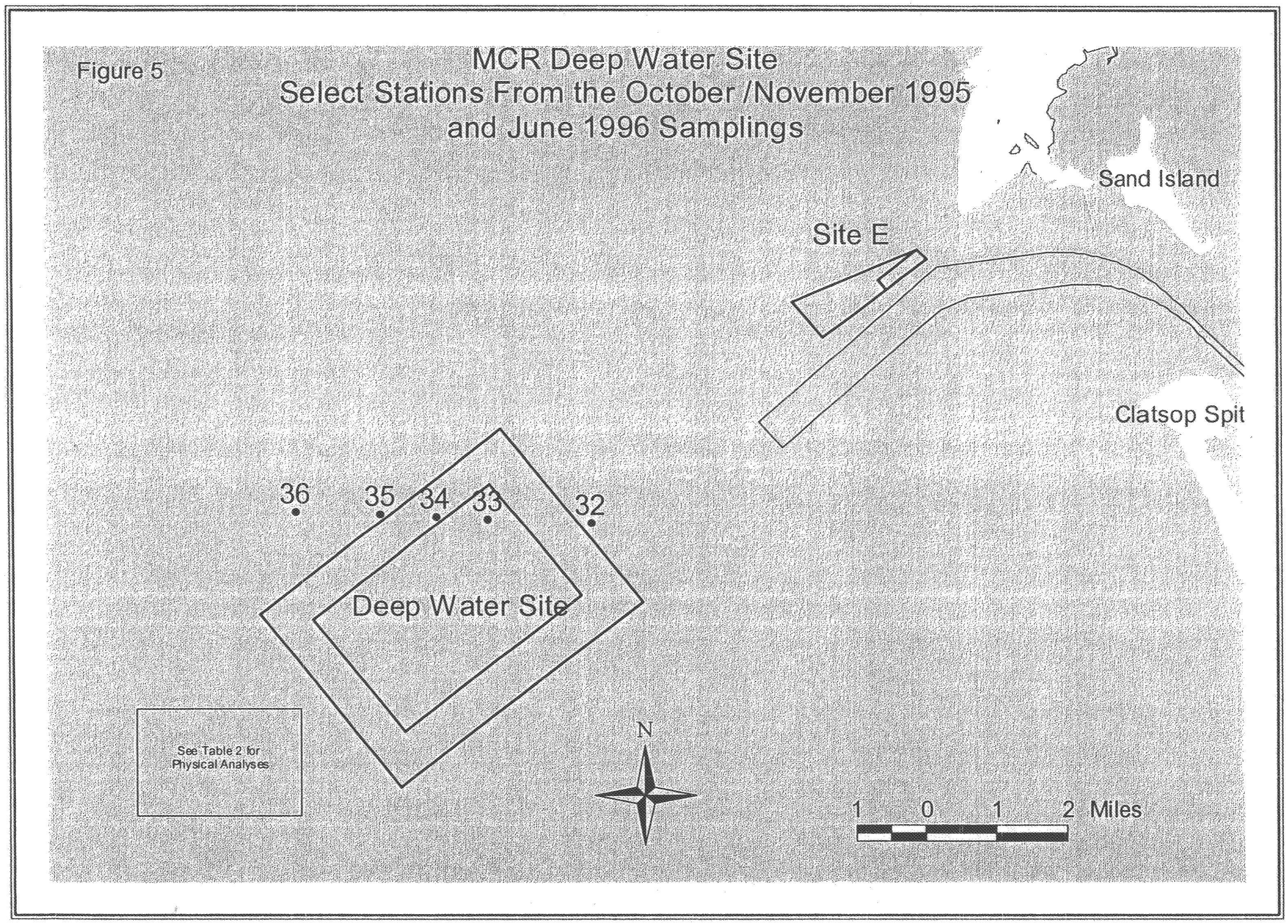


Figure 5
MCR Deep Water Site
Select Stations From the October /November 1995
and June 1996 Samplings
Sand Island
Site E
Clatsop Spit
36
35
34
33
32
Deep Water Site
See Table 2 for
Physical Analyses
N
1 0 1 2 Miles

