[New Bedford Harbor] 4.6 51870

NEW BEDFORD HARBOR SUPERFUND SITE

ACUSHNET RIVER ESTUARY STUDY

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The upper Acushnet estuary in New Bedford, MA, is one of the largest and most contaminated PCB waste sites known. The fact that the PCB's (and other contaminants) are associated with estuarine sediments in an unpredictable pattern makes accurate characterization of the site a complex problem.

The contamination of the upper Acushnet is not recent news, and a variety of attempts has been made to assess the nature and extent of chemical pollution in the estuary's sediments. These attempts have fallen short, however, of sufficiently characterizing the sediments so that the engineering feasibility of harbor clean-up could be evaluated.

Previous studies have yielded a general description of the sediments, but little in the way of detailed physical data. Historical chemical data sufficiently described the PCB levels in surface sediments, but provided only limited information on the distribution of PCBs with depth. Past push coring efforts by the U.S. Coast Guard and others rarely exceeded 24 inches in depth. Very little data was available on trace metal contamination of the sediments, with or without depth considerations.

The objectives of this sampling and analytical effort can be summarized as follows:

1. Obtain a sufficient number (≥120) sample cores to spatially characterize the upper Acushnet estuary.

2. Obtain thirty additional samples from the wetland adjacent to the estuary.

3. Obtain sample cores of as great a length as possible, preferably ≥ 24 inches.

4. Generate scientifically valid and legally defensible chemical and physical data on selected cores segmented by depth.

The New England Division's (NED's) Materials and Water Quality Laboratory (MWQL) began field operations in late July, 1985 and concluded them in October of that same year. Laboratory analyses were initiated in late September of 1985, and finished in May of 1986. This report presents the methods and results of the 1985 investigation, excluding data interpretation which will be left to others.

SUMMARY

Over a 28-day period, 168 push cores were taken in 143 locations. The vast majority of these cores (81%) were greater than 24" long. The average length of the cores was 53".

Sediments from 39 push cores were extruded, representing 38 locations. Standard visual classifications were performed on the sediments from 33 of these cores. Physical Tests (Atterberg limits, grain size, specific gravity, percent moisture and volatiles) were performed on sediments from 34 cores; chemical analyses (PCBs, oil & grease, and trace metals) were performed on 71 sub-samples from 33 cores. An additional 15 sub-samples from 8 cores were also analyzed for PCBs only. Cation exchange capacity was determined for 34 sub-samples from an equal number of push cores.

In addition, 75 soil samples from 23 locations were taken from the wetland adjacent to the estuary. 42 of these samples were sent to USEPA contract laboratories for priority pollutant analyses. That data is not presented in this report.

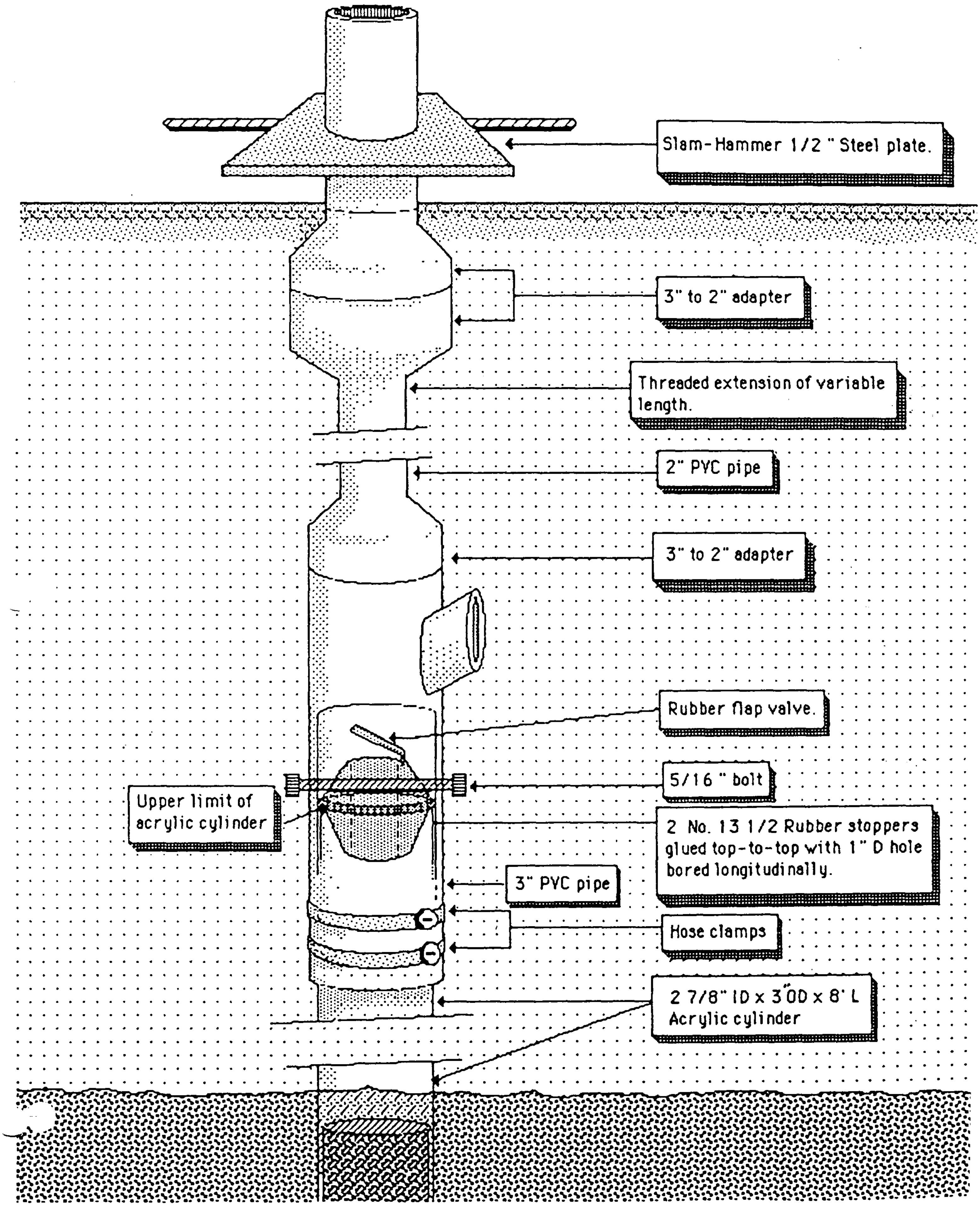
SAMPLING

The sampling effort involved 21 days of actual field sampling. An additional 9 days were spent in the field in other activities including reconnaissance, developing sampling methods, relocating vessels, sample transportation, travel, and clean-up.

The first 10 sampling days were spent collecting core samples from the Cape Cod Canal Barge Salem. The Salem is a self-propelled, shallow draft barge of 50' in length and 20' in width. It was equipped with a cantilevered deck on the bow, roughly 16' x 8' in size. A 2' x 2' hole in the cantilevered deck allowed workers to safely surround the sampling device during sampling operations. The Barge Salem proved to be difficult to maneauver, difficult to anchor, and too deep draft a vessel to use in sampling the more shallow areas in the estuary. A smaller barge (10' x 20') was brought in for these areas. This vessel was also equipped with a cantilevered deck similar to the Salem; however, it did not possess any propulsion system of its own and had to be pushed around by a small boat. This "Mini-Barge", as it was dubbed, proved to be the most efficacious vessel for this type of sampling. The sampling crew was able to average over 12 cores a day with the Mini-Barge, whereas they could manage just over 5 cores a day from the Barge Salem. The sampling crew was dressed in EPA Level C protective safety gear, according to the Health and Safety Plan written by MRD (Appendix A).

The coring device utilized throughout this project is essentially that shown in Figure 1. This device was modified slightly by using a single solid rubber stopper instead of the twin holed combination with flap valve shown. The single stopper possessed an eyebolt, to which was attached a polypropylene rope that extended out of the sampler sidearm to the vessel on the surface. The single stopper was allowed to move within the tube, but was prevented from touching the sediment by lashing the rope to the barge deck just prior to pushing the tube.

FIGURE 1


Slam-Hammer 1/2 " Steel plate.
3" to 2" adapter
Threaded extension of variable length.
2" PVC pipe
3" to 2" adapter
Rubber flap valve.
5/16 " bolt
Upper limit of acrylic cylinder
2 No. 13 1/2 Rubber stoppers glued top-to-top with 1" D hole bored longitudinally.
3" PVC pipe
Hose clamps
2 7/8" ID x 3"OD x 8' L Acrylic cylinder

The coring operation entailed first positioning the vessel as close to the center of the quadrant as possible. This was effected through the efforts of the NED Survey team using laser-based Electronic Distance Measuring (EDM) equipment. The sampling and survey parties maintained open communications via walkie-talkie radios.

Once the vessel was "on-target", a three-man sampling team dressed in Level C protective gear took over. The location was first sounded for depth from the estuary bottom to the deck surface. The sampling device was assembled with a new acrylic tube, and then marked with the sounded depth. The sampler was then slowly lowered into the water column. If the depth was roughly 10 feet or more, the sampler had to be filled with seawater supplied by an on board pump to negate the sampler's bouyancy. When the sampler reached the sounded depth mark, the rope leading to the rubber stopper was lashed to a cleat bolted to the deck surface. At this point, the stopper was at the lower end of the tube, which was suspended immediately above the sediment surface. The sampler was then pushed into the sediment by hand. The rubber stopper was prevented from moving with the tube since the rope which held it was lashed fast to the deck above. The effect was that the sampling tube filled with sediment, while the stopper travelled up the tube, all the while remaining fixed above the surface of the sediment.

If refusal was met while pushing by hand, the sampler was further driven into the sediment using a steel plate slam-hammer. This process was continued until refusal was met once more. The sampler was then withdrawn from the sediment. At this point the rope was freed from the cleat and pulled up along with the sampler. This created a vacuum within the tube and prevented the sediment from falling out as the sampler was retrieved.

The sampling device was kept in a vertical position as it was brought up on deck. A cap was quickly placed over the tube bottom to prevent the loss of any sediment. The outside of the tube was then hosed down with seawater. One or more ¼" diameter holes were drilled into the acrylic tube between the top of the sediment and the rubber stopper. This allowed any trapped water to escape and also permitted the stopper to be removed. Any excess tube was cut off just above the sediment surface using a conventional hack saw. The tube was then capped on top, the cap secured, and the tube was then measured, and then labelled with the quadrant and length. If the tube was longer than about five feet, it was usually cut into two shorter lengths to facilitate storage and handling. The bottom half was labelled, and all caps were secured with duct tape. Each tube or portion of tube was then further identified with a paper label, containing the grid number, tube length, and sampling date.

The lengths of the push cores taken in this manner are displayed in Table I. It can generally be said that the push core length was inversely proportional to the amount of sand and gravel in the substrate; i.e., the more sand and gravel (and hence the less fines), the more difficult it was to push the core into the substrate, the sooner refusal was met, resulting in a shorter core. One should be wary, however, of directly interpreting all of the push core lengths in this fashion. Occasionally the coring device would hit a buried object (rock, shells, tires, etc.) which would cause early refusal. This was exemplified at quadrant J-8, where the first attempt penetrated only 18", while the second try succeeded in going to a depth of 73". The depth of penetration was also affected by a variety of other factors, including the sampling crew and their condition as affected by time of day, number of cores pushed that day, ambient temperature, etc.

TABLE I
New Bedford Harbor
Lengths of Push Cores

Field Sample No.	Push Core Length (inches)	Field Sample No.	Push Core Length (inches)
D-25	16	H-19	83
D-26	74	H-20	77
E-25-1	37	H-21	73
E-25-2	26	H-22	76
E-26	84	H-23	62
E-27-1	36	H-24	59
E-27-2	32	H-25	62
E-28	4	H-26	27
F-25	40	H-27	42
F-26	55	H-28	74
F-27	79	H-29	75
F-28	60	H-30	78
G-12	9	H-31	55
G-13-1	81	H-32	73
G-13-2	64	H-33	55
G-14	84	I-2	17
G-15	58	I-3-1	30
G-16	71	I-3-2	20
G-17-1	46	I-4	25
G-17-2	81	I-9-1	70
G-18	76	I-9-2	64
G-19	64	I-10	74
G-20-1	53	I-11-1	80
G-20-2	62	I-11-2	75
G-25	44	I-12	49
G-26	50	I-13	73
G-27	35	I-14	76
G-28	57	I-15	82
G-29-1	70	I-16	77
G-29-2	51	I-17	73
G-30	13	I-18	61
G-31	51	I-19	73
G-32	54	I-20	78
H-10	48	I-21	79
H-12	44	I-22	83
H-13	79	I-23	81
H-14	82	I-24	76
H-15	69	I-25	84
H-16	86	I-26	45
H-17	85	I-27	78
H-18	82	I-28	78
I-29	72	J-33	84
I-30	82	K-4	40
I-31	26	K-5-1	36

TABLE I (cont'd)

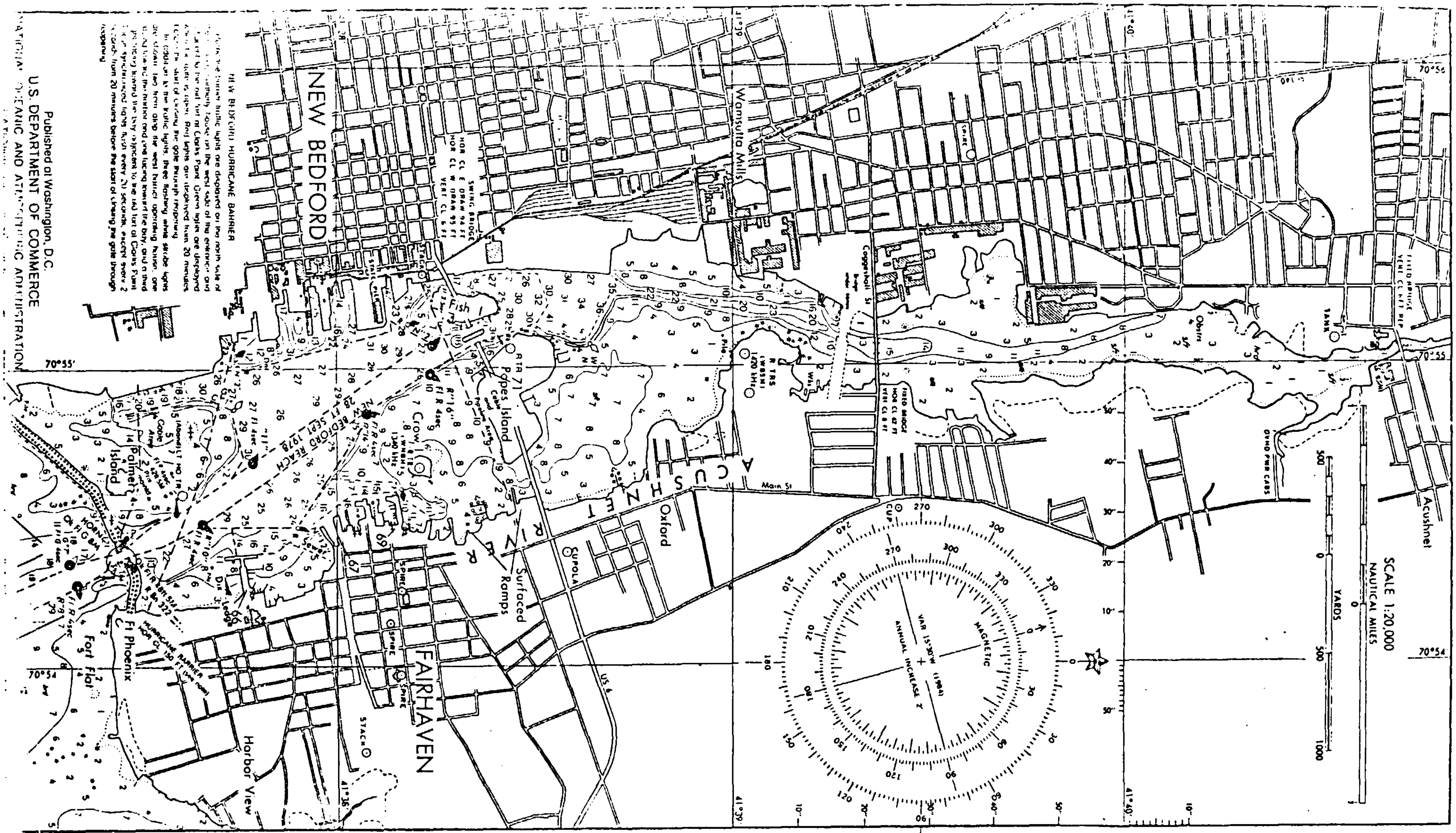
New Bedford Harbor
Lengths of Push Cores

Field Sample No.	Push Core Length (inches)	Field Sample No.	Push Core Length (inches)
I-32	46	K-5-2	48
I-33	28	K-6	50
J-3	63	K-7	75
J-4	69	K-8	81
J-5-1	74	K-9	60
J-5-2	62	K-10	60
J-6	87	K-21	42
J-7	68	K-22	43
J-8-1	18	K-23	22
J-8-2	73	K-24	25
J-9	74	K-25	41
J-10	74	K-26-1	22
J-11	66	K-26-2	21
J-12	5	K-27	21
J-13-1	17	K-28-1	8
J-13-2	21	K-28-2	21
J-14	45	K-29	75
J-15-1	16	K-30	70
J-15-2	14	K-31	38
J-16	16	K-32-1	24
J-17-1	21	K-32-2	22
J-17-2	24	L-5	70
J-18	18	L-6	64
J-19	26	L-7	22
J-20-1	15	L-8	16
J-20-2	16	L-9	74
J-21	77	L-10-1	90
J-22	79	L-10-2	71
J-23	70	L-28	46
J-24	52	L-29-1	70
J-25	77	L-29-2	72
J-26	62	L-30-1	34
J-27	78	L-30-2	48
J-28	20	L-30-3	77
J-29	63	L-31	14
J-30	71	M-6-1	55
J-31	50	M-6-2	70
J-32	25	M-27-1	27
M-27-2	26		
M-28	34		
M-29	18		
M-30	20		

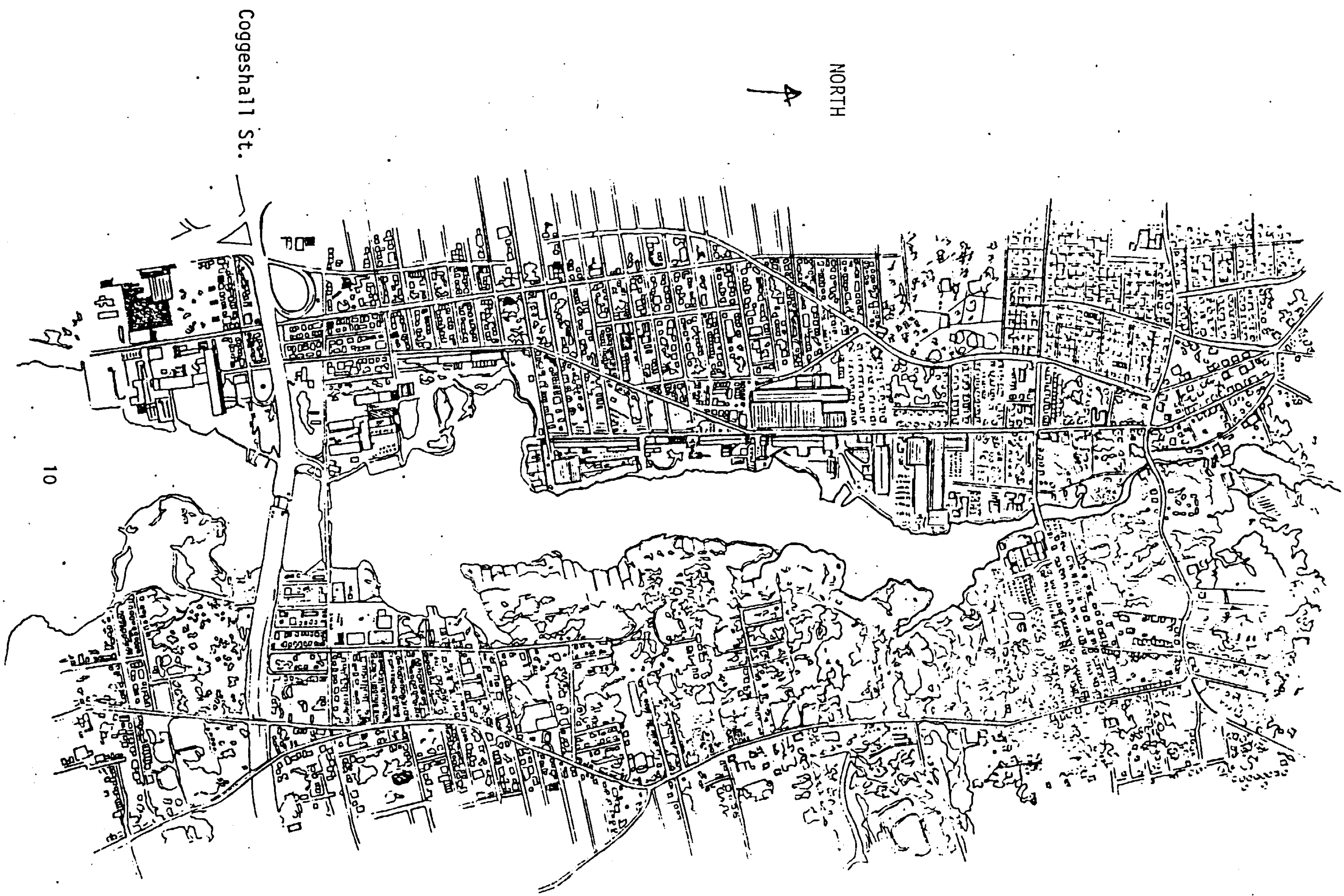
The cores taken using the Barge Salem are displayed in Table II in chronological order, along with the attendant sampling crews. Similarly, Table III show the samples taken from the Mini-Barge. Map 1 displays the entire Acushnet River Estuary, from the river's mouth to the Hurricane Barrier. Map 2 is a pictorial representation of the area north of I-95 and the Coggeshall Street Bridge to the river mouth. Map 3 displays the letter/number grid system imposed on this area for the purposes of sample location. Table IV lists the actual sample locations as defined by the Lambert Grid System for the Commonwealth of Massachusetts.

Soil samples from the wetland area were taken on foot using a common garden spade. Sample locations were positioned in grid centers as determined by the same laser-based EDM methods used for the core samples. The soil samples taken in September were initially contained in double layers of black polyethylene bags. Aliquots of these were later transferred to pre-cleaned 16 oz. jars with Teflon capliners prior to being sent to private contractors for analysis. These aliquots were taken from the center of the soil sample so as to minimize sample contact with the polyethylene container. The October soil samples were collected in glass 1-quart containers with aluminum foil capliners. Aliquots of these samples were similarly transferred to 16 oz. glass jars before shipment to the same contractors (Rocky Mountain Analytical Labs, Cambridge Analytical, and Aquatec). Table V displays the soil samples taken in the wetland area.

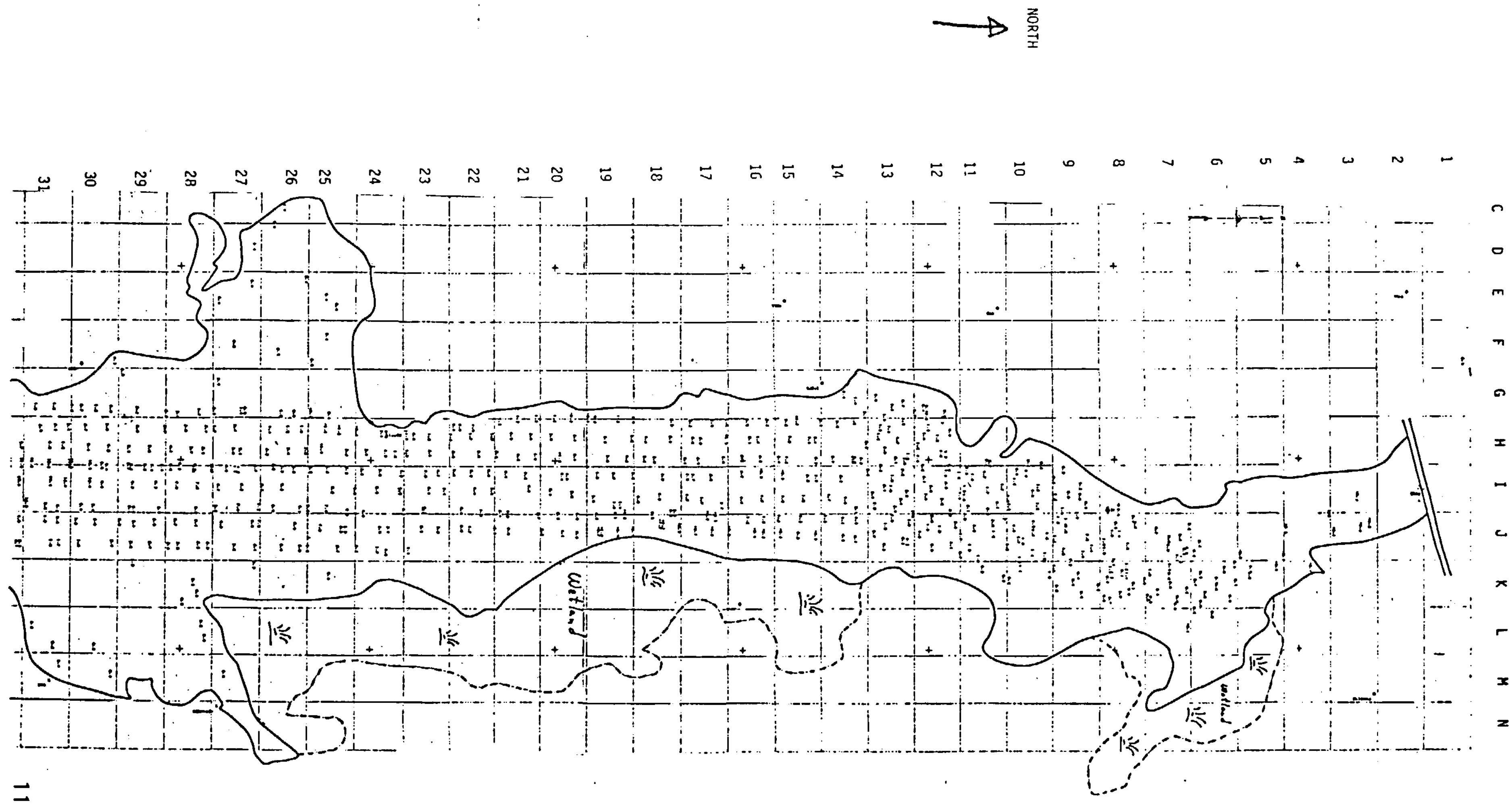
The Master Sample List for Sediment Cores (Appendix B) summarizes the sample location, number, tube length, and date sampled. A short chain-of-custody history is also displayed, along with notations concerning sample extrusion. The Master Sample List for Soils (Appendix C) contains similar information.



Map 1
Acushnet River Estuary
New Bedford Harbor



Map 2
Acushnet River Estuary
New Bedford Harbor
Coggeshall Street Bridge North To River Mouth



Map 3
Acushnet River Estuary
New Bedford Harbor
North of Coggeshall Street Bridge
Arbitrary Sampling Grid

TABLE II

NEW BEDFORD HARBOR

Core Samples Taken Using Barge Salem

DAY/DATE	SAMPLERS	SAMPLES TAKEN*	NUMBER OF QUADRANTS SAMPLED	NUMBER OF CORES PUSHED	CLEAN MAN
Tuesday 20 August 1985	Brazeau Condike Lubianez Spano	L: 30-1, 30-2, 30-3	1	3	Trinchero
Wednesday 21 August 1985	Condike Lubianez Spano	I: 29, 30, 31, 32, 33	5	5	Trinchero
Thursday 22 August 1985	Brazeau Condike Lubianez	I: 17, 18, 19, 20, 21	5	5	Trinchero
Friday 23 August 1985	Condike Lubianez Spano	I: 22	1	1	Trinchero
Tuesday 27 August 1985	Condike Lubianez Spano	H: 28, 29, 30, 31 I: 23, 24, 25, 26, 27, 28	10	10	Trinchero
Wednesday 28 August 1985	Condike Lubianez Spano	H: 32, 33 J: 27, 28, 29, 30	6	6	Trinchero
Thursday 29 August 1985	Condike Lubianez Spano	H: 14, 15, 16, 17, 18, 19, 20, 21, 22	9	9	Brazeau
Tuesday 3 Sept 1985	Condike Lubianez Spano	J: 31, 32, 33 K: 29, 30, 31	6	6	Vieira
Wednesday 4 Sept 1985	Condike Spano Vieira	H: 13 I: 13, 14, 15, 16	5	5	Lubianez
Thursday 5 Sept 1985	Condike Lubianez Vieira	H: 23, 24, 25, 26, 27	5	5	Spano
		TOTAL:	53	55	
		AVERAGE/DAY:	5.3	5.5	

* NOTE: Grid Numbers with "-1" or "-2" suffixes denote the first and second replicate samples, respectively, in that grid.

TABLE III
NEW BEDFORD HARBOR
Core Samples Taken Using Mini-Barge

DAY/DATE	SAMPLERS	SAMPLES TAKEN*	NUMBER OF QUADRANTS SAMPLED	NUMBER OF CORES PUSHED	CLEAN MAN
Monday 9 Sept 1985	Lubianez Spano Vieira	G: 30, 31, 32	3	3	Condike
Tuesday 10 Sept 1985	Lubianez Spano Vieira	D: 25, 26 E: 25-1, 25-2, 26, 27-1, 27-2, 28 F: 25, 26, 27, 28 G: 25, 26, 27, 28 29-1, 29-2	15	18	Condike
Wednesday 11 Sept 1985	Condike Lubianez Spano	J: 21, 22, 23, 24 K: 21, 22, 23, 24 M: 27-1, 27-2, 28, 29, 30	12	13	Vieira
Thursday 12 Sept 1985	Condike Lubianez Spano	J: 25, 26 K: 25, 26-1, 26-2, 27, 28-1, 28-2, 32-1, 32-2	7	10	Brazeau
Friday 13 Sept 1985	Condike Lubianez Spano	G: 12, 13-1, 13-2, 14, 15 H: 12 I: 12 J: 12, 13-1, 13-2, 14, 15-1, 15-2, 16, 17-1, 17-2	12	16	Vieira
Saturday 14 Sept 1985	Condike Spano Vieira	G: 16, 17-1, 17-2, 18, 19 20-1, 20-2 J: 18, 19, 20-1, 20-2	8	11	Lubianez
Sunday 15 Sept 1985	Condike Spano Vieira	I: 2, 3-1, 3-2, 4 J: 3, 4, 5-1, 5-2, 6, 7 K: 4, 5-1, 5-2 L: 28, 29-1, 29-2, 31	13	17	Lubianez
Monday 16 Sept 85	Condike Lubianez Vieira	J: 8-1, 8-2, 11 K: 6, 7, 8, 9, 10 L: 5, 6, 7, 8, 9, 10-1, 10-2 M: 6-1, 6-2	14	17	Spano
Tuesday 17 Sept 1985	Condike Lubianez Vieira	H: 10 I: 9-1, 9-2, 10, 11-1, 11-2 J: 9, 10	6	6	Spano
		TOTAL:	90	113	
		AVERAGE/DAY:	10	12.5	
		GRAND TOTAL: (BOTH BARGES)	143	168	
		AVERAGE/DAY (BOTH BARGES)	7.5	8.8	

* NOTE: Grid Numbers with "-1" and "-2" suffixes denote the first and second replicates, respectively, for that grid.

Table IV
New Bedford Harbor
Core and Soil Sample Locations via Lambert Grid System

ACUSHNET RIVER-NEW BEDFORD, MA-SAMPLES

				GRID	DATE SAMPLE TAKEN
P	1	240596.3387	759935.8466	L-30	AUGUST 20, 1985
P	2	239835.0383	759145.9960	I-33	AUGUST 21, 1985
P	3	240038.5737	759181.9310	I-32	AUGUST 21, 1985
P	4	240281.5100	759142.7240	I-31	AUGUST 21, 1985
P	5	240540.8183	759177.3464	I-30	AUGUST 21, 1985
P	6	240817.0121	759203.1035	I-29	AUGUST 21, 1985
P	7	243813.0447	759117.8758	I-17	AUGUST 22, 1985
P	8	243554.7929	759125.6783	I-18	AUGUST 22, 1985
P	9	243330.1125	759142.2459	I-19	AUGUST 22, 1985
P	10	243145.5273	759131.9477	I-20	AUGUST 22, 1985
P	11	242926.0737	759141.6249	I-20	AUGUST 22, 1985
P	12	242573.2818	759130.0574	I-22	AUGUST 23, 1985
P	13	242281.3073	759145.3289	I-23	AUGUST 27, 1985
P	14	242044.4864	759177.9482	I-24	AUGUST 27, 1985
P	15	241791.2283	759143.6589	I-25	AUGUST 27, 1985
P	16	241571.4680	759162.0949	I-26	AUGUST 27, 1985
P	17	241251.6157	759182.6624	I-27	AUGUST 27, 1985
P	18	241037.0881	759173.6689	I-28	AUGUST 27, 1985
P	19	241058.7299	758911.8250	I-29	AUGUST 27, 1985
P	20	240822.7649	758917.8987	H-29	AUGUST 27, 1985
P	21	240549.1756	758920.0505	H-30	AUGUST 27, 1985
P	22	240345.4478	758925.6807	H-31	AUGUST 27, 1985
P	23	240053.9298	758887.8805	H-32	AUGUST 28, 1985
P	24	239836.9377	758926.9219	H-33	AUGUST 28, 1985
P	25	241311.4492	759386.9933	J-27	AUGUST 28, 1985
P	26	241060.4687	759376.7456	J-28	AUGUST 28, 1985
P	27	240786.2800	759385.8280	J-29	AUGUST 28, 1985
P	28	240489.3107	759478.0183	J-30	AUGUST 28, 1985
P	29	242544.2067	758923.9728	H-22	AUGUT 29, 1985
P	30	242782.1527	758935.3663	H-21	AUGUT 29, 1985
P	31	243087.7621	758933.7195	H-20	AUGUT 29, 1985
P	32	243296.6529	758883.9235	H-19	AUGUT 29, 1985
P	33	243545.7431	758909.8600	H-18	AUGUT 29, 1985
P	34	243781.0895	758907.6852	H-17	AUGUT 29, 1985
P	35	244023.0629	758880.1220	H-16	AUGUT 29, 1985
P	36	244293.8929	758922.8689	H-15	AUGUT 29, 1985
P	37	244527.6182	758904.5335	H-14	AUGUT 29, 1985
P	38	239812.9226	759395.3110	J-33	SEPTEMBER 3, 1985
P	39	240030.7979	759433.6705	J-32	SEPTEMBER 3, 1985
P	40	240287.3715	759412.5294	J-31	SEPTEMBER 3, 1985
P	41	240305.9840	759597.9286	K-31	SEPTEMBER 3, 1985
P	42	240533.7978	759682.3771	K-30	SEPTEMBER 3, 1985
P	43	240745.5277	759634.1502	K-29	SEPTEMBER 3, 1985
P	44	244761.6646	758918.9428	H-13	SEPTEMBER 4, 1985
P	45	244755.0754	759168.1027	I-13	SEPTEMBER 4, 1985
P	46	244528.9193	759131.4957	I-14	SEPTEMBER 4, 1985
P	47	244270.2784	759223.4468	I-15	SEPTEMBER 4, 1985
P	48	244048.0483	759151.7529	I-16	SEPTEMBER 4, 1985
P	49	244282.4521	759665.6778	K-15	SEPTEMBER 4, 1985
P	50	242280.1245	758928.9258	H-23	SEPTEMBER 5, 1985
P	51	242038.9402	758932.0171	H-24	SEPTEMBER 5, 1985
P	52	241778.7404	758899.2409	H-25	SEPTEMBER 5, 1985
P	53	241542.7096	758894.0774	H-26	SEPTEMBER 5, 1985
P	54	241265.5422	758884.8742	H-27	SEPTEMBER 5, 1985
P	55	240011.3100	758684.9547	G-32	SEPTEMBER 9, 1985
P	56	240260.1136	758662.2021	G-31	SEPTEMBER 9, 1985
P	57	240511.1902	758661.3687	G-30	SEPTEMBER 9, 1985
P	58	240844.3815	758736.6719	G-29	SEPTEMBER 10, 1985

Table IV(cont'd)
New Bedford Harbor
Core and Soil Sample Locations via Lambert Grid System

64 P	61	241548.3476	758645.8997	G-26	SEPTEMBER 10, 1985
65 P	62	241744.6023	758665.1382	G-25	SEPTEMBER 10, 1985
66 P	63	241722.6431	758407.4456	F-25	SEPTEMBER 10, 1985
67 P	64	241516.0704	758385.7800	F-26	SEPTEMBER 10, 1985
68 P	65	241298.2862	758397.1663	F-27	SEPTEMBER 10, 1985
69 P	66	241083.8601	758391.0544	F-28	SEPTEMBER 10, 1985
70 P	67	241090.9781	758167.1567	E-28	SEPTEMBER 10, 1985
71 P	68	241299.2763	758164.7203	E-27	SEPTEMBER 10, 1985
72 P	69	241532.3667	758125.8449	E-26	SEPTEMBER 10, 1985
73 P	70	241803.5161	758152.2279	E-25	SEPTEMBER 10, 1985
74 P	71	241692.6174	757803.8155	D-25	SEPTEMBER 10, 1985
75 P	72	241503.6157	757942.2373	D-26	SEPTEMBER 10, 1985
76 P	73	242767.9744	759392.7897	J-21	SEPTEMBER 11, 1985
77 P	74	242724.6773	759582.1957	K-21	SEPTEMBER 11, 1985
78 P	75	242470.7444	759568.6292	K-22	SEPTEMBER 11, 1985
79 P	76	242507.6637	759359.0807	J-22	SEPTEMBER 11, 1985
80 P	77	242301.3771	759411.3582	J-23	SEPTEMBER 11, 1985
81 P	78	242279.7207	759589.7875	K-23	SEPTEMBER 11, 1985
82 P	79	242027.3986	759541.1776	J-24	SEPTEMBER 11, 1985
83 P	80	242003.8539	759344.0839	J-24	SEPTEMBER 11, 1985
84 P	81	241308.3736	760162.9235	M-27	SEPTEMBER 11, 1985
85 P	82	241023.0441	760152.2183	M-28	SEPTEMBER 11, 1985
86 P	83	240807.6317	760111.4416	M-29	SEPTEMBER 11, 1985
87 P	84	240594.7131	760132.6928	M-30	SEPTEMBER 11, 1985
88 P	85	240018.5463	759621.3419	K-32	SEPTEMBER 12, 1985
89 P	86	241757.0191	759540.6973	J-25	SEPTEMBER 12, 1985
90 P	87	241780.1403	759405.7179	J-25	SEPTEMBER 12, 1985
91 P	88	241534.6370	759417.0516	J-26	SEPTEMBER 12, 1985
92 P	89	241556.1031	759575.3292	K-26	SEPTEMBER 12, 1985
93 P	90	241296.8096	759575.8300	K-27	SEPTEMBER 12, 1985
94 P	91	241074.6176	759628.7346	K-28	SEPTEMBER 12, 1985
95 P	92	244999.4959	759400.7499	J-12	SEPTEMBER 13, 1985
96 P	93	244746.7497	759398.1972	J-13	SEPTEMBER 13, 1985
97 P	94	244478.2792	759352.6165	J-14	SEPTEMBER 13, 1985
98 P	95	244403.5987	759386.5729	J-15	SEPTEMBER 13, 1985
99 P	96	244166.5463	759369.1856	J-16	SEPTEMBER 13, 1985
100 P	97	243824.1977	759290.6371	I-17	SEPTEMBER 13, 1985
101 P	98	245066.0391	759201.6916	I-12	SEPTEMBER 13, 1985
102 P	99	244972.1214	758885.6526	H-12	SEPTEMBER 13, 1985
103 P	100	245097.2765	758704.0344	G-12	SEPTEMBER 13, 1985
104 P	101	244814.6854	758637.9203	G-13	SEPTEMBER 13, 1985
105 P	102	244536.8559	758651.0026	G-14	SEPTEMBER 13, 1985
106 P	103	244267.7741	758673.2597	G-15	SEPTEMBER 13, 1985
107 P	104	243068.6001	759390.8025	J-20	SEPTEMBER 14, 1985
108 P	105	243226.4130	759357.1459	J-19	SEPTEMBER 14, 1985
109 P	106	243475.0228	759299.0355	I-18	SEPTEMBER 14, 1985
110 P	107	244010.5129	758692.8044	G-16	SEPTEMBER 14, 1985
111 P	108	243743.7337	758706.5382	G-17	SEPTEMBER 14, 1985
112 P	109	243606.5882	758722.4827	G-18	SEPTEMBER 14, 1985
113 P	110	243322.1209	758753.0743	G-19	SEPTEMBER 14, 1985
114 P	111	243000.9177	758810.4144	G-20	SEPTEMBER 14, 1985
115 P	112	247584.8901	759187.6125	I-2	SEPTEBER 15, 1985
116 P	113	247283.9288	759216.8291	I-3	SEPTEBER 15, 1985
117 P	114	247304.9867	759340.0463	J-3	SEPTEBER 15, 1985
118 P	115	247038.5374	759445.8011	J-4	SEPTEBER 15, 1985
119 P	116	247010.6605	759587.1619	K-4	SEPTEBER 15, 1985
120 P	117	246801.6323	759657.5278	K-5	SEPTEBER 15, 1985
121 P	118	246716.1059	759434.7949	J-5	SEPTEBER 15, 1985
122 P	119	246964.9729	759267.7822	I-4	SEPTEBER 15, 1985
123 P	120	246362.8245	759411.0370	J-7	SEPTEBER 15, 1985
124 P	121	246539.8215	759433.7597	J-6	SEPTE[illegible]R 15, 1985
125 P	122	241027.0515	759897.4283	I-28	[illegible]