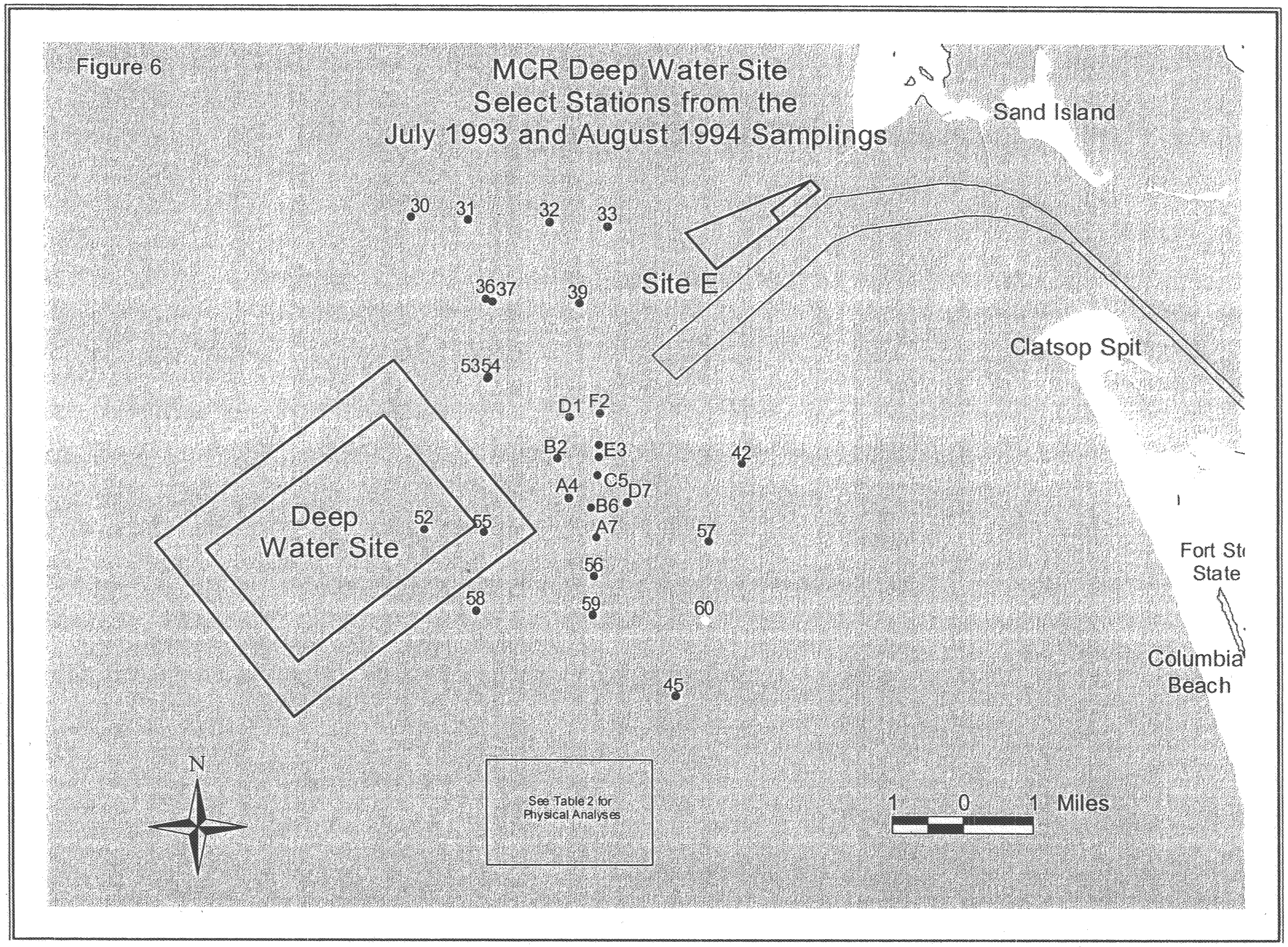


Figure 6
MCR Deep Water Site
Select Stations from the
July 1993 and August 1994 Samplings
Sand Island
30
31
32
33
Site E
36
37
39
Clatsop Spit
53
54
D1
F2
B2
E3
42
A4
C5
D7
B6
Deep
Water Site
52
55
A7
57
56
58
59
60
45
Columbia
Beach
N
See Table 2 for
Physical Analyses
1
0
1
Miles

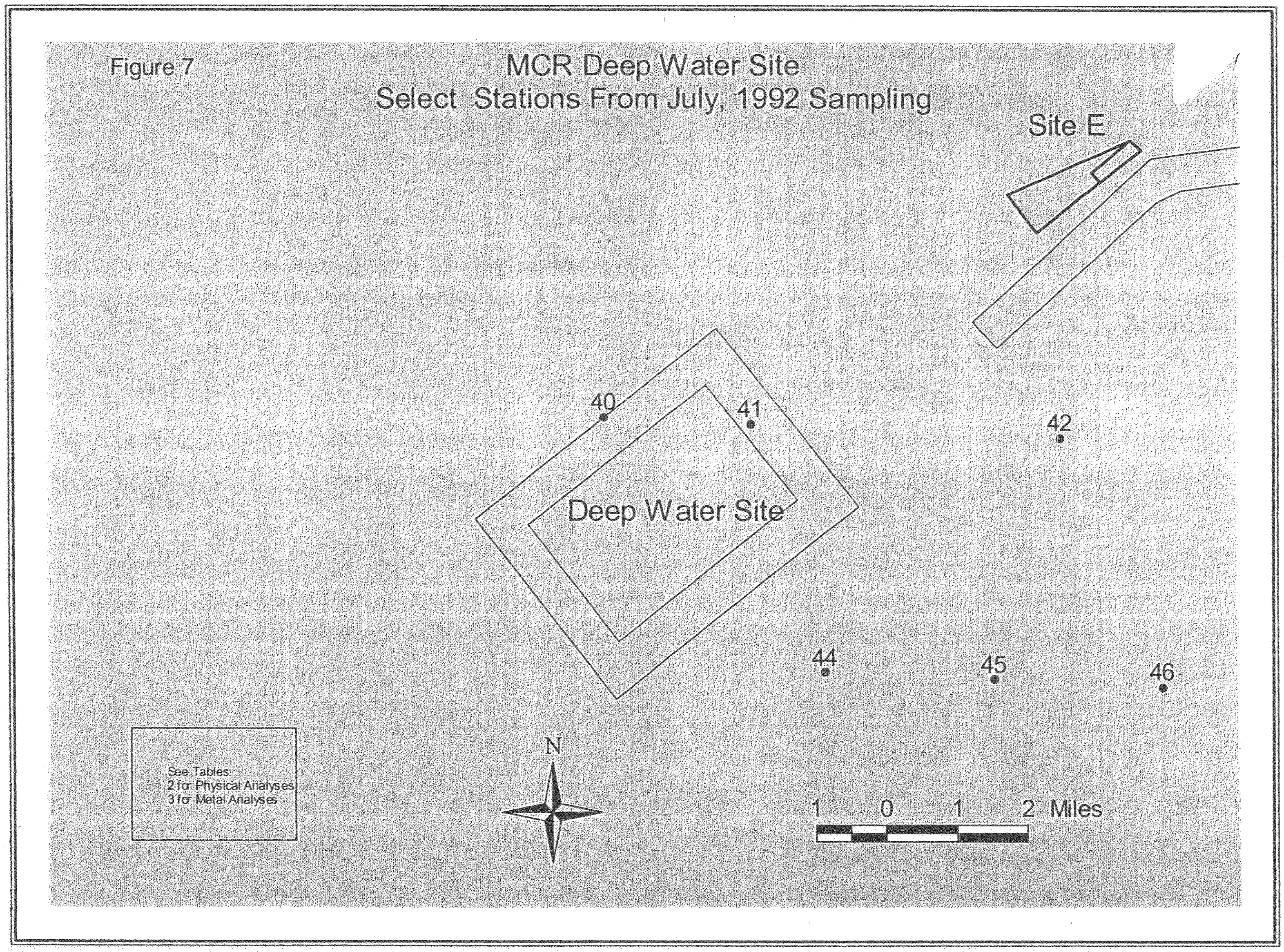


Figure 7
MCR Deep Water Site
Select Stations From July, 1992 Sampling
Site E
40
41
42
Deep Water Site
44
45
46
N
See Tables
2 for Physical Analyses
3 for Metal Analyses
1 0 1 2 Miles