Table IV (cont'd)
New Bedford Harbor
Core and Soil Sample Locations via Lambert Sample Grid

128	P 125	241378.6595	759857.1113	L-27	SEPTEMBER 15, 1985	*
129	P 126	241559.8275	760192.8817	M-26	SEPTEMBER 15, 1985	*
130	P 127	241805.8328	759944.2814	L-25	SEPTEMBER 15, 1985	*
131	P 128	246485.1028	759579.9382	K-6	SEPTEMBER 16, 1985	
132	P 129	246736.0697	759811.1752	L-5	SEPTEMBER 16, 1985	
133	P 130	246518.1759	760155.1955	M-6	SEPTEMBER 16, 1985	
134	P 131	246380.7685	759842.2958	L-7	SEPTEMBER 16, 1985	
135	P 132	246287.5482	759600.9391	K-7	SEPTEMBER 16, 1985	
136	P 133	246488.3305	759907.2848	L-6	SEPTEMBER 16, 1985	
137	P 134	246036.6024	759330.0386	J-8	SEPTEMBER 16, 1985	
138	P 135	246060.9700	759665.5302	K-8	SEPTEMBER 16, 1985	
139	P 136	246072.2990	759873.3350	L-8	SEPTEMBER 16, 1985	
140	P 137	245783.2305	759907.8580	L-9	SEPTEMBER 16, 1985	
141	P 138	245553.2079	760005.8041	L-10	SEPTEMBER 16, 1985	
142	P 139	245561.9642	759551.3067	J-10	SEPTEMBER 16, 1985	
143	P 140	245679.2156	759474.7144	J-9	SEPTEMBER 16, 1985	
144	P 141	245296.6229	759417.8677	J-11	SEPTEMBER 16, 1985	
145	P 142	243128.1485	759875.8401	L-20	SEPTEMBER 16, 1985	*
146	P 143	243587.8623	759592.4024	K-18	SEPTEMBER 16, 1985	*
147	P 144	243982.5453	759662.0790	K-16	SEPTEMBER 16, 1985	*
148	P 145	242600.9054	760111.8787	M-22	SEPTEMBER 16, 1985	*
149	P 146	242296.0158	759814.5600	L-23	SEPTEMBER 16, 1985	*
150	P 147	245600.8924	759455.2864	J-10	SEPTEMBER 17, 1985	
151	P 148	245744.9380	759483.6731	J-9	SEPTEMBER 17, 1985	
152	P 149	245784.6090	759119.6194	I-9	SEPTEMBER 17, 1985	
153	P 150	245528.0249	759106.7869	I-10	SEPTEMBER 17, 1985	
154	P 151	245257.0863	759113.4126	I-11	SEPTEMBER 17, 1985	
155	P 152	245449.4952	758848.6949	H-10	SEPTEMBER 17, 1985	
156	P 153	246396.3476	760363.3493	N-7	OCTOBER 5, 1985	*
157	P 154	246575.3401	760343.0298	N-6	OCTOBER 5, 1985	*
158	P 155	246723.3493	760192.8032	M-5	OCTOBER 5, 1985	*
159	P 156	246908.4960	759946.2152	L-5	OCTOBER 5, 1985	*
160	P 157	246061.9553	760514.4422	N-8	OCTOBER 5, 1985	*
161	P 158	245710.5549	759265.1365	M-7	OCTOBER 5, 1985	*
162	P 159	245044.7783	759671.9297	K-12	OCTOBER 6, 1985	*
163	P 160	244773.6499	759613.3952	K-13	OCTOBER 6, 1985	*
164	P 161	244529.3212	759714.3061	K-14	OCTOBER 6, 1985	*
165	P 162	244424.2524	759985.0181	L-14	OCTOBER 6, 1985	*
166	P 163	244282.8598	759679.5210	K-15	OCTOBER 6, 1985	*
167	P 164	243781.1504	759651.1152	K-17	OCTOBER 6, 1985	*
168	P 165	243330.1815	759502.5554	J-19	OCTOBER 6, 1985	*
169	P 166	243313.4416	759715.5042	K-19	OCTOBER 6, 1985	*
170	P 167	243290.7409	759988.2373	L-19	OCTOBER 6, 1985	*
171	P 168	242978.0088	759650.2638	K-20	OCTOBER 6, 1985	*
172	P 169	243040.1568	759614.9742	K-20	OCTOBER 6, 1985	*
173						
174		* LAND SAMPLES				

TABLE V
NEW BEDFORD HARBOR
Soil Samples from Wetland Area

DAY/DATE	SAMPLERS	SAMPLES TAKEN*	NUMBER OF QUADRANTS SAMPLED	NUMBER OF SAMPLES
Sunday 15 Sept 1985	Clark Lubianez Vieira	L: 25-1-1, 25-1-2 25-1-3, 25-2-1 25-2-2, 25-2-3 27-0-1, 27-0-2, 27-0-3 M: 26-0-1, 26-0-2, 26-0-3	3	12
Monday 16 Sept 1985	Clark Lubianez Vieira	K: 16-0-1, 16-0-2, 16-0-3, 18-1-1, 18-1-2, 18-1-3, 18-2-1, 18-2-2, 18-2-3 L: 20-0-1, 20-0-2, 20-0-3, 23-0-1, 23-0-2, 23-0-3, M: 22-0-1, 22-0-2, 22-0-3	5	18
Saturday 5 Oct 1985	Clark Mabb	L: 5-0-1, 5-0-2, 5-0-3 M: 5-0-1, 5-0-2, 5-0-3, 8-0-1, 8-0-2 N: 6-0-1, 6-0-2, 6-0-3, 7-1-1, 7-1-2, 7-1-2.4, 7-2-1, 7-2-2, 7-2-2.4, 8-0-1, 8-0-2, 8-0-3	6	20
Sunday 6 Oct 1985	Clark Mabb	J: 19-01-, 19-0-2, 19-0-3 K: 12-0-1, 12-0-2, 12-0-3, 13-0-1, 13-0-2, 13-0-3, 14-0-1, 14-0-2, 14-0-3, 15-0-1, 15-0-2, 19-0-1, 19-0-2, 19-0-2.5, 20-1-1, 20-1-2, 20-1-3 L: 14-0-1, 14-0-2, 14-0-2.5, 19-0-1, 19-0-2	9	25
		TOTAL:	23	75

* NOTE: The middle digit denotes the replicate number (zero for no replicates). The last digit represents the depth in feet of the sub-sample; e.g., "-2" would be the sample from 13"-24", or the "2 foot" sample.

SAMPLE STORAGE AND PRESERVATION

After collection, sample cores were placed in an open 55-gallon drum to maintain their vertical position. Care was exercised to ensure that the cores remained vertical and right side up at all times. The cores remained in the drum on the barge deck during each sampling day. No attempt was made to refrigerate the samples during this time. Packing crushed ice in the drum around one or more sample cores during the sampling day would have prevented storing any more cores in that drum, and there was insufficient space to accommodate more drums for that purpose. This was particularly true when sampling from the Mini-Barge.

Following the conclusion of sampling each day, the sample cores were transported via pick-up truck to a local fish processing house, where they were maintained in refrigerated ($4^{o}C$) storage. Each 55-gallon drum of sample cores was covered with inverted black polyethylene bags affixed with several lengths of duct tape. The tape and bags were inspected each day for evidence of tampering with none being found.

The core samples were transported to Corps laboratory facilities on four separate occasions; on 23 and 30 August, and on 6 and 17 September, 1985. The samples transported on 23 and 30 August, and on 6 September went to the Water Quality Laboratory in Hubbardston, MA, while those transported on 17 September went to the Materials Laboratory in Waltham, MA. The finite refrigerated storage facilities at the Corps laboratories precluded storing all of the samples at either laboratory. The short transport time (1-1½ hours) obviated the need for refrigeration during transport; the mass of the sample cores retained their cold until arrival at the Corps facilities. Once at the Corps laboratory, the samples were again maintained in refrigerated ($4^{o}C$) condition.

SAMPLE HANDLING AND PREPARATION

Sediment samples were extracted from sample cores via an extrusion process. A short section (one to four feet long) was cut as necessary from a particular sample tube using an ordinary hack saw. An aluminum cylinder 4" long, with a diameter of 2 13/16" was inserted into one end of the 2 7/8" ID sample core. The cylinder was then forced through the length of the sample tube, either manually with a wooden broom handle, or mechanically with a manually powered screw-type extrusion device. The aluminum cylinder being forced through the sample tube pushed the sediment core out into a clean trough of aluminun foil.

The extruded sample core was measured for length, and that length was compared with the length of the original tube. Occasional differences were observed and could be explained by a combination of factors including sample settling during transport, compaction during extrusion, and approximations in original field measurements of the tubes.

The core was then split longitudinally using a polystyrene knife, and visually classified using the Unified Soil Classification System (ASTM D-2487 and D-2488). A photograph of the split core was taken, followed by subsampling various strata within the core.

Subsamples for chemical analysis were taken using polystyrene spoons drawn longitudinally down the center of the split core over the depth segments of interest. The subsamples thus taken avoided the circumference of the sample core, which tended to appear smeared from being pushed to depth through visibly different strata. These subsamples were stored in 8 oz. polypropylene containers for the duration of the chemical analyses.

Residual material was saved for physical analyses in polyethylene zip-lock bags. The decisions as to what depth segments were to be segregated and saved for physical analyses were for the most part based upon the results of the visual classifications. The decisions as to what depth segments were to be segregated and saved for chemical analyses were based partly on information needs at various depths, and partly upon the results of the visual classifications. These decisions were made by representatives of a variety of organizations (WES, NED, WQL, & EPA) and are recorded in the extrusion logs.

The extrusion logs (Appendix D) pictorially display the sample core lengths, field cuts, segmentation for physical and chemical subsamples, and the visual classifications.

Subsamples for chemical analysis were air-dried at ambient temperature in a fume hood for 72 hours. Fresh, uncontaminated air was directed over the open containers by the use of cardboard baffles. Samples were aligned singly in the direction of the air flow, no sample being in front of or behind another, to avoid cross-contamination.

The air-dried samples were hand-ground with a porcelain mortar-and-pestle. The mortar-and-pestle was washed in hot, soapy water, rinsed with hot tap water, distilled-deionized water, acetone, and finally hexane between each sample. The dried and ground samples were then stored in their original respective polypropylene containers at room temperature.

Since the air-drying at ambient temperature was not complete, aliquots of the subsamples were taken for moisture determination. These moisture determinations were later used to adjust all other analyses to a dry weight basis. Table V lists the resultant moisture contents after this air-drying process.

TABLE VA
New Bedford Harbor
Sediment Core Sample Residual Moisture
(after air-drying at ambient temperature for 72 hours)

Field Grid No. (1)	Stratum (inches)	Lab ID No.	Percent Moisture
E-25-1	0-12	9910A	11.9
	12-24	9910B	12.1
	24-30	9910C	9.1
E-27-1	0-24	9912A	11.0
	24-33	9912B	6.7 (2)
G-13-1	0-10	9914A	19.5
	24-36	9914C	15.1
G-17-2	0-24	9918A	40.7
	24-38	9918B	43.1
	45-49	9919D	24.5
G-18	0-12	0030A	
	12-24	0030B	46.0
	24-36	0030C	44.7 (3)
G-20-2	0-12	9921A	10.4 (3)
	24-36	9921C	9.2
G-29-1	0-15	9922A	18.1
	15-27	9922B	18.2
H-12	0-12	0042A	8.3
	12-24	0042B	30.5
H-17	0-6	9877A	33.0
	6-8	9877B	3.9
	18-36	9877C	7.0
H-21	0-12	9869A	23.5
	12-24	9869B	20.0
	24-37	9869C	20.9
H-25	0-12	9907A	17.0
	24-33	9907C	6.3
H-33	0-12	9859A	6.9
	24-36	9859C	9.4
I-3-1	0-18	9925A	18.8
	18-28	9925B	13.9
I-9-1	0-22	9927A	32.7
	22-29	9927B	4.5
I-11-1	0-13	9930A	57.0
	13-24	9930B	10.7
	24-36	9930C	3.9 (2)
I-11-2	0-12	9932A	28.3
	12-24	9932B	4.2
I-12	0-12	0047A	12.6
	12-24	0047B	9.4
I-15	0-6	9902A	18.0 (3)
	6-24	9902B	15.0
	24-36	9902C	18.2
I-19	0-13	9786A	23.0
	24-37	9786C	14.1

TABLE VA (cont'd)
New Bedford Harbor
Sediment Core Sample Residual Moisture
(after air-drying at ambient temperature for 72 hours)

Field Grid No. (1)	Stratum (inches)	Lab ID No.	Percent Moisture
I-23	0-24	9840A	23.8
	24-36	9840B	32.5
I-28	0-12	9848A	13.0
	24-38	9848C	26.9
I-31	0-8	9778A	6.1
	8-24	9778B	6.5
J-5-1	0-24	9934A	22.2
	24-36	9934B	6.2
J-7	0-1	0052A	28.2
	5.5-6.5	0052C	17.0
	12-13	0052E	28.5
	30-40	0052G	3.0
J-8-2	0-24	9938A	36.3
	24-32	9938B	31.2
J-10	0-12	0055A	6.6
	12-24	0055B	6.2
J-12	0-5	0058A	8.6
J-13-2	0-8	9941A	19.3
	8-20	9941B	10.8
J-15-1	0-16	9942A	10.2
J-17-2	0-12	9945A	16.4
	12-24	9945B	8.0
J-20-2	0-16	9947A	10.6
K-5-2	0-12	9949A	28.5 (3)
	12-24	9949B	27.2
	24-33	9949C	5.4
K-26-1	0-12	9950A	28.2
	12-22	9950B	3.8
K-28-2	0-8	9953A	14.8
	8-20	9953B	8.6
K-32-1	0-12	9954A	14.1
	12-23	9954B	9.0
L-10-1	0-11	9956A	25.9
	24-36	9956C	4.1
L-29-2	0-12	9962A	25.0
	24-36	9962C	7.2
M-6-2	0-24	9965A	20.4
	24-31	9965B	1.6
M-27-1	0-16	9967A	19.6
	16-26	9967B	10.6
Control	N/A	0101A-D	0.9 (4)
Control	N/A	0161A-E	1.1 (5)

(1) In the form of A-N (-n), where coordinate (1= North);

(x) Average value of x replica

LABORATORY ANALYSIS

Physical analyses for Atterberglimits, grain size (seive and hydrometer), specific gravity, and moisture content were performed according to USACE Engineer Manual EM-1110-2-1906, dated 30 November, 1970. Volatile solids were determined by adapting Method 209D from the 16th edition of Standard Methods for the Examination of Water and Wastewater (1985) to sediments. Cation exchange capacity was performed using the method listed in Procedures for Handling and Chemical Analysis of Sediment and Water Samples (1981). Atterberg limits, grain size, and specific gravity were performed by personnel from the USACE Materials Laboratory in Waltham, MA on assignment at the USACE Water Quality Laboratory (WQL) in Hubbardston, MA. Materials Lab personnel, being most qualified to perform the above noted tests, were temporarily assigned to WQL so as to avoid the possible contamination of the Waltham laboratory. All other physical tests and chemical analyses were performed by WQL personnel at the Hubbardston facility.

Chemical analyses were for the most part performed according to those methods recorded in the EPA/USACE Technical Report No. EPA/CE-81-1 Procedures for Handling and Chemical Analysis of Sediment and Water Samples (May 1981). Exceptions and/or options to these methods are as follows:

a) Trace Metals (Cd, Cr, Cu, Pb, Ni, & Zn) - Nitric acid/hydrogen peroxide digestion (option)

b) Oil & Grease - Infrared spectrophotometry finish (option). Air drying at 60°C prior to extraction in place of mixing wet sample with anhydrous magnesium sulfate ($MgSO_4$) (exception).

c) Arsenic - Hydrogen generated in situ using sodium teterhydridoborate ($NaBH_4$) in place of zinc slurry (exception).

Analyses for PCB's were mostly performed according to the USEPA's SW846, Test Methods for Evaluating Solid Waste, Methods 3540 (extraction) and 8080 (analysis). Exceptions to this were the air-drying of the samples prior to extraction in place of mixing wet sample with anhydrous sodium sulfate (Na_2SO_4), and using nitrogen as the carrier gas in place of 95:5 argon:methane. The former was used to promote a more homogeneous sample, while the latter originates from an old EPA procedure. WQL's new Shimadzu Model GC-9A gas chromatograph with twin ECDs, autosampler, and twin computer/plotters was used for this project. Most of the chromatograms were permanently stored on floppy disk for future reference.

QUALITY ASSURANCE/QUALITY CONTROL

A draft quality assurance/quality control (QA/QC) program for the chemical laboratory was published on 2 August 1985 (Appendix E). This document was reviewed by USACE Missouri River Division (MRD) Laboratory and by the USACE Waterways Experiment Station (WES). Written comments were received from MRD, (Appendix F), but not from WES.

In general, the draft QA/QC plan was adhered to as originally stated. A comparison of the draft plan to the actual events as noted earlier in this document concerning sampling would reveal only a minor change in the sampling device and the omission of on-board icing of samples during sampling operations.

MRD's comments were reviewed and implemented as appropriate. Several of the comments revealed that MRD was interpreting the draft QA/QC plan as a Site Specific Quality Management Plan (SSQMP). This is unfortunate since that was not the original intent of this document. The request to author an SSQMP was never made by MRD, by WES, or by the NED Project Manager.

The comment identifying a new edition of SW846 was well received and the newer edition was obtained prior to initiating laboratory analyses. Complete chronological resumes for the technical staff are being supplied as an addendum to this report (Appendix G). The choice of trace metals to be analyzed was made by WES and NED and was not the function of the laboratory. Confirmation of PCB's was performed via 12% split samples with WES. Other comments by MRD were either addressed earlier within this document, or were compatible with WQL's original draft QA/QC plan.

The QA/QC program executed for this series of samples exceeded the 10% goals set in the draft QA/QC plan. QA/QC analyses were analyzed at the following percentage rates:

Controls	14%
Internal Replicates	14%
Internal Spikes	11%
External Splits	13%
Standard Reference Materials	8%
Average	12%

Table VI summarizes the QA/QC effort expended for this project.

TABLE VI
NEW BEDFORD SUPERFUND
QA/QC Summary (Numbers of Analyses)

PARAMETER	SAMPLE ANALYSES	CONTROLS	INTERNAL REPLICATES WQL	INTERNAL SPIKES WQL	EXTERNAL SPLITS WES	STANDARD REFERENCE MATERIALS	TOTAL QA/QC	% QA/QC
PCB's	86	11	12	11	10	7	51	59
Oil & Grease	71	9	9	3	9	0*	30	42
Arsenic	71	9	10	8	9	8	44	62
Mercury	71	9	8	7	9	7	40	56
Cadmium	71	11	10	10	9	2**	42	59
Chromium	71	11	10	9	9	6	45	63
Copper	71	11	10	9	9	8	47	66
Lead	71	11	10	9	9	8	47	66
Nickel	71	11	10	10	9	7	47	65
Zinc	71	11	10	7	9	8	45	66
Total (%)	725	104 (14)	99 (14)	83 (11)	91 (13)	61 (8)	438	60

* No SRM for O & G available at time of analysis

** Most SRM values for Cd were below detection limit

WQL - USACOE New England Division Water Quality Laboratory

WES - USACOE Waterways Experiment Station Environmental Laboratory

RESULTS

Table VII displays the results of the moisture and volatiles analyses, while Table VIII reveals the cation exchange capacities of selected strata. The results of the remaining physical tests (Atterberg limits, grain size, and specific gravity) are contained in Appendix H.

The analytical results of the sediment core chemical analyses are displayed in Table IX. Two separate groups of samples were analyzed for all of the parameters listed in the table, one in November of 1985, and one in December of 1985. Two smaller groups were later analyzed for PCBs alone, one in February of 1986, and the last one in May, 1986.

Tables X through XIV, inclusive, present measures of analytical precision (via internal replicate analyses) and accuracy (via internal spiked sample analyses). Data for these measures are displayed for all of the chemical analyses.

Tables XV through XVII, inclusive, reveal the results of analyzing various standard reference materials (SRM's). Results of this type of data validation are available for all of the chemical parameters with the exception of oil & grease. At the time these analyses were performed, NED's WQL did not possess an appropriate SRM for the oil & grease test.

Tables XVIII and XIX present the results of split sample analyses. A random selection of sediment samples were extruded, air-dried, ground, and then split into roughly equal portions. One-half of each sample was analyzed by the Corps' NED Laboratory, while the other half of each sample was independently analyzed by the Corps' Waterways Experiment Station (WES) Environmental Laboratory in Vicksburg, MS. Neither laboratory knew the results of the other laboratory's analyses prior to their own testing. The results of these split sample analyses agreed remarkably well, and are probably the best form of data validation available.

Table VII

New Bedford Superfund

Physical Analyses

Moisture and Volatiles

Grid No.	Stratum (inches)	Lab ID No.	% Moisture	% Volatiles
E-25-1	0-24	9910 E/E	54.1	14.4
E-27-1	0-18	9912 C	53.4	7.64
G-13-1	0-10	9914 E	52.7	13.6
G-17-2	0-38	9918 C	68.6	21.3
G-20-2	0-9	9921 D	55.6	12.2
G-29-1	0-27	9922 D	54.0	7.05
H-21	0-37	9869 D	62.6	13.7
H-25	0-12	9907 D	60.6	13.4
H-33	0-36	9859 D	48.0	5.64
I-3-1	18-28	9925 D	31.8	5.62
I-9-1	0-8	9927 D	64.5	17.0
I-11-1	0-13	9930 E	67.4	22.8
I-15	6-46	9902 F	55.9	7.54
I-19	0-13	9786 D	67.3	14.2
I-23	24-45	9840 E	58.7	11.3
I-28	0-38	9849 D	58.8	11.2
I-31	0-8	9778 C	30.5	5.33
J-5-1	0-12	9934 C	50.4	9.31
J-8-2	0-15	9938 C	68.1	22.9
J-13-2	0-20	9941 C/D	29.2	4.55
J-15-1	0-16	9942 B	40.5	7.09
J-17-2	0-6	9945 C	51.9	10.8
J-20-2	0-16	9947 B	24.1	3.04
K-5-2	0-7	9949 D	66.2	21.7
K-26-1	0-22	9950 C/D	23.2	2.99
K-28-2	8-20	9953 D	24.1	2.64
K-32-1	0-23	9954 C	30.2	3.47
L-10-1	11-34	9956 E	54.2	7.31
L-29-2	6-34	9962 E	56.9	6.87
M-6-2	24-31	9965 D	42.2	7.32
M-27-1	16-26	9967D	27.2	3.24

Table VIII
New Bedford Superfund
Physical Analyses
Cation Exchange Capacity (CEC)

Grid No.	Stratum (inches)	Lab ID No.	CEC meg/100g
E-25-1	0-24	9910 E/F	47
E-27-1	0-18	9912 C	23
G-13-1	0-10	9914 E	33
G-17-2	0-38	9918 C	65
G-18	0-40	0030 D	49
G-20-2	0-9	9921 D	40
G-29-1	0-27	9922 D	47
H-17	0-6	9877 E	21
H-17	6-49	9877 F	49
H-21	0-37	9869 D	32
H-25	0-12	9907 D	30
H-33	0-36	9859 D	41
I-3-1	18-28	9925 D	21
I-9-1	0-8	9927 D	60
I-11-1	0-13	9930 E	42
I-15	6-46	9902 F	45
I=19	0-13	9786 D	59
I-23	24-45	9840 E	30
I-28	0-38	9849 D	23
I-31	0-8	9778 C	4.1
J-5-1	0-12	9934 C	9.7
J-8-2	0-15	9938 C	43
J-13-2	0-20	9941 C/D	15
J-15-1	0-16	9942 B	30
J-17-2	0-6	9945 C	43
J-20-2	0-16	9947 B	3.2
K-5-2	0-7	9949 D	9.0
K-26-1	0-22	9950 C/D	5.7
K-28-2	8-20	9953 D	3.7
K-32-1	0-23	9954 C	28
L-10-1	11-34	9956 E	20
L-29-2	6-34	9962 E	48
M-6-2	24-31	9965 D	49
M-27-1	16-26	9967 D	21

LE IX
New Bedford Harbor
Results of Sediment Core Chemical Analyses

Field Grid No. (1)	Stratum (inches)	Lab ID No.	Total PCBs (ppm)	Oil & Grease (ppm)	Arsenic (ppm)	Cadmium (ppm)	Chromium (ppm)	Copper (ppm)	Lead (ppm)	Mercury (ppm)	Nickel (ppm)	Zinc (ppm)
E-25-1	0-12	9910A	90.7	10100	2.4	16	325	897	434	1.1	57	1120
	12-24	9910B	2.08	329	1.8	7	115	748	539	<0.1	44	1760
	24-30	9910C	0.21	50	1.4	<2	<7	<6	<20	<0.1	<24	12
E-27-1	0-24	9912A	26.7	3910	3.8	12	209	392	183	0.7	30	455
	24-33	9912B	1.10	590	1.8 (2)	<2	16	36	27	0.4 (2)	<24	50
G-13-1	0-10	9914A	79.8	8980	5.4	<3	23	24	<19	1.4	25	81
	24-36	9914C	0.08	85	2.9	<2	22	10	<20	<0.1	24	42
G-17-2	0-24	9918A	1147 (2)	40500	8.1	54	1130	1900	1420	1.5	241	3280
	24-38	9918B	577	22300	15.2	8 (2)	379 (2)	1670 (2)	1500(2)	2.5	63 (2)	3990(2)
	45-49	9919D	3.31	7190	13.0	10	241	2050	1300	1.4	57	4130
	49-65	9919E	5.79	7160	8.1	4 (3)	48 (3)	628 (3)	474 (3)	0.7	<35 (3)	1400(3)
G-18	0-12	0030A	312 (2)	-	-	-	-	-	-	-	-	-
	12-24	0030B	1440	31200	2.6	36	628	1750	1980	2.0	80	3630
	24-36	0030C	375	23000 (2)	6.0	6	141	1700	960	1.7	<45	5000
G-20-2	0-12	9921A	12.6	8040 (2)	5.4 (2)	9	177	612	470	1.3 (2)	36	1200
	24-36	9921C	0.29	60	3.1	<2	22	9	<20	<0.1	<24	35
G-29-1	0-15	9922A	22.6	3690	3.7	11	244	560	216	0.5	27	583
	15-27	9922B	0.55	<50	2.3	<2	23	16	<20	<0.1	<24	38
H-12	0-12	0042A	8370	-	-	-	-	-	-	-	-	-
	12-24	0042B	3740	-	-	-	-	-	-	-	-	-
H-17	0-6	9877A	499	-	-	-	-	-	-	-	-	-
	6-18	9877B	4.05	550	4.6	<2	29	33	17	<0.1	<22	111
	18-36	9877C	1.15	494	3.4	3	27	31	37	<0.1	≤24	119
H-21	0-12	9869A	448	22500	4.6	51	827	1830	751	1.4	191	2390
	12-24	9869B	2.04 (2)	5590	4.0	<3	47	259	254	1.3	<26	365
	24-37	9869C	0.19	<50	4.0	<2 (2)	33 (3)	58 (2)	39 (2)	<0.1	<24 (2)	54 (2)
H-25	0-12	9907A	160	21500	4.2 (2)	70	997	1780	558	1.0 (2)	455	3150
	24-33	9907C	0.16 (2)	<50	2.7	<2	10	<6	<20	<0.1	<24	23
H-33	0-12	9859A	2.42	418	3.9 (2)	3	50	96	61	0.2 (2)	<23	133
	24-36	9858C	0.04	60	3.2	<2	22	9	<20	<0.1	<24	34
I-3-1	0-18	9925A	938	19700	9.1	20	494	1180	892	1.0	80	3040
	18-28	9925B	0.22	90	1.8	<2	29	25	54	<0.1	<24	85

TABL X (cont'd)
New Bedford Harbor
Results of Sediment Core Chemical Analyses

Field Grid No. (1)	Stratum (inches)	Lab ID No.	Total PCBs (ppm)	Oil & Grease (ppm)	Arsenic (ppm)	Cadmium (ppm)	Chromium (ppm)	Copper (ppm)	Lead (ppm)	Mercury (ppm)	Nickel (ppm)	Zinc (ppm)
I-9-1	0-22	9927A	146	10600	6.5	6	80	719	484	1.5	<32	1970
	22-29	9928B	0.10 (2)	220	2.4	<2	9	8	<20	<0.1	<24	32
I-11-1	0-13	9930A	36000	32700	2.1	56	745	1510	971	1.0	135	3250
	13-24	9930B	66.4 (2)	214	3.2	<3	40	47	43	<0.1	<25	228
	24-36	9930C	1.06	<50 (2)	3.6 (2)	<2	24	9	<20	<0.1	<24	37
I-11-2	0-12	9932A	22500	-	-	-	-	-	-	-	-	-
	12-24	9932B	11200	-	-	-	-	-	-	-	-	-
I-12	0-12	0047A	1370	-	-	-	-	-	-	-	-	-
	12-24	0047B	73	-	-	-	-	-	-	-	-	-
I-15	0-6	9902A	882	20400 (2)	10.7	44 (3)	749 (3)	1390 (3)	573 (3)	0.9	113 (3)	2050 (3)
	6-24	9902B	16.1	838	3.9	4	48	129	60	<0.1	<24	275
	24-36	9902C	0.63	<50	5.1	<2	25	9	<20	<0.1	<24	41
I-19	0-13	9786A	911	7920	11.4	55	1100	1560	507	0.9	136	1770
	24-37	9786C	<0.01	60	3.7	<2	16	<6	<20	<0.1	<24	28
I-23	0-24	9840A	441	30600	11.7	60	1230	2470	806	1.2	206	3020
	24-36	9840B	0.34	1990	6.6	<2	48	595	362	2.5	<24	671
I-28	0-12	9848A	177	17000	5.0	19	740	2030	529	1.1	89	1880
	24-38	9848C	0.02	2250	7.3	<2	40	212	202	1.9	<24	174
I-31	0-8	9778A	22.4	2260	3.1	7	118	397	111	0.2	42	568
	8-24	9778B	0.27	<50 (2)	1.8 (2)	<2	8	7	<20	<0.1 (2)	<24	35
J-5-1	0-24	9934A	282	3340	2.5	4	145	165	223	0.2	34	572
	24-36	9934B	0.20	<50	4.2	<2 (2)	19 (2)	8 (2)	<20 (2)	<0.1	<24 (2)	32 (2)
J-7	0-1	0052A	21800	-	-	-	-	-	-	-	-	-
	5.5-6.5	0052C	76100 (2)	-	-	-	-	-	-	-	-	-
	12-13	0052D	54000	-	-	-	-	-	-	-	-	-
	30-40	0052G	92.3	-	-	-	-	-	-	-	-	-
J-8-2	0-24	9938A	2540	15300	4.1	12	301	1060	791	1.2	52	2970
	24-32	9938B	1.22	2100	4.8	<2	36	137	153	1.4	<24	182
J-10	0-12	0055A	8560	-	-	-	-	-	-	-	-	-
	12-24	0055B	0.74	-	-	-	-	-	-	-	-	-
J-12	0-5	0058A	173 (2)	-	-	-	-	-	-	-	-	-

TABLE (cont'd)

New Bedford Harbor

Results of Sediment Core Chemical Analyses

Field Grid No. (1)	Stratum (inches)	Lab ID No.	Total PCBs (ppm)	Oil & Grease (ppm)	Arsenic (ppm)	Cadmium (ppm)	Chromium (ppm)	Copper (ppm)	Lead (ppm)	Mercury (ppm)	Nickel (ppm)	Zinc (ppm)
J-13-2	0-8	9941A	139 (2)	3060	3.8 (2)	3	119	355	181	0.4 (2)	<26	935
	8-20	9941B	0.14	510	1.7	2	19	47	33	0.2	<24	132
J-15-1	0-16	9942A	58.2	560	4.5	2	74	197	88	0.3	<24	339
J-17-2	0-12	9945A	139	2690	2.9	5 (3)	134 (3)	358 (3)	145 (3)	0.5	27 (3)	547 (3)
	12-24	9945B	0.04	<50 (2)	2.0 (2)	<2	10	<6	<20	0.2	<24	17
J-20-2	0-16	9947A	3.54	280	2.6	<2	15	36	<20	<0.1	<24	71
K-5-2	0-12	9949A	440	15000 (2)	3.3	7	129	896	174	0.7	38	3370
	12-24	9949B	2.34	232	3.3	<3	15	31	27	<0.1	<32	128
	24-33	9949C	0.05 (2)	50	3.8	<2 (2)	23 (2)	10 (2)	<20 (2)	<0.1	<24 (2)	37 (2)
K-26-1	0-12	9950A	42.4	283	1.0	<2	94	189	48	0.2	<30	208
	12-22	9950B	0.04	<50	1.6	<2	<7	<6	<20	<0.1	<24	14
K-28-2	0-8	9953A	16.5	385	<0.5	<2	41	114	41	<0.1	<24	159
	8-20	9953B	0.06	<50	0.7	<2	8	<6	<20	<0.1	<24	13
K-32-1	0-12	9954A	2.56	163	2.0	<2	<9	<6	<18	<0.1	<24	52
	12-23	9954B	0.02	<50	1.2	<2	<7	<6	<20	<0.1	<24	5
L-10-1	0-11	9956A	318	21300	5.8	12	247	1530	838	0.8	49	3660
	24-36	9956C	0.08	70	2.9	<2	18	10	<20	<0.1	<24	32
L-29-2	0-12	9962A	29.1 (2)	1110	1.9	<3	57	153	<21	<0.1	<31	240
	24-36	9962C	0.06	<50	3.4	<2	20	10	<20	0.1	<24	37
M-6-2	0-24	9965A	607	3500	2.9 (2)	5	114	717	497	0.9 (2)	<31	2260
	24-31	9965B	0.35	<50	3.0	<2 (2)	30 (2)	10 (2)	<20 (2)	<0.1	<24 (2)	32 (2)
M-27-1	0-16	9967A	51.8	4620	0.7	5 (3)	72 (3)	227 (3)	151 (3)	0.6	<30 (3)	363 (3)
	16-26	9967B	0.02 (2)	<50	1.0	<2	<7	<6	<20	<0.1	<24	35
Control	N/A	0101A-D	0.10 (2)	151 (4)	7.0 (4)	2	16	11	26	<0.1 (4)	<24	32
Control	N/A	0161A-E	0.04 (5)	50 (5)	<0.5 (5)	2 (7)	10 (7)	11 (7)	16 (7)	<0.1 (5)	<26 (7)	48 (7)

(1) In the form of A-N (-n), where A is the alphabetical West/East coordinate (A=West); N is the numeric North/South coordinate (1=North); and (-n) is the field sample replicate number.

(x) Average value of x replicates; e.g., (3) indicates average value of 3 replicates

TABLE X
New Bedford Superfund
Precision (Replicates) and Accuracy (Spikes)
PCB's

Sample No. (R= Replicate)	TOTAL PCB's (ppm)	Sample No. (R= Replicate)	TOTAL PCB's (ppm)
9907C	0.14	9869B	3.1
9907CR	0.17	9869BR	1.0
Average	0.16	Average	2.0
Spike Level (ppm)	1000	Spike Level (ppm)	100
% Recovery	77%	% Recovery	72%
9927B	0.18	9918A	1040
9927BR	0.03	9918AR	1254
Average	0.11	Average	1147
Spike Level (ppm)	1000	Spike Level (ppm)	100
% Recovery	58%	% Recovery	94%
9949C	0.06	9930B	68.1
9949CR	0.04	9930BR	64.6
Average	0.05	Average	66.4
Spike Level (ppm)	1000	Spike Level (ppm)	48%
% Recovery	78%	% Recovery	48%
9967B	0.02	9941A	152
9967BR	0.01	9941AR	125
Average	0.02	Average	139
Spike Level (ppm)	1000	Spike Level (ppm)	100
% Recovery	84%	% Recovery	130%
0030A	398	9962A	34.4
0030AR	227	9962AR	23.8
Average	312	Average	29.1
Spike Level (ppm)	500	Spike Level (ppm)	100
% Recovery	68%	% Recovery	107%
0058A	154	0052C	77,400
0058AR	192	0052CR	74,900
Average	173	Average	76,100
Spike Level (ppm)	500	Spike Level (ppm)	*
% Recovery	66%	% Recovery	*
Control 0101A	0.12	Control 0161A	.02
Control 0101B	0.11	Control 0161B	.04
Control 0101C	0.06	Control 0161C	.04
Control 0101D	0.09	Control 0161D	0.10
		Control 0151E	<.01
Blank 1	<0.01		
Blank 2	<0.01	Blank 1	.02
Blank 3	<0.01	Blank 2	.02
Spike Level (ppm)	1000	Blank 3	.02
% Recovery	96%		

* No spike was analyzed for this sample

Table XI

New Bedford Superfund

Precision (Replicates) and Accuracy (Spikes)

Heavy Metals

Sample No. (R = Replicate)	Nickel (ppm)	Copper (ppm)	Chromium (ppm)	Lead (ppm)	Zinc (ppm)	Cadmium (ppm)
9869C	<24	58	33	38	55	<2
9869CR	<24	58	33	40	53	<2
Ave	<24	58	33	39	54	<2
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	62%	57%	56%	63%	48%	59%
9918B	62	1640	372	1450	4020	8
9918BR	64	1700	386	1550	3960	8
Ave	63	1670	379	1500	3990	8
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	86%	*	104%	*	*	81%
9934B	<24	8	17	<20	29	<2
9934BR	<24	8	20	<20	35	<2
Ave	<24	8	19	<20	32	<2
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	88%	84%	75%	91%	89%	84%
9949C	<24	10	23	<20	41	<2
99[illegible]R	<24	8	21	<20	34	<2
[illegible]	<24	9	22	<20	37	<2
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	75%	80%	74%	90%	76%	75%
9965B	<24	11	37	<20	27	<2
9965BR	<24	9	24	<20	37	<2
Ave	<24	10	30	<20	32	<2
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	90%	88%	79%	94%	91%	84%
Control A	<24	13	9	20	26	<2
Control B	<24	10	23	<20	38	<2
Control C	<24	11	21	20	36	<2
Control D	<24	10	9	43	30	<2
Blank 1	<24	<6	<7	<20	4	<2
Blank 2	<24	<6	<7	<20	3	<2
Blank 3	<24	<6	<7	<20	2	<2

* NOTE: Spike level too low for this concentration range

Table XI (cont'd)

New Bedford Superfund

Precision (Replicates) and Accuracy (Spikes)

Heavy Metals

Sample No. (R = Replicate)	Nickel (ppm)	Copper (ppm)	Chromium (ppm)	Lead (ppm)	Zinc (ppm)	Cadmium (ppm)
9902A	111	1300	698	546	1950	44
9902A R1	110	1400	752	555	2150	43
9902A R2	119	1480	798	619	2050	45
Ave	113	1390	749	573	2050	44
Spike Level (mg/L)	2.0	*	*	1.0	*	1.0
% Recovery	90%	*	*	84%	*	88%
9919E	<29	615	49	474	1400	3
9919E R1	<29	653	51	446	1380	3
9919E R2	<35	617	45	501	1440	6
Ave	<35	628	48	474	1400	4
Spike Level (mg/L)	2.0	2.0	2.0	1.0	*	1.0
% Recovery	84%	90%	95%	78%	*	83%
9945A	29	349	145	138	525	6
9945A R1	30	377	153	155	563	6
9945A R2	22	348	104	143	554	3
Ave	27	358	134	145	547	5
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	88%	145%	95%	83%	24%	89%
[illegible]	<30	229	63	144	345	6
9967A R1	<29	234	74	154	391	6
9967A R2	<29	218	78	155	354	4
Ave	<30	227	72	151	363	5
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	93%	86%	78%	103%	44%	89%
0161E	<25	<6	<10	<17	22	4
0161E R1	<26	7	<10	<18	40	4
0161E R2	<26	12	<10	<17	44	<2
Ave	<26	10	<10	<18	35	4
Spike Level (mg/L)	2.0	2.0	2.0	1.0	1.0	1.0
% Recovery	67%	73%	49%	66%	59%	70%
Control A	<23	13	11	<16	41	<2
Control B	<24	8	<9	<16	41	<2
Control C	<23	12	<9	<16	99	<2
Control D	<23	16	10	<16	48	4
Control E	<26	10	<10	<18	35	4
Blank 1	<24	<6	<9	<16	51	4
Blank 2	<24	<6	29	<16	27	3
Blank 3	<24	<6	48	<16	15	3

* NOTE: Spike level too low for this concentration range

Table XII

NEW BEDFORD SUPERFUND

Precision (replicates) and Accuracy (spikes)

SAMPLE NO. (R = replicate)	Arsenic (ppm)	Mercury (ppm)	Oil & Grease (ppm)
9778 B	2.0	<0.1	<50
9778 BR	1.6	<0.1	<50
Avg.	1.8	<0.1	<50
Spike Level Total ug	5.0	0.5	-
% Recovery	98%	82%	-
9912 B	1.8	0.15	620
9912 BR	1.8	0.26	560
Avg.	1.8	0.41	590
Spike Level Total ug	5.0	0.5	-
% Recovery	73%	91%	-
9930 C	4.1	-	<50
9930 CR	3.0	-	<50
Avg.	3.6	-	<50
Spike Level Total ug	5.0	-	-
Recovery	73%	-	-
9945 B	1.5	-	<50
9945 BR	2.4	-	<50
Avg.	2.0	-	<50
Spike Level Total ug	5.0	-	-
% Recovery	56%	-	-
9962 C	4.1	0.12	<50
9962 CR	2.6	<0.1	<50
Avg.	3.4	0.11*	<50
Spike Level Total ug	5.0	0.5	-
% Recovery	57%	30%	-

* Detection Limit used in calculating average

Control A	6.5	<0.1	155
Control B	11.6	<0.1	120
Control C	4.5	<0.1	140
Control D	5.3	<0.1	190
Blank 1	<0.5	<0.1	<50
Blank 2	<0.5	<0.1	<50
Blank 3	<0.5	<0.1	<50

Table XIII

NEW BEDFORD SUPERFUND

Precision (replicates) and Accuracy (spikes)