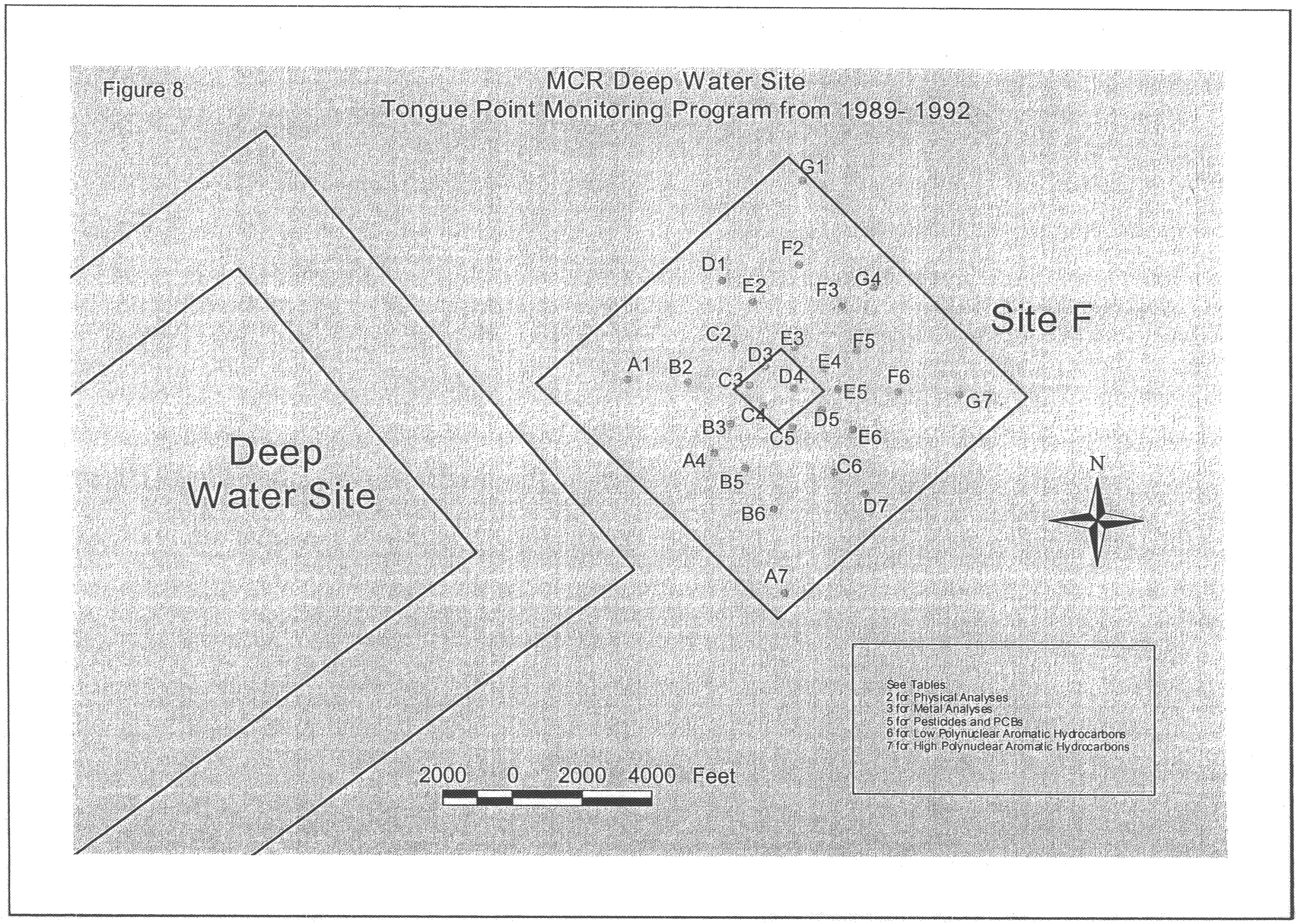


Figure 8
MCR Deep Water Site
Tongue Point Monitoring Program from 1989- 1992
G1
F2
D1
E2
F3
G4
Site F
C2
E3
F5
D3
E4
A1
B2
C3
D4
F6
E5
G7
C4
D5
B3
C5
E6
A4
C6
B5
Deep
Water Site
N
D7
B6
A7
See Tables:
2 for Physical Analyses
3 for Metal Analyses
5 for Pesticides and PCBs
6 for Low Polynuclear Aromatic Hydrocarbons
7 for High Polynuclear Aromatic Hydrocarbons
2000 0 2000 4000 Feet

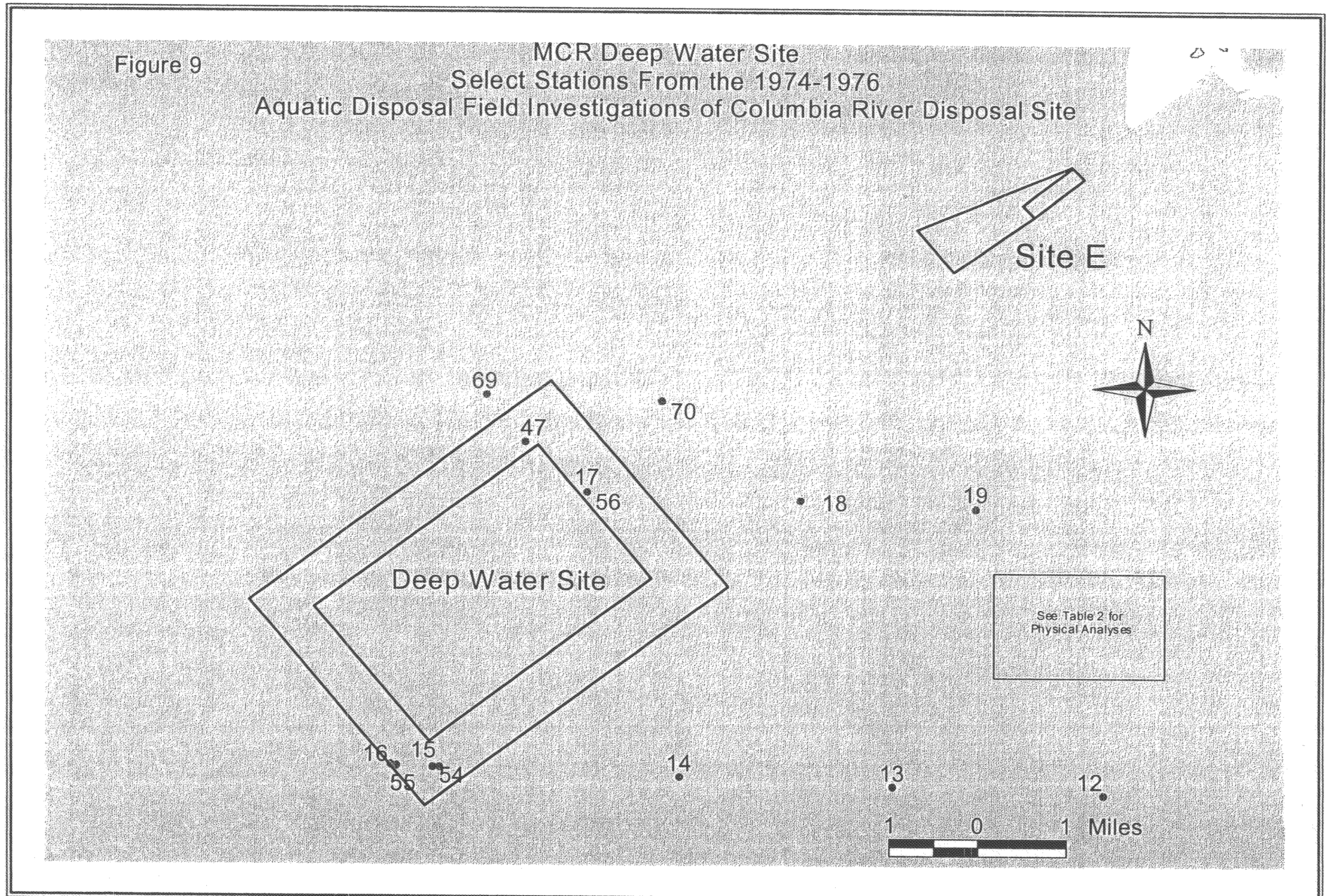
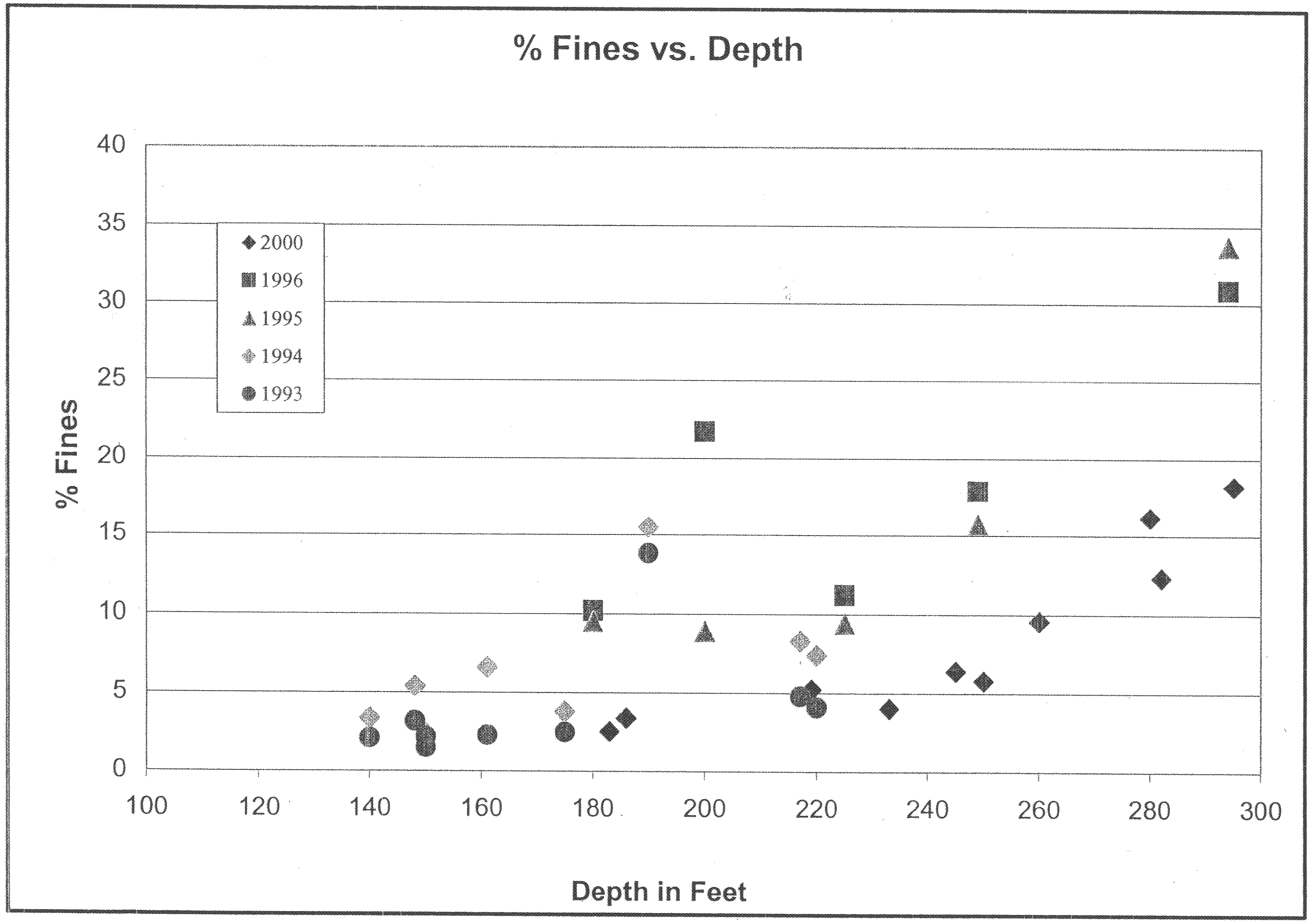