SAMPLE NO. (R = replicate)	Arsenic (ppm)	Mercury (ppm)
9959A	2.8	0.18
9959AR	5.0	0.18
Avg.	3.9	0.18
Spike Level Total ug	3.8	0.5
% Recovery	69%	55%
9907A	4.6	1.00
9907AR	3.9	0.92
Avg.	4.2	0.96
Spike Level Total ug	3.8	0.5
% Recovery	30%	33%
9921A	5.2	1.21
9921AR	5.6	1.32
Avg.	5.4	1.26
Spike Level Total ug	*	*
% Recovery	*	*
9941A	4.1	0.43
9941AR	3.4	0.40
Avg.	3.8	0.42
Spike Level Total ug	*	0.5
% Recovery	*	69%
9965A	2.0	0.87
9965AR	3.8	0.87
Avg.	2.9	0.87
Spike Level Total ug	3.8	0.5
% Recovery	46%	22%

* Sample not spiked

Control A	0.5	<0.1
Control B	<0.5	<0.1
Control C	<0.5	<0.1
Control D	<0.5	<0.1
Control E	0.9	<0.1
Blank 1	<0.5	<0.1
Blank 2	<0.5	<0.1
Blank 3	<0.5	<0.1

Table XIV
NEW BEDFORD SUPERFUND
Precision (replicates) and Accuracy (spikes)

SAMPLE NO. (R = replicate)	Oil & Grease (ppm)
9902A	21,700
9902AR	19,100
Avg.	20,400
Spike Level Total mg	82.7
% Recovery	57%
9921A	9,030
9921AR	7,040
Avg.	8,040
Spike Level Total mg	8.27
% Recovery	121%
9949A	16,900
9949AR	13,100
Avg.	15,000
Spike Level Total mg	*
% Recovery	*
0030C	24,000
0030CR	22,000
Avg.	23,000
Spike Level Total mg	8.27
% Recovery	102%

* Sample not spiked

Control A	50
Control B	<50
Control C	56
Control D	76
Control E	<50
Blank 1	<50
Blank 2	<50
Blank 3	<50

Table XV
New Bedford Superfund

Analysis of Standard Reference Materials (SRM's)

Total PCB's

	TOTAL PCB's (ppm)
EPA Group 1	
True Value	24.6
Acceptable Range	MDL-51.6
Measured Value A	11.4
Measured Value B	14.1
EPA Group 2	
True Value	2.34
Acceptable Range	MDL-5.37
Measured Value	1.47
EPA Group 3	
True Value	14.3
Acceptable Range	6.21-22.4
Measured Value A	9.71
B	18.0
C	20.4
D	6.83

NOTE: Source for all above SRM's is the U.S. Environmental Protection Agency

EPA Group 1 contains A-1242

EPA Group 2 contains A-1254

EPA Group 3 contains a mixture of A-1242 and A-1254

NOTE: MDL = Method Detection Limit

Table XVI

New Bedford Superfund

Analysis of Standard Reference Materials (SRM's)

Heavy Metals

	Nickel (ppm)	Copper (ppm)	Chromium (ppm)	Lead (ppm)	Zinc (ppm)	Cadmium (ppm)
BCSS-1						
True Value ± 2s	53.3 ± 3.6	18.5 ± 2.7	123 ± 3.4	22.7 ± 3.4	119 ± 12	0.25 ± 0.04
Measured Value	47	18	43	15	89	<2
% Recovery of True Value	88%	97%	35%	66%	74%	*
MESS-1						
True Value ± 2s	29.5 ± 2.7	25.1 ± 3.8	71 ± 11	34 ± 6.1	191 ± 17	0.59 ± 0.10
Measured Value	21	30	22	15	159	<2
% Recovery of True Value	71%	119%	31%	44%	83%	*
NBS 1645						
True Value ± 2s	45.8 ± 2.9	109 ± 19	29,600 ± 280	714 ± 28	1720 ± 169	10.2 ± 1.5
Measured Value	27	94	**	620	1411	6
% Recovery of True Value	59%	86%	**	87%	82%	59%
NBS 1646						
True Value ± 2s	32 ± 3	18 ± 3	76 ± 3	28.x ± 1.8	138 ± 6	0.36 ± 0.07
Measured Value	17	16	28	19	94	<2
% Recovery of True Value	53%	89%	37%	67%	68%	*

* Measured value below detection limit; % Recovery not calculable

** True value not representative of sample concentrations

BCSS-1 = Marine sediment from Baie des Chaleurs; source: National Research Council of Canada

MESS-1 = Marine sediment from Miramichi River estuary; source: National Research Council of Canada

NBS 1645 = River sediment from Indiana Harbor Canal, near Gary, IN; source: National Bureau of Standards

NBS 1646 = Estuarine sediment from Chesapeake Bay; source: National Bureau of Standards

Table XVI (cont'd)

New Bedford Superfund

Analysis of Standard Reference Materials (SRM's)

Heavy Metals

	Nickel (ppm)	Copper (ppm)	Chromium (ppm)	Lead (ppm)	Zinc (ppm)	Cadmium (ppm)
BCSS-1						
True Value ± 2s	53.3 ± 3.6	18.5 ± 2.7	123 ± 3.4	22.7 ± 3.4	119 ± 12	0.25 ± 0.04
Measured Value	44	37	42	23	171	<2
% Recovery of True Value	82%	200%	34%	101%	143%	*
MESS-1						
True Value ± 2s	29.5 ± 2.7	25.1 ± 3.8	71 ± 11	34 ± 6.1	191 ± 17	0.59 ± 0.10
Measured Value	24	28	20	31	31	<2
% Recovery of True Value	81%	112%	28%	91%	68%	*
NBS 1645						
True Value ± 2s	45.8 ± 2.9	109 ± 19	29,600 ± 280	714 ± 28	1720 ± 169	10.2 ± 1.5
Measured Value	30	95	**	600	1507	5
% Recovery of True Value	66%	87%	**	84%	88%	49%
NBS 1646						
True Value ± 2s	32 ± 3	18 ± 3	76 ± 3	28.x ± 1.8	138 ± 6	0.36 ± 0.07
Measured Value	*	24	22	17	155	<2
% Recovery of True Value	*	133%	29%	60%	112%	*

* Measured value below detection limit; % Recovery not calculable

** True value not representative of sample concentrations

BCSS-1 = Marine sediment from Baie des Chaleurs; source: National Research Council of Canada

MESS-1 = Marine sediment from Miramichi River estuary; source: National Research Council of Canada

NBS 1645 = River sediment from Indiana Harbor Canal, near Gary, IN; source: National Bureau of Standards

NBS 1646 = Estuarine sediment from Chesapeake Bay; source: National Bureau of Standards

Table XVII

NEW BEDFORD SUPERFUND

Analysis of Standard Reference Materials

	Arsenic (ppm)	Mercury (ppm)
BSCC-1		
True Value ± 2s	11.1 ± 1.4	0.129 ± 0.12
Measured Value	4.8	<0.1
% Recovery	43%	<78%
MESS-1		
True Value ± 2s	10.6 ± 1.2	0.171 ± 0.014
Measured Value	5.6	0.12
% Recovery	53%	70%
NBS 1645		
True value ± 2s	66*	1.1 ± 0.5
Measured Value	20.4	0.75
% Recovery	31%	68%
NBS 1646		
True Value ± 2s	11.6 ± 1.3	0.063 ± 0.012
Measured Value	4.0	<0.1
% Recovery	34%	**

* Not a confirmed value

** Below detection limit

Table XVII (cont'd)
NEW BEDFORD SUPERFUND
Analysis of Standard Reference Materials

	Arsenic (ppm)	Mercury (ppm)
BSCC-1		
True Value ± 2s	11.1 ± 1.4	0.129 ± 0.12
Measured Value	4.1	<0.1
% Recovery	36%	<78%
MESS-1		
True Value ± 2s	10.6 ± 1.2	0.171 ± 0.014
Measured Value	0.10	7.2
% Recovery	68%	58%
NBS 1645		
True Value ± 2s	66*	1.1 ± 0.5
Measured Value	37	0.6
% Recovery	56%	54%
NBS 1646		
True Value ± 2s	11.6 ± 1.3	0.063 ± 0.012
Measured Value	3.5	**
% Recovery	30%	-

* Not a confirmed value

** Below detection limit

Table XVIII
NEW BEDFORD HARBOR
Results of Split Sample Analyses
Total PCBs

Location	Stratum (inches)	Lab ID	PCBs (ppm) NED*	PCBs (ppm) WES*
G-17-2	0-24	9918A	1147	1267
G-17-2	24-38	9918B	577	570
H-12	0-12	0042A	8370	6790 5540
H-21	12-24	9869B	2.04	0.05
J-13-2	0-8	9941A	139	98.2 107.5
J-15-1	0-16	9942A	58.2	101.3 109.1
J-20-2	0-16	9947A	3.54	11.46
K-26-1	0-12	9950A	42.4	20.2
[illegible]-1	12-23	9954B	0.02	0.214
L-29-2	0-12	9962A	29.1	24.4

* NED = USACOE New England Division Water Quality Laboratory

WES = USACOE Waterways Experiment Station Environmental Laboratory, Vicksburg, MS

T[illegible] XIX
New Bedford Harbor
Results of Split Sample Analyses
Trace Metals and Oil & Grease

Sample No.	Arsenic (ppm)		Cadmium (ppm)		Chromium (ppm)		Copper (ppm)		Lead (ppm)		Mercury (ppm)		Nickel (ppm)		Zinc (ppm)		Oil & Grease (ppm)	
	NED*	WES	NED	WES	NED	WES	NED	WES	NED	WES	NED	WES	NED	WES	NED	WES	NED	WES
9918A	8.1	11.2 11.0	54	48.6	1130	1110 1100	1900	2070 2040	1420	1375	1.5	0.96 0.96	241	302 305	3280	3540 3620	40500	19400 18200
9941A	4.1 3.4	3.65	<3	7.15	119	105	355	383	181	273	0.43 0.40	0.49 0.45	<26	21.9	935	809	3060	<1000
9950A	1.0	2.22	<2	4.22	94	83.2	189	188	48	83.0	0.2	0.18 0.13	<30	13.8	208	128	283	<1000
9962A	1.9	4.07	<3	9.28	57	82.4	153	206	<21	68.0	<0.1	0.32 0.32	<31	22.0	240	200	1110	<1000
9869B	4.0	6.62	<3	5.27	47	42.2	259	272	254	299	1.3	2.27 2.18	<26	19.0	365	310	5590	<1000
9918B	15.2	15.0 14.7	8 8	13.0 12.5	372 386	425 428	1640 1700	2080 2070	1450 1550	1525	2.5	1.12 1.14	62 64	74.4 74.4	4020 3960	4620 4510	22300	21400
9942A	4.5	4.92	<2	5.45	74	73.2	197	188	88	108	0.26	0.39 0.46	<24	17.8	339	316	560	3030
9947A	2.6	3.81	<2	4.95	15	18.5	36	41.9	<20	10.9	<0.1	0.09 0.09	<24	6.68	71	66.4	280	<1000
9954B	1.2	1.49	<2	4.34	<7	4.00	<6	3.45	<20	4.10	<0.1	<0.1 <0.1	<24	3.17	5	7.08	<50	<1000

* NED = USACOE New England Division Water Quality Laboratory

WES = USACOE Waterways Experiment Station Environmental Laboratory, Vicksburg, MS

APPENDIX A

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN
FOR THE
INVESTIGATIVE ACTIVITIES
NEW BEDFORD SUPERFUND SITE
(Acushnet River Estuary above Coggeshell Street Bridge)

PURPOSE

The United States Army Corps of Engineers has been tasked by the United States Environmental Protection Agency to perform additional predesign studies for the New Bedford Superfund Site, and in so doing, an engineering evaluation of the remedial dredging and disposal alternatives is to be conducted by New England Division (NED) and Waterways Experiment Station (WES). The Corps will perform sediment sampling and analysis for determining appropriate compositing of samples for test procedures and to determine the limit of the proposed dredging project. This sampling program will require handling of and exposure to sediments known to be contaminated with PCB's and toxic heavy metals. Unless appropriate precautions are taken by personnel engaged in the sediment sampling operations, exposures to the hazardous chemicals contained in the sediments may occur that could result in illness or injury. The purpose of this Health and Safety Plan is to specify protective equipment and identify procedures for avoiding personal exposures to harmful levels of the toxic chemicals of concern. It is also intended to provide for contingencies in responding to serious exposures or accidents that may arise while sampling operations are being conducted.

APPLICATION

The provisions of this Health and Safety Plan are mandatory for all sediment sampling activities (Task 2: Sediment Characterization - Element 1:Sediment Sampling(Push Cores)) described fully in the Project Work Plan, and summarized in the "Work Description" section of this document. All personnel engaged in sediment sampling operations or in the immediate vicinity of such sampling shall be familiar with this Plan and comply with its requirements. If field activities are modified after the issue date of this Plan, the hazards associated with the modified activities must be reassessed and the site specific provisions of this Plan modified accordingly.

RESPONSIBILITIES

Project Manager

The project manager (or his designated representative) shall direct the on-site investigation and operation efforts. At the site, the project manager or on-site coordinator has the primary responsibility for:

1. Assuring that appropriate personnel protective equipment

is available and properly utilized by all personnel potentially exposed to contaminants.

2. Assuring that personnel are aware of the provisions of this Plan, and are instructed in the work practices necessary to ensure safety and in procedures for dealing with emergencies.

3. Assuring that personnel are aware of potential hazards associated with site operations.

4. Monitoring the safety performance of all personnel to ensure that the required work practices are employed, and directing corrective action, as necessary.

5. Correcting any work practices or conditions that may result in injury or exposure to the hazardous substances.

6. Preparing any accident/incident reports, as necessary.

Project Personnel

Project personnel involved in on-site investigations and operations are responsible for:

1. Taking all responsible precautions to prevent injury to themselves and to their fellow workers.

2. Implementing the project Health and Safety Plan, and reporting to the project manager or on-site coordinator any deviations from the anticipated conditions described in the Plan.

3. Performing only those tasks that they believe they can do safely, and immediately reporting any accidents and/or unsafe conditions to the project manager or his designee.

SITE DESCRIPTION

The focus of this sediment sampling program will be the PCB "hot- spot" areas of the Upper Acushnet River Estuary extending northward from the Coggeshell Street Bridge to the Tarkiln Hill Road Bridge, between the towns of New Bedford and Fairhaven, Massachusetts (See Figure 2-1, NUS, 1984, attached). Previous investigations have shown that high levels of PCB's are present in this area, generally 1,000-5,000 ppm (dry weight), with some measurements greater than 10,000 ppm and some less than 1 ppm. Thus, PCB contamination in this highly contaminated area is "patchy". It may be that the tidal flats along the shores contain pockets of PCB-laden oils in some locations, whereas some portions of the river (estuary) may have been swept clean.

WORK DESCRIPTION

The sampling activities to be performed consist of collecting approximately 120 sediment samples via push core tubes from the bottom sediments at various locations throughout the estuary and thirty (30) sediment samples in the associated wetlands (tidal flats). The wetland sample locations will be accessed by land and the estuary locations will be accessed by a Corps survey barge. Acrylic sample tubes will pushed into the sediment to refusal at each sampling location, removed and drained of water, capped, and stored in cooled, closed containers for subsequent off-site transport to the receiving analytical laboratory. The estimated duration of this sampling program is two to three weeks. For a more detailed description of the sediment sampling procedures, refer to the Project Work Plan.

HAZARD ASSESSMENT

The health hazards associated with the above sediment sampling activities will be generally chemical in nature, and include respiratory and dermal hazards. (Physical hazards such as noise and slippery working surfaces may also be present, and although not specifically addressed in this Plan, appropriate precautions must be taken in accordance with applicable COE safety and health regulations.) The chemical hazards of concern for this project are PCB's (polychlorinated biphenyls) found in sediments, as well as relatively high concentrations of toxic heavy metals, particularly lead and chromium.

PCB's consist of a mixture of chlorinated biphenyls which contain a varying number of substituted chlorine atoms on aromatic rings. The persistence in the environment and the toxicity increases as the chlorine content increases. The commercial products of the complex chlorobiphenyls were registered and manufactured under the trademark "Aroclor". The highest concentrations of Aroclor's detected in the Upper Acusknet Estuary sediments were for Aroclor 1254 (54% chlorine) and Aroclor 1248 (48% chlorine). Such PCB's are strongly absorbed onto solid surfaces such as soils and sediments; in aquatic environments they are associated with the sediments in high concentrations rather than in the water in contact with them.

The major routes of PCB entry into the body are inhalation, ingestion, and skin and eye contact. Target organs are the skin, eye, liver, kidneys. Major symptoms of PCB exposure include eye irritation, dermatitis (notably chloracne), hepatic degeneration, fatigue, dark urine, and jaundice. The above routes of exposure are also applicable to the toxic heavy metals identified. Specific health effects and hazards for the toxic chemicals identified on site are described in Appendix A - Hazard Evaluation of Chemicals.

Occupational exposure limits (PELs and TLVs) have been established for certain PCB's and heavy metals in air which are present in the sediments to be sampled. These limits are average concentrations in air to which individuals can presumably be exposed without harm during an average work day (8 hrs) and work week (5 days). See Appendix A for applicable standards.

Volatilization of PCB's to harmful airborne vapor levels and/or increased airborne particulate concentrations, containing PCB's or heavy metals, during sampling operations are not likely due to the low vapor pressures of the PCB's and the wet characteristics of the sediment material itself. However, due to the toxicity of these materials, respiratory and complete dermal protection will be required when handling and cleaning sampling tubes containing contaminated sediments.

The overall hazard rating for the sediment sampling activities is considered to be low-moderate, requiring modified

EPA - Level C protective equipment for adequate respiratory and dermal protection. The site specific personal protective equipment to be utilized is detailed in the following Personnel Protection section.

GENERAL HEALTH AND SAFETY DIRECTIVES

Medical Monitoring

All personnel assigned to onsite work at this project must be active participants in a complete medical surveillance program dictated by the appropriate Division, pursuant to EP 385-1-58. The required medical surveillance program consists of a complete medical examination and certification as to fitness for work under the specific site conditions, prior to onsite operations, at the conclusion of work and/or at 1-year intervals. The medical examination should include the following, as a minimum:

- o medical history
- o work history
- o vital signs
- o physical examination of all major organ systems
- o audiogram
- o vision screening
- o chest x-ray (if previous work history warrants)
- o electrocardiogram
- o complete blood count with differential
- o blood chemistry screen - SMAC 21 test survey
- o urinalysis
- o pulmonary function test (including FEV 1.0 and FVC)

Training

All personnel assigned to onsite work must have received formal training in the use of personal protective equipment equivalent to EPA - Level C and previous on-the-job training for the tasks they are assigned to perform. Site specific training and onsite orientation training will also be required to be given to all personnel who will be potentially exposed to contaminants, and will include the following:

o Health effects and hazards of the chemicals identified or suspected to be onsite.

o Personnel Protection, including use, care, and fitting of protective equipment, the necessity for such equipment, and its limitations and effectiveness.

- o Decontamination Procedures
- o Safe work practices and procedures
- o Emergency procedures
- o Medical requirements

Prohibitions

Eating, drinking, and smoking are prohibited in any areas where contaminated materials are present or suspected.

Facial hair, features, or other protective equipment that interferes with proper fit of respirators shall not be permitted for those required to wear respirators during sampling operations.

PERSONNEL PROTECTION

The protective equipment required to be worn by personnel actually performing contaminated sediment sampling are listed below. The requirements are essentially a modified EPA - Level C, less stringent than EPA - Level C, but more protective than EPA - Level D. Equipment specifications are based upon the foregoing hazard assessment and site-specific conditions. Protective suits, gloves, and boots shall be made of materials resistant to the chemicals identified to be present in the sediments to be sampled and handled. All respirators shall be NIOSH/MSHA certified.

Respirator:	Half-mask respirator with air purifying cartridges for protection against organic vapors and dusts, fumes, and mists with PELs not less than 0.05mg/m3 (pesticide pre-filters). All respirators shall be individually assigned to personnel.
Coveralls:	Disposable, Saranex-laminated, Tyvek coverall suits; one-piece with attached hoods and booties. (Duct tape should be used to close/seal the overlap between coverall sleeves and gloves, and pantlegs and boots.)
Gloves	Nitrile outer gloves (medium duty-10 mils/medium length). Viton inner gloves. (Cotton jersey gloves may be used between the Viton inner gloves and the skin for absorption of perspiration and further dexterity.
Boots	Neoprene overboots worn over the Saranex Tyvek booties.
Eye Protection	Fog-free chemical splash goggles shall be worn with the specified half-face respirators during all sampling and decontamination operations. Face shields may be worn instead.
Hard Hats	Hard hats are to be worn if there are overhead hazards present or the potential for such exists.

The personnel assigned to be the "clean" assistants to the sampling and decontamination operations, who will not be in direct contact with contaminated materials nor in the immediate area of these operations, will not be required to wear the prescribed respiratory protection, but shall wear, as a minimum, the coveralls, outer gloves and overboots.

DECONTAMINATION PROCEDURES

Decontamination of personnel and equipment is necessary to prevent hazardous materials from being transferred from contaminated areas to clean areas. Procedures for personnel and equipment decontamination shall be designed to be appropriate for the types of contaminants present, the personal protective equipment and other equipment utilized, and the operations taking place.