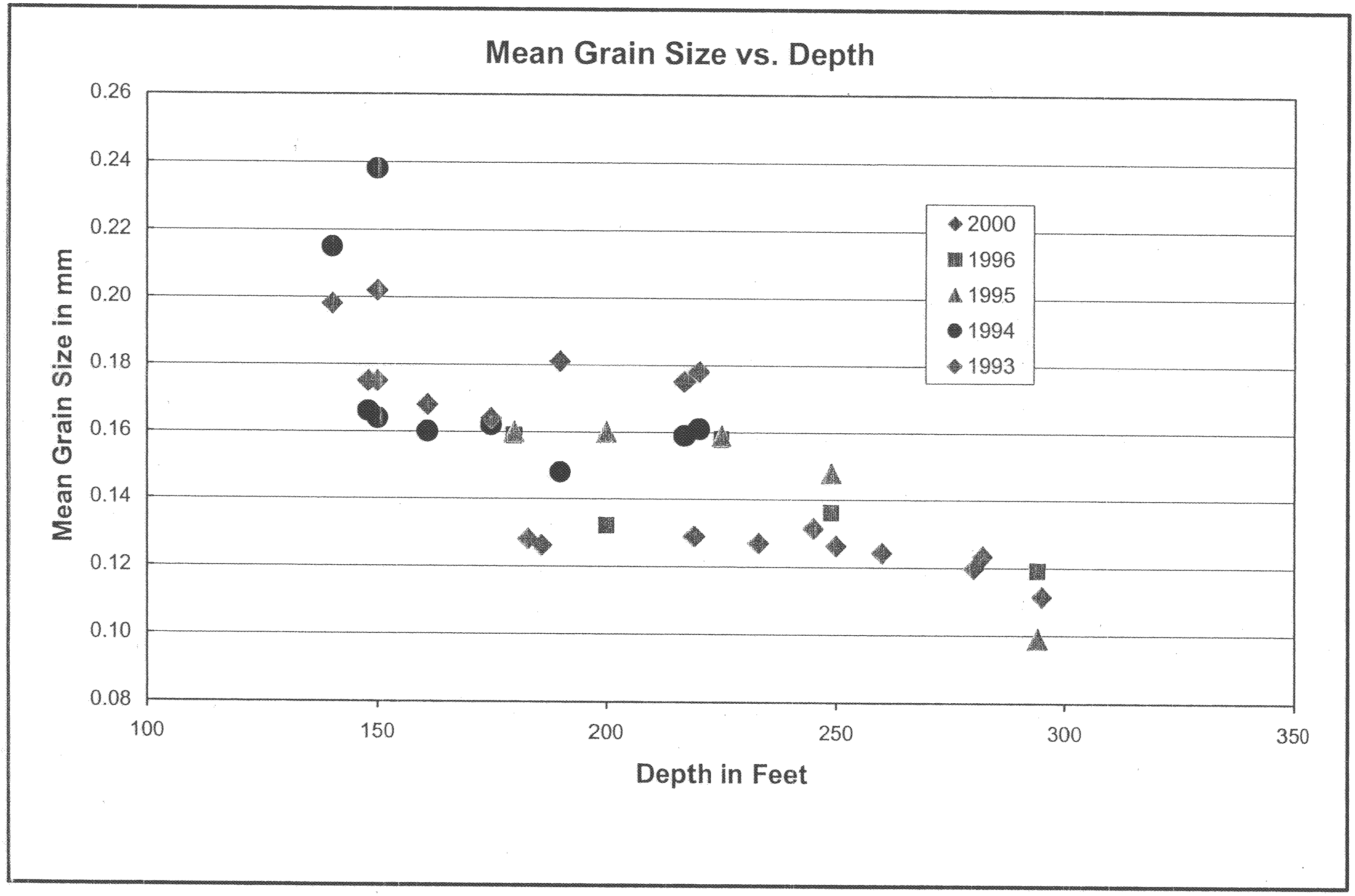
Figure 9
MCR Deep Water Site
Select Stations From the 1974-1976
Aquatic Disposal Field Investigations of Columbia River Disposal Site
Site E
N
69
70
47
17
56
18
19
Deep Water Site
See Table 2 for
Physical Analyses
16
15
55
54
14
13
12
1
0
1
Miles

Figure 10



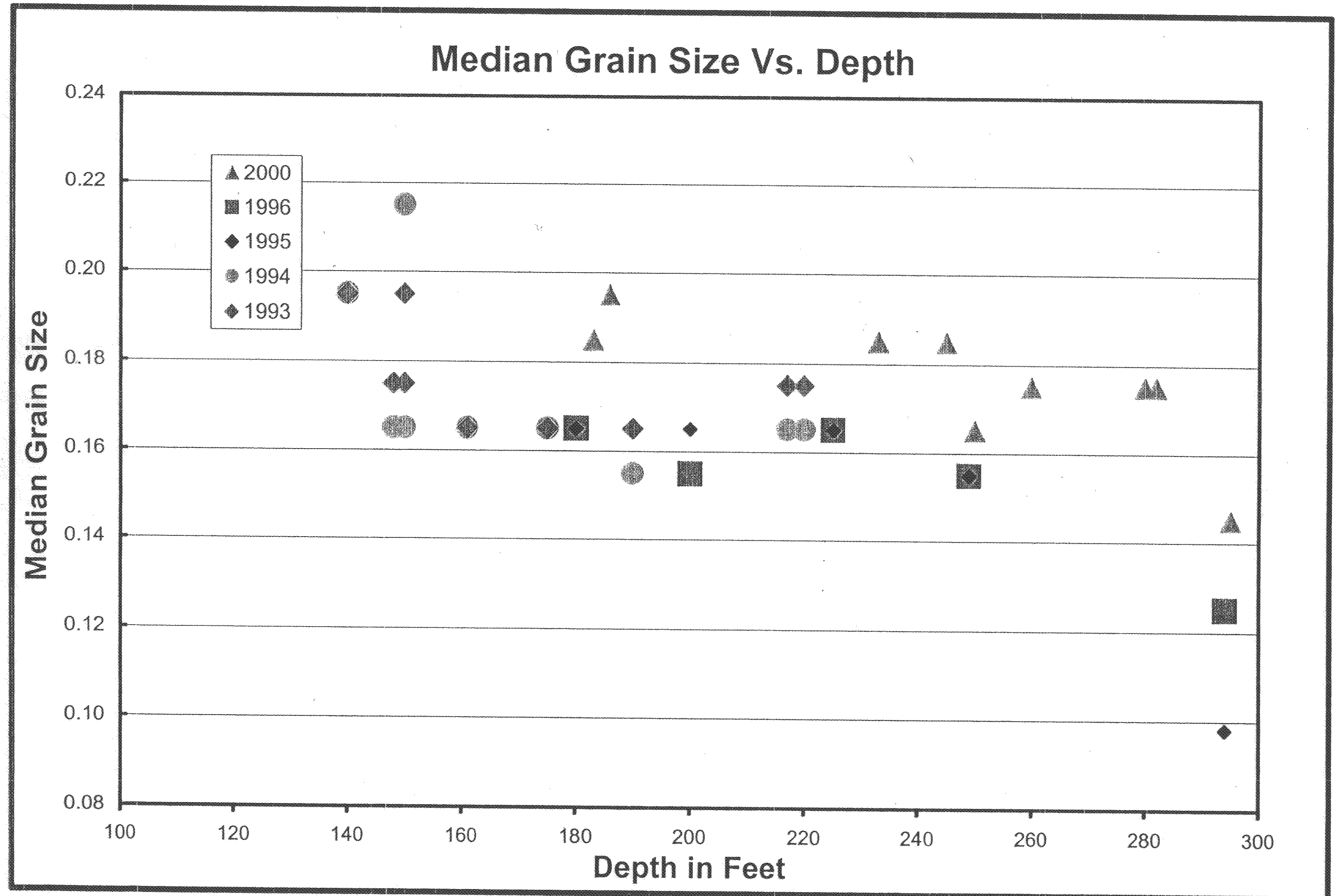
% Fines vs. Depth
% Fines
40
35
30
25
20
15
10
5
0
100
120
140
160
180
200
220
240
260
280
300
Depth in Feet
2000
1996
1995
1994
1993