Personnel

All personnel participating in the sediment sampling operations on the sampling barge or the associated wetlands of the estuary shall remove all protective clothing and equipment and wash their faces, necks, and hands prior to leaving the site and/or prior to eating, drinking, or smoking. The project manager or the on-site coordinator shall be responsible for identifying appropriate areas for donning and doffing protective equipment, for setting up facilities for equipment decontamination and field washing of personnel, and for seeing that all decontamination procedures are properly followed

Personnel wearing the prescribed protective equipment should adhere to the following decontamination procedures; however they may be modified in accordance with site-specific conditons and protective equipment used (NED-MWQL SOP attached):

1. Equipment Drop: A plastic sheet and/or containers lined with plastic bags shall be used to deposit contaminated equipment (e.g. tools, sampling devices, etc.). Equipment should be segregated depending upon degree of contamination to reduce the probability of cross-contamination.

2. Overboot and Outer Glove Wash: Overboots and outer gloves are to be washed with a detergent/water solution, using long-handled soft-bristled scrub brushes.

3. Overboot and Outer Glove Rinse: Rinse off decon solution from Step 2 using generous amounts of clean water. Remove tape seal from wrists and legs.

4. Overboot and Outer Glove Removal: Place overboots in a separate lined storage container for re-use until material integrity is compromised. Dry boots prior to next days use. Place outer gloves in plastic lined container for disposal at the end of the day or sooner if they are damaged.

5. Chemically-resistant Coverall Removal: Remove protective coveralls and discard them into the appropriate container at the end of the day or more often as necessary due to more often as necessary due to rips, tears, etc.

6. Inner Glove (VITON) Wash: Wash inner gloves with detergent/water solution.

7. Inner Glove (VITON) Rinse: Rinse inner gloves with water.

8. Respirator Removal: Remove respirator taking care not to touch the face with gloves. Remove cartridges from respirator after wearing for a full day or when breathing becomes difficult, and place them in a lined container for disposal. Place respirator face piece in lined storage container for subsequent

daily cleaning, sanitizing and drying.

9. Re-wash and Rinse Inner Gloves.

10. Inner Glove (VITON) Removal: Remove inner gloves and place in lined storage container for re-use until the material integrity is compromised. The gloves should be taken to a clean area where they can be air dried prior to the next day's use. Remove and discard or wash/dry the cotton jersey glove liners.

11. Field Wash: All personnel wearing protective clothing and equipment shall, at a minimum, wash their faces, necks, and hands before leaving the site and/or before eating, drinking, or smoking. A complete shower is required to be taken after returning to place of lodging.

Equipment

All non-disposable equipment used where contact with contaminated sediment material may occur must be decontaminated either onsite or placed in sealable, secure containers and properly decontaminated offsite. Respirator face pieces, VITON inner gloves, and re-usable overboots shall be washed, dried, and inspected for missing parts and condition. They shall then be stored in clean, dry areas at the end of the day, ready for next day's use. Contaminated sampling equipment and tools shall be washed with detergent/water solution and rinsed with clean water. Proper care must be taken to avoid vehicle contamination during subsequent transport of samples to the analytical laboratory. If the sample container was taken into the immediate sampling area, the outside of it must be thoroughly washed before placed in the transport vehicle. If there is any possibility that the outside of the sampling tubes themselves may be contaminated, the analytical laboratory must be notified.

Wash water from the decontamination procedures (personnel and equipment) will be allowed to runoff back into the sampling environment from which the samples came. Previous lab analyses of wash waters generated at this site during identical trial operations revealed no detectable contamination.

All contaminated disposable equipment, including coveralls, outer gloves, respirator cartridges/pre-filters, etc. shall be placed into heavy plastic bags or impermeable containers and disposed of offsite in an approved manner.

COMMUNICATIONS

Onsite Communications: It is anticipated that during the sediment sampling activities on or adjacent to the estuary, no special communication systems will be required. Emergency hand signals are described below under General Emergency Procedures.

Communications with Emergency Facilities: Radio communications with emergency response personnel will be necessary because of the relative remote locations of the sediment sampling sites on and adjacent to the estuary. Nearby emergency facilities shall be advised of these sampling activities so that they can be prepared to respond to any emergency.

HEAT STRESS MONITORING AND RECOGNITION PROCEDURES

Ambient temperatures during site sampling activities combined with the requirements for personal protective equipment may create heat stress for onsite workers. Procedures for recognizing, monitoring, and avoiding heat stress must be followed. (See Appendix B - Standard Operating Procedures for Emergencies due to Heat and Heat Stress Monitoring)

EMERGENCY RESPONSE PROCEDURES

In the event that an emergency develops at the work site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- o Any member of the field sampling crew is involved in an accident or experiences any adverse effects or symptoms of exposure while onsite.
- o A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

General Emergency Procedures

The following emergency procedures shall be followed:

a. Personnel on-site shall use the "buddy" system (pairs).

b. Hand signals for communication while wearing respirators are suggested.

1. Hand gripping throat: cannot breathe.
2. Grip partner's wrist or place both hands around waist: leave area immediately, no debate.
3. Hands on top of head: need assistance.
4. Thumbs up: O.K., I'm alright, I understand.
5. Thumbs down: No, negative.

c. Visual contact shall be maintained between "buddies" with other team members in close proximity in order to assist in case of emergencies.

d. In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while onsite, the entire field crew should immediately halt work and act according to the instructions provided by the project manager and/or on-site coordinator.

e. The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated shall result in the evacuation of the field team and re-evaluation of the hazard and the level of protection required.

f. In the event that an accident occurs, the project manager shall complete appropriate reports and notify appropriate personnel, immediately.

Personal Injury

In case of personal injury at the sampling site, the following procedures shall be followed:

a. Emergency rescue personnel/ambulance shall be notified by radio or telephone immediately. An ambulance will be dispatched to the site, and the injured person shall be evacuated to the nearest emergency medical facility. The staff of the medical facility shall be advised that the patient's clothing and skin may be contaminated with site-specific chemicals.

Chemical Exposure

If a member of the field sampling crew is exposed to chemicals, the procedures outlined below shall be followed:

a. Another team member (buddy) should remove the individual from the immediate area of contamination.

b. Precautions shall be taken to avoid exposure of other individuals to the chemical.

c. If the chemical is on the individual's clothing, the clothing should be removed if it is safe to do so.

d. If the chemical has contacted the skin or eyes, they shall be washed with copious amounts of clean water.

f. All chemical exposure incidents shall be reported in writing.

EMERGENCY CONTACTS

Telephone numbers or instructions for contacting outside assistance or support services shall be posted and available to all onsite personnel in the event that any situation or unplanned occurrence arises where such assistance is required. This list of outside contacts shall include, as a minimum:

- Ambulance/Rescue Squad
- Police/Fire Department
- Coast Guard
- Emergency Medical Facility/Hospital
- Corps of Engineers contact
- EPA contact

For emergency assistance while on the sampling barge, the ship-to-shore radio must be used. Appropriate contact frequencies, etc. shall also be included in addition to telephone numbers for the emergency contacts listed above.

Locations of telephones closest to wetland sampling sites shall also be delineated on the emergency contact list.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Chromium

Date: 3/29/85

CAS Number: 7440-47-3

REFERENCES CONSULTED: NIOSH/OSHA Pocket Guide

CHEMICAL PROPERTIES: (Synonyms: Chrome, chromium metal, ASTM 1481)

Chemical Formula: Cr

Molecular Weight: 52

Physical State: Solid

Solubility (H_2O): Insoluble

Boiling Point: 4784°F

Flash Point: 752°F

Vapor Pressure/Density: 1 mm @ 1610°C

Freezing Point: 3452°F

Specific Gravity: 7.14

Flammable Limits: Nonflammable

Incompatabilities: Nonflammable strong oxidizers, acids, strong alkalies

BIOLOGICAL PROPERTIES:

TLV-TWA: 0.5 mg/m^3

IDLH: 500 mg/m^3

Carcinogen: Suspected in animals

Odor Characteristic: Odorless

PEL: 1 mg/m^3

Route of Exposure: Inhalation, ingestion

HANDLING RECOMMENDATIONS: (Personal protective measures)

Skin: Wear impervious clothing, gloves, and face shield. Inhalation: APR with appropriate cartridges

HEALTH HAZARDS AND FIRST AID:

Eyes: Flush with large amounts of water. Skin contact: Wash with soap or mild detergent and water. Inhalation: Move person to fresh air and give artificial respiration if necessary. Ingestion: Large quantities of water and induce vomiting

SYMPTOMS:

Acute: Pulmonary/respiratory irritation, dizziness, vomiting

Chronic: Cancer, broteimuria, hematuria, oliguria, anuria, uremia, shock

HAZARD EVALUATION OF CHEMICALS

Chemical Name: Lead

Date: 3/29/85

CAS Number: 7439-92-1

REFERENCES CONSULTED: NIOSH/OSHA Pocket Guide, Merck Index

CHEMICAL PROPERTIES: (Synonyms: White lead, lead flake, CI 77575)

Chemical Formula: Pb

Molecular Weight: 207.19

Physical State: Solid

Solubility (H_2O): Insoluble

Boiling Point: 1783°F

Flash Point: Incombustible

Vapor Pressure/Density: 1 mm @ 970°C

Freezing Point: 473°F

Specific Gravity: 11.35

Flammable Limits: Incombustible

Incompatabilities: Strong oxidizers, hydrogen peroxide, active metals: sodium potassium

BIOLOGICAL PROPERTIES:

TLV-TWA: 0.15 mg/m^3

IDLH: Variable (assumed 100 ppm)

Teratogen: Suspected

PEL: 0.05 mg/m^3

Route of Exposure: Inhalation, ingestion, direct contact

HANDLING RECOMMENDATIONS: (Personal protective measures)

Prevent skin contact; wear impervious clothing and gloves, and boots; respirator required at levels of 0.05 mg/m^3; positive pressure respirator at 100 ppm; eye protection should be worn

HEALTH HAZARDS AND FIRST AID:

If into eyes, immediately wash eyes with large amounts of water; onto skin, wash with soap (mild detergent) and water; if breathed in, get to fresh air; perform artificial respiration if breathing stopped; if ingested, remove by gastric lavage with magnesium sulfate or sodium sulfate

SYMPTOMS:

Chronic: Lassitude, insomnia, cyanosis, eye grounds, gingival lead line, anorexia, weight loss, malnutrition, constipation, abdominal pain, hypotension, anemia, tremors, wrist drop, reproductive effects, lowered sperm count

HAZARD EVALUATION OF CHEMICALS

Chemical Name: PCB 1254

Date: 4/01/85

CAS Number: 11097-69-1

REFERENCES CONSULTED: NIOSH/OSHA Pocket Guide, Chris (Vol. II)

CHEMICAL PROPERTIES: (Synonyms: Chlorodiphenyl [54% chlorine], Aroclor 1254)

Chemical Formula: $C_{12}H_5Cl_5$ (approx.)

Molecular Weight: 326

Physical State: Liquid

Solubility (H_2O): Insoluble

Boiling Point: 689-734°F

Flash Point: 432°F

Vapor Pressure/Density: 0.00006

Freezing Point: 50°F

Specific Gravity: 1.3 - 1.8

Incompatabilities: Strong oxidizers

BIOLOGICAL PROPERTIES:

TLV-TWA: 0.5 mg/m^3

Odor Characteristics: Mild hydrocarbon

IDLH: 5 mg/m^3

Carcinogen: Possible

Mutagen: Possible

PEL: 1 mg/m^3

Rat: LD_{50} 3980 mg/kg

Route of Exposure: Inhalation, ingestion, absorption, direct skin contact

HANDLING RECOMMENDATIONS: (Personal protective measures)

Impermeable clothing, gloves, and boots; eye protection; respirator with recommended cartridges at 0.5 mg/m^3; SCBAs at 5 mg/m^3

HEALTH HAZARDS AND FIRST AID:

Remove from exposure; administer artificial respiration if needed; wash skin with soap and water; irrigate eyes with water; induce vomiting if swallowed; if chloracne appears, seek medical attention immediately

SYMPTOMS:

Acute: Acne, eye irritation, jaundice, skin itching and irritation, dark urine

Chronic: Chromosomal abnormalities (in rats), birth defects (in birds), dermatitis, liver damage, chloracne

APPENDIX ~~A~~B

STANDARD OPERATING PROCEDURES FOR EMERGENCIES DUE TO HEAT AND HEAT STRESS MONITORING

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion, and heat stroke can be experienced, and if not remedied, can threaten life or health. Therefore, it is important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated more rapidly, the body cools to a point at which the production of heat is accelerated and the excess is available to bring the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. When such a condition exists, it produces a vicious cycle in which certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost by convection. However, when the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture or sweat from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95 to 100°F, with high humidity and little or no breeze, conditions are ideal for the retention of heat within the body. It is on such a day, or more commonly a succession of such days (a heat wave), that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

Heat Cramp Symptoms. The symptoms of heat cramp are:

- Muscle cramps in legs and abdomen,
- Pain accompanying the cramps,
- Faintness, and
- Profuse perspiration.

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Gatorade" or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot environments, and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lower extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

- Weak pulse;
- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;

- Profuse perspiration;
- Dizziness;
- Unconsciousness; and
- Appearance of having fainted (the patient responds to the same treatment administered in cases of fainting).

Heat Exhaustion Emergency Care. Remove the patient to a cool place and remove as much clothing as possible. Administer cool water, "Gatorade," or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock, and remove him to a medical facility if there is any indication of a more serious problem.

HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20% mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness;
- Full and fast pulse;
- Breathing deep at first, later shallow and even almost absent;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106°F or higher.

Heat Stroke Emergency Care. Remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible, and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly--preferably by wrapping in a wet sheet or else by dousing the body with water. If cold packs are available, place them under the arms, around the neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that, in the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high--and especially in situations where protection Levels A, B, and C are required--the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);

- Assure that frequent breaks are scheduled so overheating does not occur; and

- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5 a.m. to 1 p.m., and 6 p.m. to nightfall).

- Assure that workers are acclimated before allowing them to work for extended periods. Heat induces a series of physiological and psychological stresses that the individual worker must adjust to during the first week of heat exposure. Workers should slowly work into their peak work performance over a two-week period. Workers absent from the site several days must be allowed to become reacclimated.

If protective clothing must be worn, especially Levels A and B, the suggested guidelines for ambient temperature and maximum wearing time per excursion are given in Table B-1.

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method:

- During a three-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.

- Double the count.

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate is above that specified, a longer rest period is required, accompanied by an increased intake of fluids.

Table B-1

Ambient Temperature (°F)	Maximum Wearing Time per Excursion (minutes)
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

U.S. Army Corps of Engineers - New England Division
Water Quality Laboratory Hubbardston, MA

LEVEL C DECONTAMINATION SOP

1. Subjects hose down arms, hands, bodies, and legs with onboard-pumped seawater prior to leaving sampling site.

2. Level C integrity is maintained until disembarking at decontamination station.

3. While seated in chair, subject removes Neoprene boots. Clean-man will assist as necessary. Boots are deposited in soapy water washtub.

4. Subject stands in large soapy water washtub. Clean-man scrubs down coveralls and gloves with long-handled brush dipped in soapy water.

5. Subject stands in rinse water washtub. Clean-man rinses down coveralls and gloves.

6. Subject removes duct tape from nitrile glove cuffs and discards in contaminated waste barrel. Barrel should be lined with plastic bag.

7. Subject removes and discards nitrile gloves in contaminated waste barrel.

8. Clean-man unties hood and removes.

9. Handling by strap only, clean-man removes goggles and places in soapy water washtub.

10. Handling by straps only, clean-man removes respirator and hands to subject.

11. Subject removes prefilter holders, removes prefilters, and places holders in soapy water washtub.

12. Subject removes organic vapor cartridges and discards in contaminated waste barrel.

13. Subject sponges down respirator in soapy water washtub and rinses.

14. While still wearing, wash Viton gloves in soapy water and rinse well.

15. Remove Viton gloves and save.

16. Remove jersey gloves and discard.

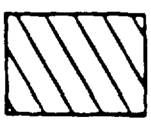
17. Clean-man peels coveralls down to waist, freeing arms and hands. Clean-man continues to peel coveralls down to subject's knees and subject is seated.

18. Clean-man grasps coveralls by integral boots, removes, and discards in contaminated waste barrel.

19. Subject washes face and hands with warm, soapy water at disembarking station.

20. Subject takes complete shower after returning to place of lodging.

LEGEND



HOT SPOT AREA

(AS DEFINED FOR THIS STUDY)

BASE MAP IS A PORTION OF THE U.S.G.S. NEW BEDFORD NORTH, MA QUADRANGLE (1979), 7.5 MINUTE SERIES, CONTOUR INTERVAL 10'.

FIGURE 2-1

HOT SPOT AREA

NEW BEDFORD SITE, NEW BEDFORD, MA

SCALE: 1" = 4000'

NUS CORPORATION

A Halliburton Company

APPENDIX B

MASTER SAMPLE LIST FOR SEDIMENT CORES

Revised 29 May 1986

Superfund - New Bedford, MA

Master Sample List - Sediment Cores

Grid No. ID	T/B/-[1]	Lab ID	Stratum (inches)	Date Sampled	C of C[2] History	Remarks[3]
D-25	-	9996	0-16	9-10-85	W	
D-26	T	9997	0-38	9-10-85	W/B	
D-26	B	0015	38-74	9-10-85	W/B	
E-25-1	-	9910	0-37	9-10-85	W/B	E
E-25-2	-	9911	0-26	9-10-85	W/B	
E-26	T	0016	0-48	9-10-85	W	
E-26	B	0017	48-84	9-10-85	W	
E-27-1	-	9912	0-36	9-10-85	W/B	E
E-27-2	-	9913	0-32	9-10-85	W/B	
E-28	-	0018	0-4	9-10-85	W	
F-25	-	0019	0-40	9-10-95	W	
F-26	-	0020	0-55	9-10-85	W	
F-27	T	0021	0-43	9-10-85	W	
F-27	B	0022	43-79	9-10-85	W	
F-28	-	0023	0-60	9-10-85	W	
·12	-	0024	0-9	9-13-85	W	
G-13-1	T	9914	0-45	9-13-85	W/B	E
G-13-1	B	9915	45-81	9-13-85	W/B	
G-13-2	-	9916	0-64	9-13-85	W/B	
G-14	T	0025	0-48	9-13-85	W	
G-14	B	0026	48-84	9-13-85	W	
G-15	-	0027	0-58	9-13-85	W	
G-16	T	0028	0-35	9-14-85	W	
G-16	B	0029	35-71	9-14-85	W	
G-17-1	-	9917	0-46	9-14-85	W/B	
G-17-2	T	9918	0-45	9-14-85	W/B	E
G-17-2	B	9919	45-81	9-14-85	W/B	E
G-18	T	0030	0-40	9-14-85	W /B	E
G-18	B	0031	40-76	9-14-85	W	

1 T = top portion of tube; B= bottom portion; (-) = tube uncut

C of C = chain of custody; B= WQL in Barre, MA; W= Waltham, MA;
NUS = NUS Corp., Bedford, MA

3 E(o-x) = sediment extracted from tube at o''-x'' stratum

Grid No. ID	T/B/-[1]	Lab ID	Stratum (inches)	Date Sampled	C of C[2] History	Remarks[3]
^-19	T	0032	0-28	9-14-85	W	
G-19	B	0033	28-64	9-14-85	W	
G-20-1	-	9920	0-53	9-14-85	W/B	
G-20-2	-	9921	0-62	9-14-85	W/B	E (0-36)
G-25	-	0034	0-44	9-10-85	W	
G-26	-	0035	0-50	9-10-85	W/NUS	
G-27	-	0036	0-35	9-10-85	W	
G-28	-	0037	0-57	9-10-85	W	
G-29-1	T	9922	0-34	9-10-85	W/B	E
G-29-1	B	9923	34-70	9-10-85	W/B	
G-29-2	-	9924	0-51	9-10-85	W/B	
G-30	-	0038	0-13	9-9-85	W	
G-31	-	0039	0-51	9-9-85	W	
G-32	-	0040	0-54	9-9-85	W	
H-10 (I-11B)	-	0041	0-48	9-17-85	W	
H-12	-	0042	0-44	9-13-85	W/B	E (0-24)
H-13	T	9894	0-43	9-4-85	B/W	
H-13	B	9895	43-79	9-4-85	B/W	
14	T	9883	0-46	8-29-85	B/W	
H-14	B	9884	46-82	8-29-85	B/W	
H-15	T	9881	0-33	8-29-85	B/W	
H-15	B	9882	33-69	8-29-85	B/W	
H-16	T	9879	0-50	8-29-85	B/W/NUS	
H-16	B	9880	50-86	8-29-85	B/W	
H-17	T	9877	0-49	8-29-85	B/W/B	E
H-17	B	9878	49-85	8-29-85	B/W	
H-18	T	9875	0-46	8-29-85	B/W	
H-18	B	9876	46-82	8-29-85	B/W	
H-19	T	9873	0-47	8-29-85	B/W	
H-19	B	9874	47-83	8-29-85	B/W	
H-20	T	9871	0-41	8-29-85	B/W	
H-20	B	9872	41-77	8-29-85	B/W	
H-21	T	9869	0-37	8-29-85	B/W/B	E
H-21	B	9870	37-73	8-29-85	B/W	
H-22	T	9867	0-40	8-29-85	B/W/NUS	
·22	B	9868	40-76	8-29-85	B/W	
H-23	T	9904	0-26	9-5-85	B/W	