Figure 11

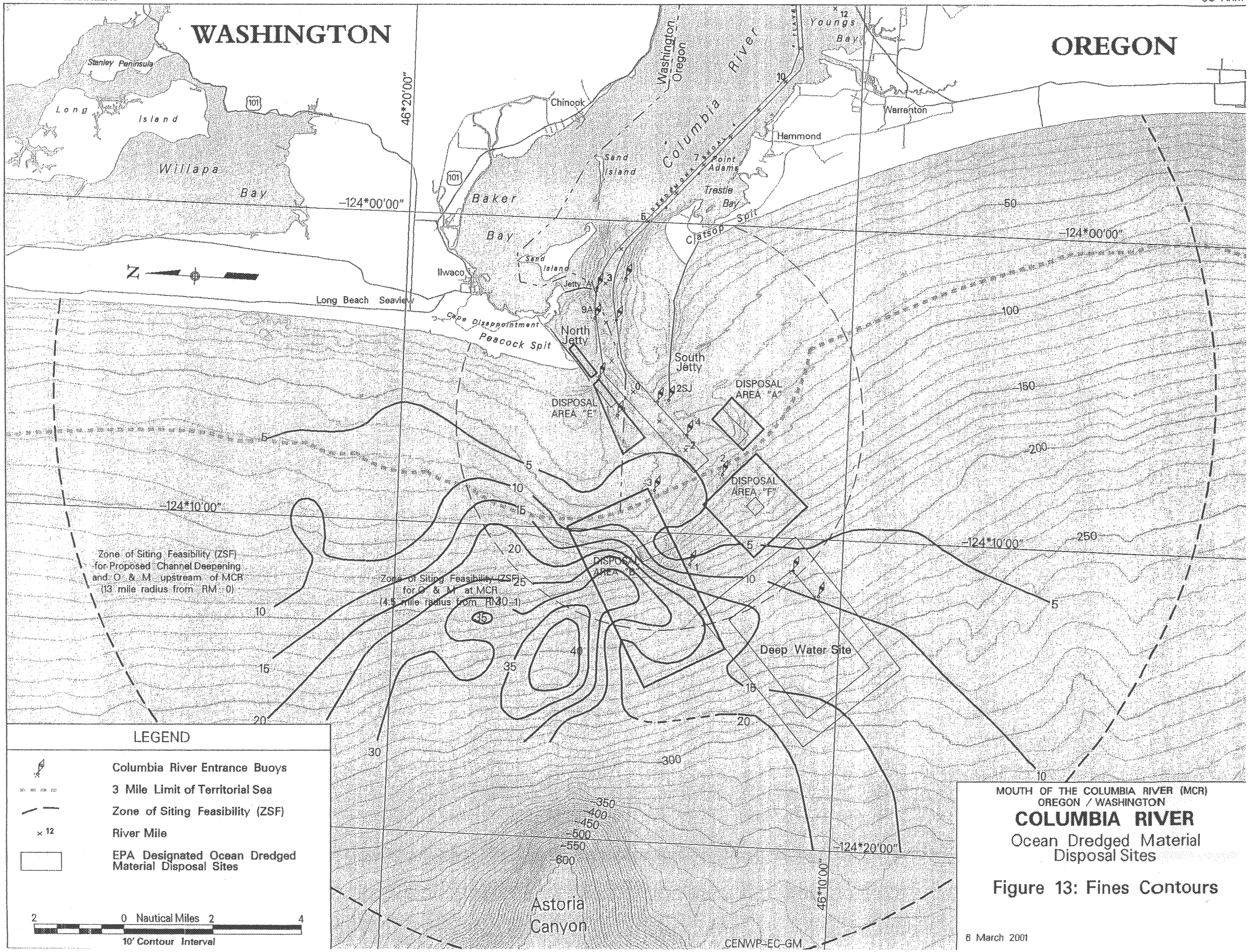


Mean Grain Size vs. Depth
Mean Grain Size in mm
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
100
150
200
250
300
350
Depth in Feet
2000
1996
1995
1994
1993

Figure 12



Median Grain Size Vs. Depth
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
Median Grain Size
2000
1996
1995
1994
1993
100
120
140
160
180
200
220
240
260
280
300
Depth in Feet



MOUTH OF THE COLUMBIA RIVER (MCR)
OREGON / WASHINGTON

COLUMBIA RIVER

Ocean Dredged Material Disposal Sites

Figure 13: Fines Contours

6 March 2001