Revised 5 February 1986

Grid No. ID	T/B/-[1]	Lab ID	Stratum (inches)	Date Sampled	C of C[2] History	Remarks[3]
23	B	9905	26-62	9-5-85	B/W	
H-24	-	9906	0-59	9-5-85	B/W	
H-25	-	9907	0-62	9-5-85	B/W/B	E (0-36)
H-26	-	9908	0-27	9-5-85	B/W	
H-27	-	9909	0-42	9-5-85	B/W	
H-28	T	9850	0-38	8-27-85	B/W	
H-28	B	9851	38-74	8-27-85	B	
H-29	T	9852	0-39	8-27-85	B	
H-29	B	9853	39-75	8-27-85	B	
H-30	T	9854	0-42	8-27-85	B/W	
H-30	B	9855	42-78	8-27-85	B	
H-31	-	9856	0-55	8-27-85	B/W	
H-32	T	9857	0-37	8-28-85	B/W/NUS	
H-32	B	9858	37-73	8-28-85	B/W	
H-33	-	9859	0-55	8-28-85	B/W/B	E (0-36)
I-2	-	0043	0-17	9-15-85	W	
I-3-1	-	9925	0-30	9-15-85	W/B	E
I-3-2	-	9926	0-20	9-15-85	W/B	
I-4	-	0044	0-25	9-15-85	W	
I-9-1	T	9927	0-34	9-17-85	W/B	E
I-9-1	B	9928	34-70	9-17-85	W/B	
I-9-2	-	9929	0-64	9-17-85	W/B/W	
I-10	T	0045	0-38	9-17-85	W/NUS	
I-10	B	0046	38-74	9-17-85	W	
I-11-1	T	9930	0-44	9-17-85	W/B	E
I-11-1	B	9931	44-80	9-17-85	W/B	
I-11-2	T	9932	0-39	9-17-85	W/B	E (0-24)
I-11-2	B	9933	39-75	9-17-85	W/B	
I-12	-	0047	0-49	9-13-85	W /B	E (0-24)
I-13	T	9896	0-37	9-4-85	B/W/NUS	
I-13	B	9897	37-73	9-4-85	B/W	
I-14	T	9898	0-40	9-4-85	B/W	
I-14	B	9899	40-76	9-4-85	B/W	
I-15	T	9902	0-46	9-4-85	B/W/B	E
I-15	B	9903	46-82	9-4-85	B/W/B	

Grid No. ID	T/B/-[1]	Lab ID	Stratum (inches)	Date Sampled	C of C[2] History	Remarks[3]
16	T	9900	0-41	9-4-85	B/W	
I-16	B	9901	41-77	9-4-85	B/W	
I-17	T	9783	0-37	8-22-85	B	
I-17	B	9784	37-73	8-22-85	B	
I-18	-	9785	0-61	8-22-85	B	
I-19	T	9786	0-37	8-22-85	B	E
I-19	B	9787	37-73	8-22-85	B	
I-20	T	9788	0-42	8-22-85	B/W/NUS	
I-20	B	9789	42-78	8-22-85	B	
I-21	T	9790	0-43	8-22-85	B	
I-21	B	9791	43-79	8-22-85	B	
I-22	T	9792	0-47	8-23-85	B	
I-22	B	9793	47-83	8-23-85	B	
I-23	T	9840	0-45	8-27-85	B/W/B	E
I-23	B	9839	45-81	8-27-85	B	
I-24	T	9841	0-40	8-27-85	B	
I-24	B	9842	40-76	8-27-85	B/W	
I-25	T	9844	0-48	8-27-85	B	
I-25	B	9843	48-84	8-27-85	B/W	
I-26	-	9845	0-45	8-27-85	B/W	
I-27	T	9846	0-42	8-27-85	B/W	
I-27	B	9847	42-78	8-27-85	B	
I-28	T	9848	0-42	8-27-85	B/W/B	E
I-28	B	9849	42-78	8-27-85	B	
I-29	T	9781	0-36	8-21-85	B	
I-29	B	9782	36-72	8-21-85	B	
I-30	T	9779	0-46	8-21-85	B	
I-30	B	9780	46-82	8-21-85	B	
I-31	-	9778	0-26	8-21-85	B	E
I-32	-	9777	0-46	8-21-85	B/W	
I-33	-	9776	0-28	8-21-85	B	
J-3	-	0048	0-63	9-15-85	W	
J-4	T	0049	0-33	9-15-85	W	
J-4	B	0050	33-69	9-15-85	W	

Grid No. ID	T/B/-[1]	Lab ID	Stratum (inches)	Date Sampled	C of C[2] History	Remarks[3]
·5-1	T	9934	0-38	9-15-85	W/B	E
J-5-1	B	9935	38-74	9-15-85	W/B	
J-5-2	-	9936	0-62	9-15-85	W/B	
J-6	-	0051	0-87	9-15-85	W	
J-7	-	0052	0-68	9-15-85	W/B	E (vario
J-8-1	-	9937	0-18	9-16-85	W/B	
J-8-2	T	9938	0-37	9-16-85	W/B	E
J-8-2	B	9939	37-73	9-16-85	W/B	
J-9	T	0053	0-38	9-17-85	W/B	
J-9	B	0054	38-74	9-17-85	W	
J-10	T	0055	0-38	9-17-85	W/B	E (0-24)
J-10	B	0056	38-74	9-17-85	W	
J-11	-	0057	0-66	9-16-85	W/NUS	
J-12	-	0058	0-5	9-13-85	W/B	E
J-13-1	-	9940	0-17	9-13-85	W/B	
J-13-2	-	9941	0-21	9-13-85	W/B	E
J-14	-	0059	0-45	9-13-85	W	
15-1	-	9942	0-16	9-13-85	W/B	E
J-15-2	-	9943	0-14	9-13-85	W/B	
J-16	-	0060	0-16	9-13-85	W	
J-17-1	-	9944	0-21	9-13-85	W/B	
J-17-2	-	9945	0-24	9-13-85	W/B	E
J-18	-	0061	0-18	9-14-85	W	
J-19	-	0062	0-26	9-14-85	W	
J-20-1	-	9946	0-15	9-14-85	W/B	
J-20-2	-	9947	0-16	9-14-85	W/B	E
J-21	T	0063	0-41	9-11-85	W	
J-21	B	0064	41-77	9-11-85	W	
J-22	T	0065	0-43	9-11-85	W	
J-22	B	0066	43-79	9-11-85	W	
J-23	T	0067	0-34	9-11-85	W	
J-23	B	0068	34-70	9-11-85	W	
J-24	-	0069	0-52	9-11-85	W	
J-25	T	0070	0-41	9-12-85	W	
.I-25	B	0071	41-77	9-12-85	W	

Grid No. ID	T/B/-[1]	Lab ID	Stratum (inches)	Date Sampled	C of C[2] History	Remarks[3]
·26	-	0072	0-62	9-12-85	W	
J-27	T	9860	0-42	8-28-85	B/W	
J-27	B	9861	42-78	8-28-85	B/W	
J-28	-	9862	0-20	8-28-85	B	
J-29	T	9863	0-27	8-28-85	B/W/NUS	
J-29	B	9864	27-63	8-28-85	B/W	
J-30	T	9865	0-35	8-28-85	B	
J-30	B	9866	35-71	8-28-85	B	
J-31	-	9888	0-50	9-3-85	B/W	
J-32	-	9887	0-25	9-3-85	B/W	
J-33	T	9885	0-48	9-3-85	B/W	
J-33	B	9886	48-84	9-3-85	B/W	
K-4	-	0073	0-40	9-15-85	W	
K-5-1	-	9948	0-36	9-15-85	W/B	
K-5-2	-	9949	0-48	9-15-85	W/B	E (0-36)
K-6	-	0074	0-50	9-16-85	W	
K-7	T	0075	0-39	9-16-85	W/NUS	
K-7	B	0076	39-75	9-16-85	W	
..-8	T	0077	0-45	9-16-85	W	
K-8	B	0078	45-81	9-16-85	W	
K-9	-	0079	0-60	9-16-85	W/NUS	
K-10	-	0080	0-60	9-16-85	W	
K-21	-	0081	0-42	9-11-85	W	
K-22	-	0082	0-43	9-11-85	W	
K-23	-	0083	0-22	9-11-85	W	
K-24	-	0084	0-25	9-11-85	W	
K-25	-	0085	0-41	9-12-85	W	
K-26-1	-	9950	0-22	9-12-85	W/B	E
K-26-2	-	9951	0-21	9-12-85	W/B	
K-27	-	0098	0-21	9-12-85	W	
K-28-1	-	9952	0-8	9-12-85	W/B	
K-28-2	-	9953	0-21	9-12-85	W/B	E
K-29	T	9892	0-39	9-3-85	B/W	
K-29	B	9893	39-75	9-3-85	B/W	

Grid No. ID	T/B/-[1]	Lab ID	Stratum (inches)	Date Sampled	C of C[2] History	Remarks[3]
·30	T	9890	0-34	9-3-85	B/W	
K-30	B	9891	34-70	9-3-85	B/W	
K-31	-	9889	0-38	9-3-85	B/W	
K-32-1	-	9954	0-24	9-12-85	W/B	E
K-32-2	-	9955	0-22	9-12-85	W/B	
L-5	T	0086	0-34	9-16-85	W	
L-5	B	0087	34-70	9-16-85	W	
L-6	-	0088	0-64	9-16-85	W	
L-7	-	0089	0-22	9-16-85	W	
L-8	-	0090	0-16	9-16-85	W	
L-9	T	0091	0-38	9-16-85	W	
L-9	B	0092	38-74	9-16-85	W	
L-10-1	T	9956	0-54	9-16-85	W/B	E (0-36)
L-10-1	B	9957	54-90	9-16-85	W/B	
L-10-2	T	9958	0-35	9-16-85	W/B	
L-10-2	B	9959	35-71	9-16-85	W/B	
L-28	-	0093	0-46	9-15-85	W	
'-29-1	T	9960	0-34	9-15-85	W/B	
L-29-1	B	9961	34-70	9-15-85	W/B	
L-29-2	T	9962	0-36	9-15-85	W/B	E
L-29-2	B	9963	36-72	9-15-85	W/B	
L-30-1	-	9772	0-34	8-20-85	B	
L-30-2	-	9773	0-48	8-20-85	B	
L-30-3	T	9775	0-41	8-20-85	B	
L-30-3	B	9774	41-77	8-20-85	B	
L-31	-	0094	0-14	9-15-85	W	
M-6-1	-	9964	0-55	9-16-85	W/B	
M-6-2	T	9965	0-34	9-16-85	W/B	E
M-6-2	B	9966	34-70	9-16-85	W/B	
M-27-1	-	9967	0-27	9-11-85	W/B	E
M-27-2	-	9968	0-26	9-11-85	W/B	
M-28	-	0095	0-34	9-11-85	W	
M-29	-	0096	0-18	9-11-85	W	
M-30	-	0097	0-20	9-11-85	W	

APPENDIX A

HAZARD EVALUATIONS OF CHEMICALS

APPENDIX C

MASTER SAMPLE LIST FOR SOILS

SUPERFUND-NEW BEDFORD, MA

Master Sample List - Soils

Grid No. ID **	Lab ID	Stratum (inches)	Date Sampled	C of C * History	Inorganic Sample No.	Organic Sample No.
J-19-0-1	0137	0-12	10-6-85	W/B/RM-A	MAB764	AD570
J-19-0-2	0138	12-24	10-6-85	W/B/RM-A	MAB763	AD569
J-19-0-3	0139	24-36	10-6-85	W/B/RM-A	MAB762	AD568
K-12-0-1	0121	0-12	10-6-85	W/B/RM-A	MAB773	AD579
K-12-0-2	0122	12-24	10-6-85	W/B/RM-A	MAB772	AD578
K-12-0-3	0123	24-36	10-6-85	W/B/RM-A	MAB771	AD577
K-13-0-1	0124	0-12	10-6-85	W/B/RM-A	MAB770	AD576
K-13-0-2	0125	12-24	10-6-85	W/B/RM-A	MAB769	AD575
K-13-0-3	0126	24-36	10-6-85	W/B/RM-A	MAB768	AD574
K-14-0-1	0127	0-12	10-6-85	W/B/RM-C	MAB786	AD592
K-14-0-2	0128	12-24	10-6-85	W/B	-	-
K-14-0-3	0129	24-36	10-6-85	W/B	-	-
K-15-0-1	0133	0-12	10-6-85	W/B/RM-C	MAB785	AD591
K-15-0-2	0134	12-24	10-6-85	W/B	-	-
-0-1	9969	0-12	9-16-85	W/B/RM-C	MAB794	AD600
K-16-0-2	9970	12-24	9-16-85	W/B	-	-
K-16-0-3	9971	24-36	9-16-85	W/B	-	-
K-17-0-1	0135	0-12	10-6-85	W/B/RM-C	MAB784	AD590
K-17-0-2	0136	12-24	10-6-85	W/B	-	-
K-18-1-1	9972	0-12	9-16-85	W/B/RM-Y	MAB759	AD565
K-18-1-2	9973	12-24	9-16-85	W/B/RM-Y	MAB758	AD564
K-18-1-3	9974	24-36	9-16-85	W/B/RM-Y	MAB757	AD563
K-18-2-1	9975	0-12	9-16-85	W/B	-	-
K-18-2-2	9976	12-24	9-16-85	W/B	-	-
K-18-2-3	9977	24-36	9-16-85	W/B	-	-
K-19-0-1	0140	0-12	10-6-85	W/B/RM-C	MAB783	AD589
K-19-0-2	0141	12-24	10-6-85	W/B	-	-
K-19-0- 2.5	0142	24-36	10-6-85	W/B	-	-
K-20-1-1	0145	0-12	10-6-85	W/B/RM-C	MAB780	AD586
K-20-2-1	0151	0-12	10-6-85	W/B	-	-
K-20-2-2	0152	12-24	10-6-85	W/B	-	-
K-[illegible]-2-3	0153	24-36	10-6-85	W/B	-	-
-5-0-1	0109	0-12	10-5-85	W/B/RM-C	MAB789	AD595

Grid No. ID **	Lab ID	Stratum (inches)	Date Sampled	C of C * History	Inorganic Sample No.	Organic Sample No.
L-5-0-2	0110	12-24	10-5-85	W/B	-	-
L-5-0-3	0111	24-36	10-5-85	W/B	-	-
L-14-0-1	0130	0-12	10-6-85	W/B/RM-A	MAB767	AD573
L-14-0-2	0131	12-24	10-6-85	W/B/RM-A	MAB766	AD572
L-14-0-2.5	0132	24-30	10-6-85	W/B/RM-A	MAB765	AD571
L-19-0-1	0143	0-12	10-6-85	W/B/RM-C	MAB782	AD588
L-19-0-2	0144	12-24	10-6-85	W/B/RM-C	MAB781	AD587
L-20-0-1	9978	0-12	9-16-85	W/B/RM-C	MAB793	AD599
L-20-0-2	9979	12-24	9-16-85	W/B	-	-
L-20-0-3	9980	24-36	9-16-85	W/B	-	-
L-23-0-1	9981	0-12	9-16-85	W/B/RM-Y	MAB756	AD562
L-23-0-2	9982	12-24	9-16-85	W/B/RM-Y	MAB755	AD561
L-23-0-3	9983	24-36	9-16-85	W/B/RM-Y	MAB754	AD560
L-25-1-1	9984	0-12	9-15-85	W/B/RM-C	MAB792	AD598
L-25-1-2	9985	12-24	9-15-85	W/B	-	-
L-25-1-3	9986	24-36	9-15-85	W/B	-	-
[illegible]5-2-1	9987	0-12	9-15-85	W/B	-	-
L-25-2-2	9988	12-24	9-15-85	W/B	-	-
L-25-2-3	9989	24-36	9-15-85	W/B	-	-
L-27-0-1	9990	0-12	9-15-85	W/B/RM-Y	MAB753	AD559
L-27-0-2	9991	12-24	9-15-85	W/B/RM-Y	MAB752	AD558
L-27-0-3	9992	24-36	9-15-85	W/B/RM-Y	MAB751	AD557
M-5-0-1	0112	0-12	10-5-85	W/B/RM-A	MAB776	AD582
M-5-0-2	0113	12-24	10-5-85	W/B/RM-A	MAB775	AD581
M-5-0-3	0114	24-36	10-5-85	W/B/RM-A	MAB774	AD580
M-8-0-1	0146	0-12	10-5-85	W/B/RM-A	AMB761	AD567
M-8-0-2	0147	12-24	10-5-85	W/B/RM-A	MAB760	AD566
M-22-0-1	9993	0-12	9-16-85	W/B/RM-Y	MAB750	AD556
M-22-0-2	9994	12-24	9-16-85	W/B/RM-C	MAB791	AD597
M-22-0-3	9995	24-36	9-16-85	W/B	-	-
M-26-0-1	0103	0-12	9-15-85	W/B/RM-C	MAB790	AD596
M-26-0-2	0104	12-24	9-15-85	W/B	-	-
M-26-0-3	0105	24-36	9-15-85	W/B	-	-
N-6-0-1	0115	0-12	10-5-85	W/B/RM-C	MAB788	AD594

Grid No. ID **	Lab ID	Stratum (inches)	Date Sampled	C of C * History	Inorganic Sample No.	Organic Sample No.
N-6-0-2	0116	12-24	10-5-85	W/B	-	-
N-6-0-3	0117	24-36	10-5-85	W/B	-	-
N-7-1-1	0118	0-12	10-5-85	W/B/RM-C	MAB787	AD593
N-7-1-2	0119	12-24	10-5-85	W/B	-	-
N-7-1-2.4	0120	12-29	10-5-85	W/B	-	-
N-7-2-1	0148	0-12	10-5-85	W/B	-	-
N-7-2-2	0149	12-24	10-5-85	W/B	-	-
N-7-2- 2.4	0150	24-36	10-5-85	W/B	-	-
N-8-0-1	0106	0-12	10-5-85	W/B/RM-A	MAB779	AD585
N-8-0-2	0107	12-24	10-5-85	W/B/RM-A	MAB778	AD584
N-8-0-3	0108	24-36	10-5-85	W/B/RM-A	MAB777	AD583

* C of C = Chain-of-Custody

B = WQL in Barre, MA

W = Waltham, MA

RM = Rocky Mountain Analytical Lab in Arvada, CO

A = Aquatec in Burlington, VT

C = Cambridge Analytical in Boston, MA

Y = York Labs in Monroe, CT

"1"= change in custody

Example:

W/B/RM-A indicates samples were transferred from Waltham to Barre whereupon sample was split with portions being sent to Rocky Mountain Analytical and Aquatec.

** Grid ID No:

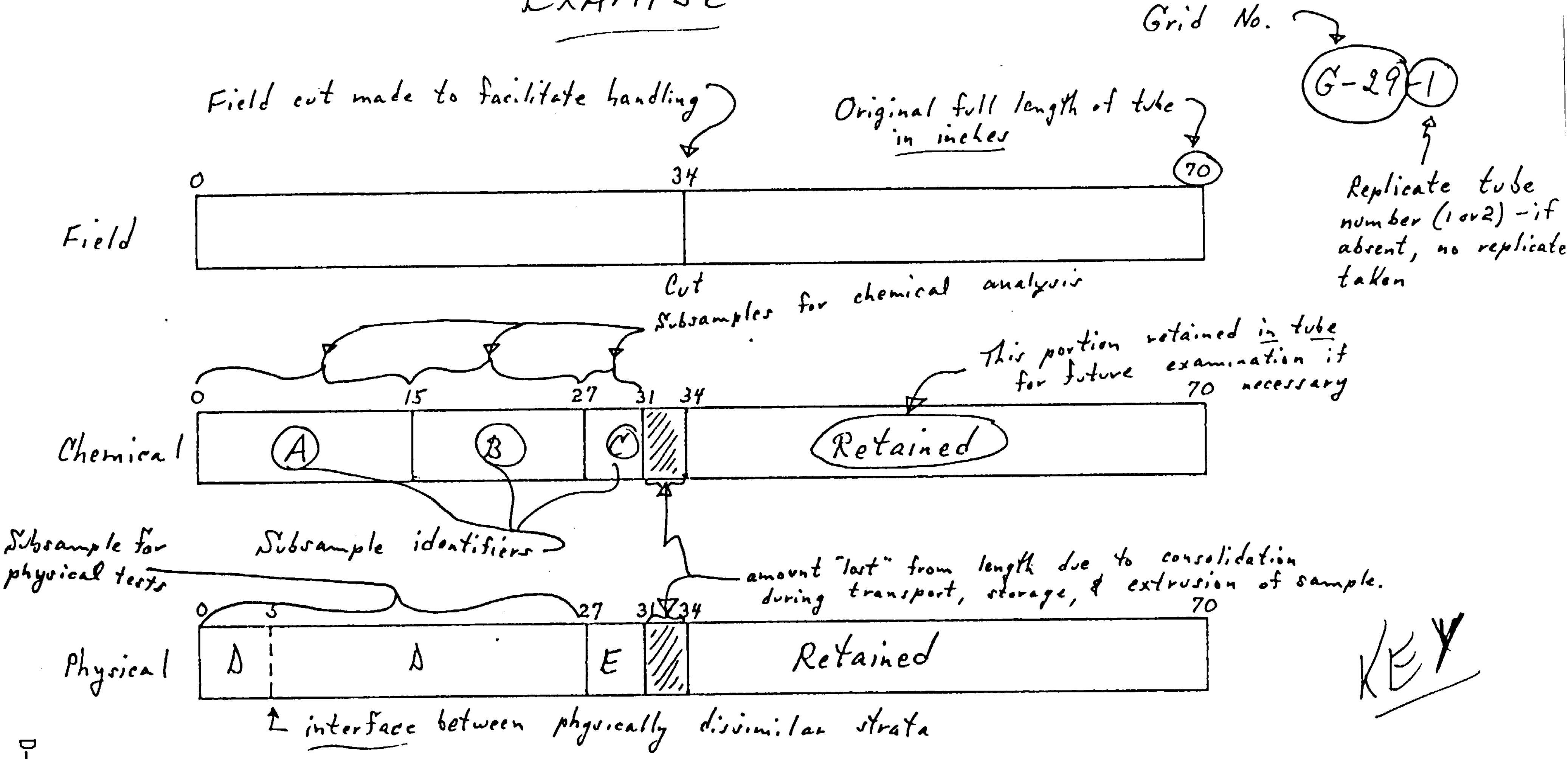
The letters J-N are the east-west ordinates of the arbitrary grid system. The numbers 5-26 immediately following the letters are the north-south ordinates of the arbitrary grid system. The second number (0,1, or 2) is the replicate number of the sample, i.e., 0 indicates a single sample only, 1 is the first replicate, etc. The final number is roughly the lowest depth of each one-foot segment; e.g., 3 would be the 2-3 foot segment (24-36 in).

Example: N-7-2-1 would be the second replicate from grid coordinates N-7 whose segment depth was 0-1 feet (0-12").

APPENDIX D

SEDIMENT CORE EXTRUSION LOGS

EXAMPLE



D: { 0"-5" Black, loosely packed medium to fine sand w̄ trace of silt & organics (leaves & roots)
5"-27" Olive green silt w̄ trace of sand w̄ shell fragments

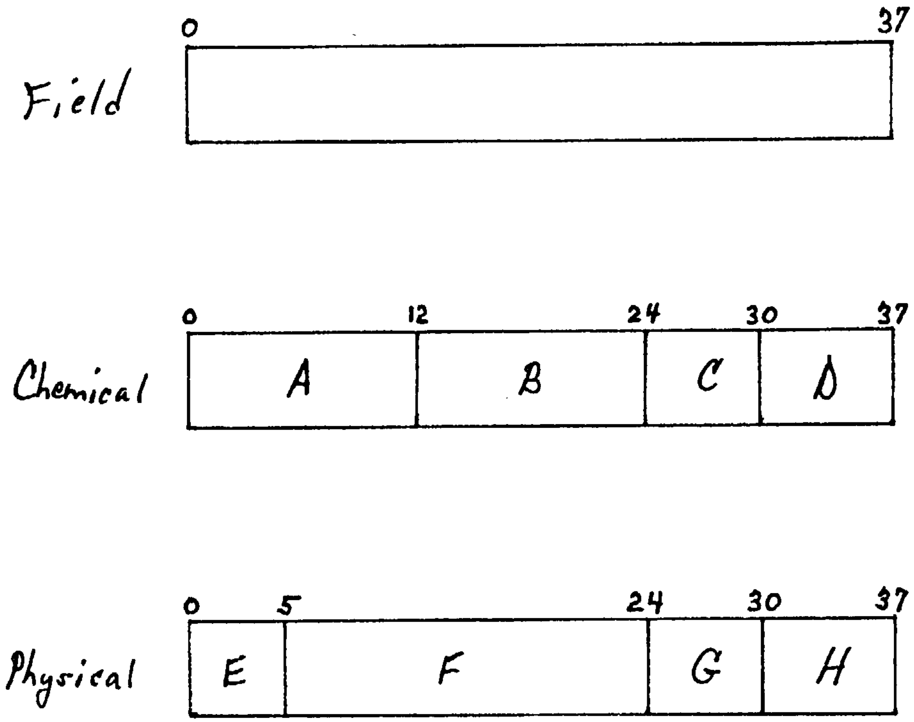
E: NOT RETAINED - Olive green, dense, sandy silt with shells

→ at discretion of laboratory representative

Lab directing removal of samples from tubes
↓
WES

E-25-1

9910



E: Black, loose, soft, peaty silt w̄ marine odor and shell fragments

F: Olive, firm, organic silt w̄ sand and marine odor

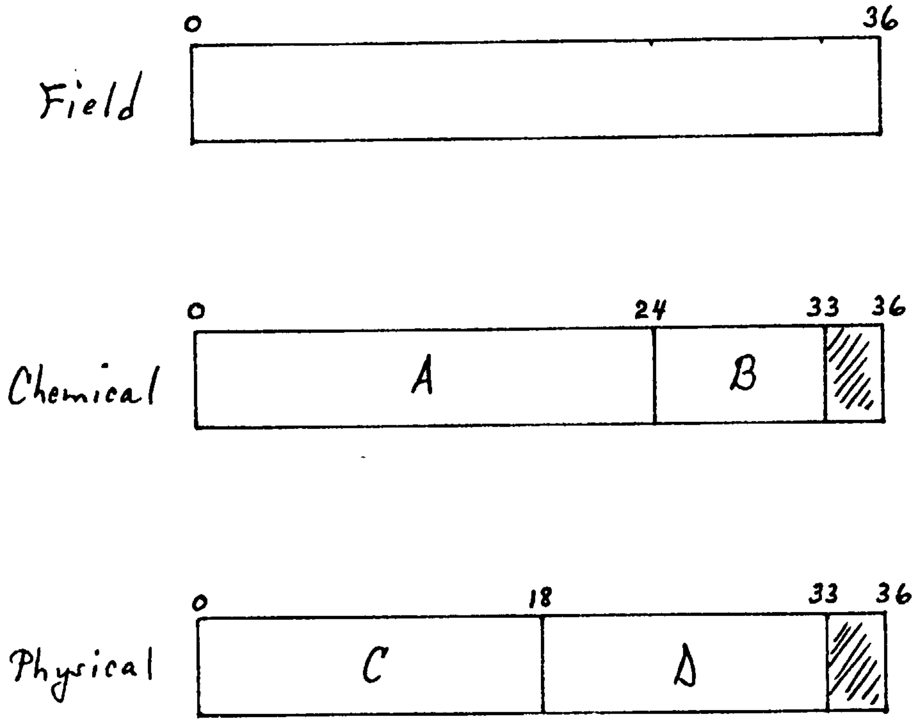
G: Olive green, firm, fine silty sand w̄ shell fragments

H: Brown, firm, medium to fine sand w̄ trace of silt

WES

E-27-1

9912

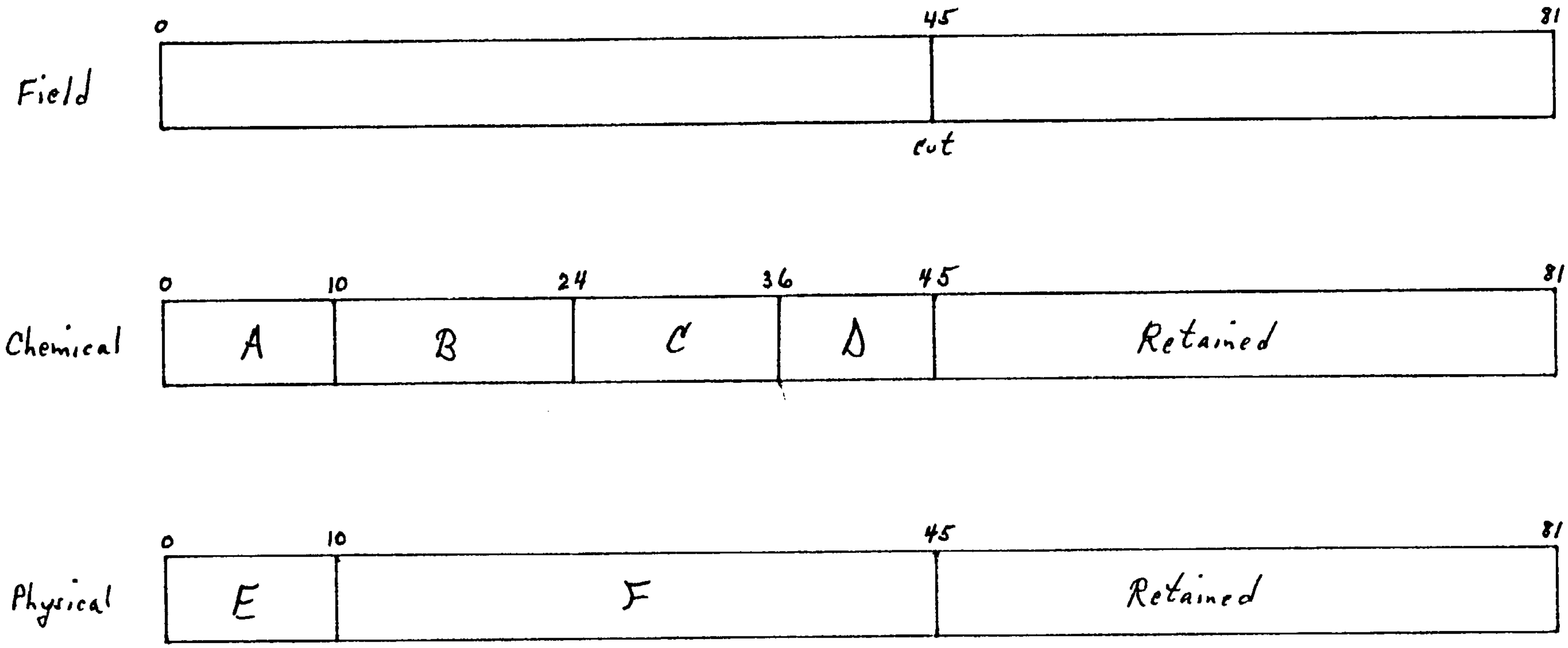


C: Black, firmly packed, fine sandy silt w shells and organics

D: Olive green, loose, soft, medium to fine silty sandy gravel with shells

WES

9914 G-13-1

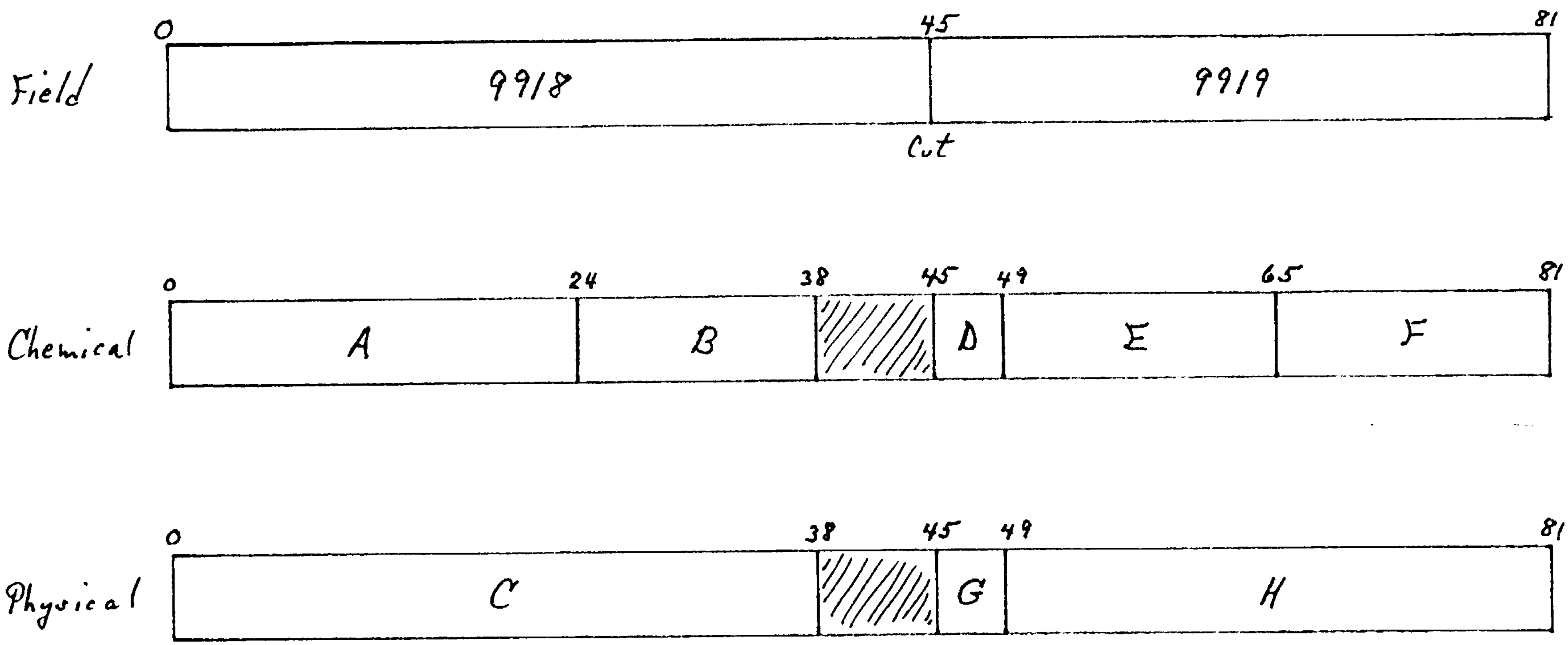


E: Black, soft, silt with trace of sand w̄ marine odor & shell fragments

F: Olive green, dense, organic clay w̄ marine odor & shell fragments
– very plastic

WES

Revised 19 November 1985 G-17-2



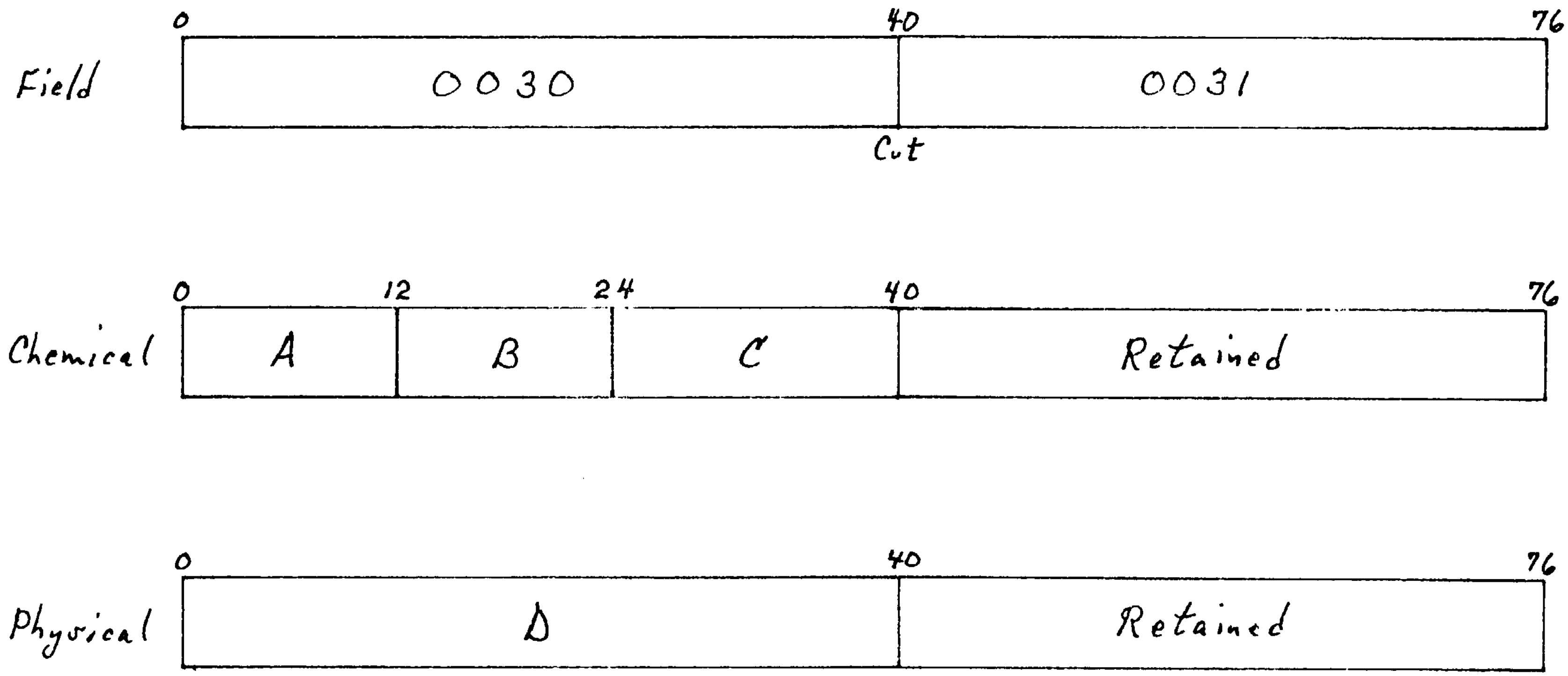
C: Black, loose, organic silt w̄ sand & leaves & roots throughout

G: Black, organic, silty sand w̄ shells & marine odor

H: Dark, olive green silty clay w̄ sand & shells & marine odor

WQL

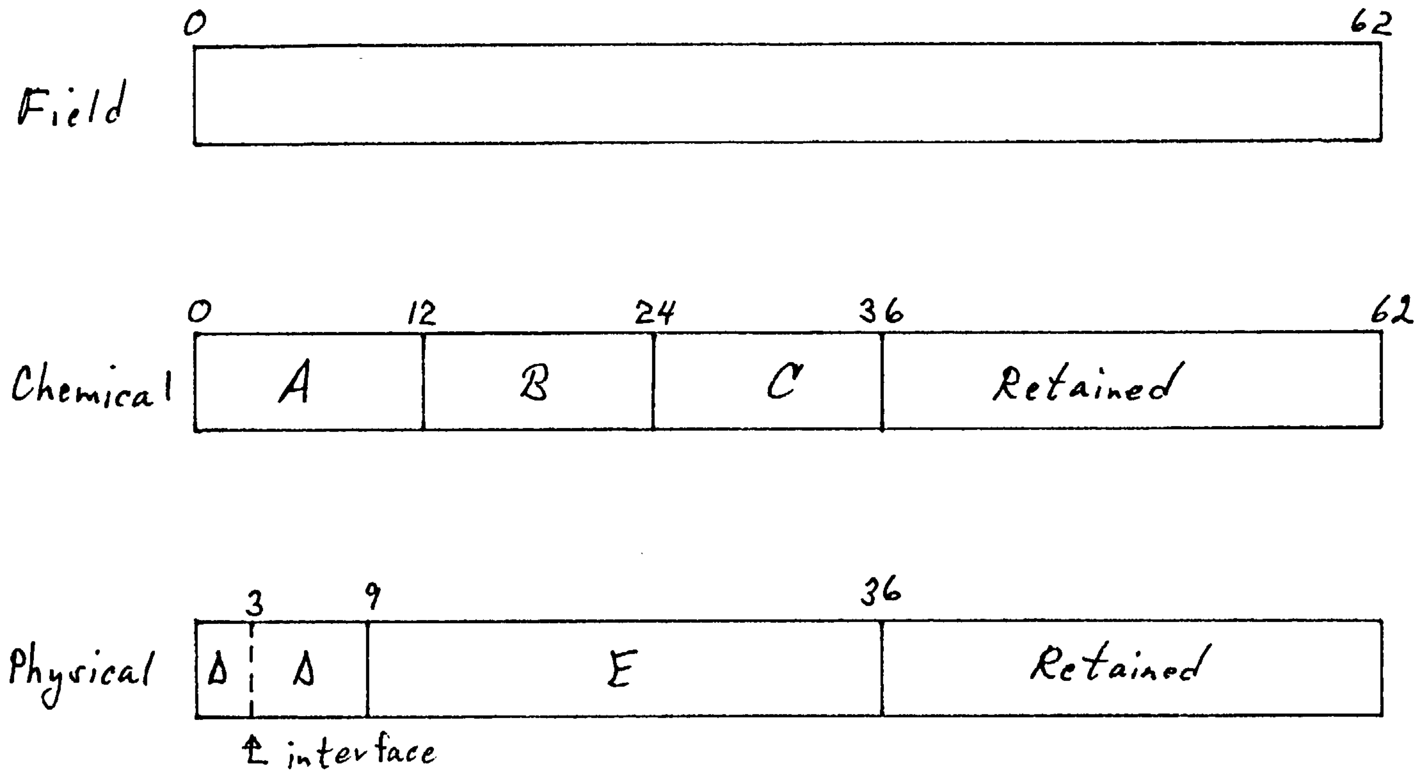
G-18



D: Black, organic silt w̄ trace of sand & marine odor.

WQL

9921 G-20-2

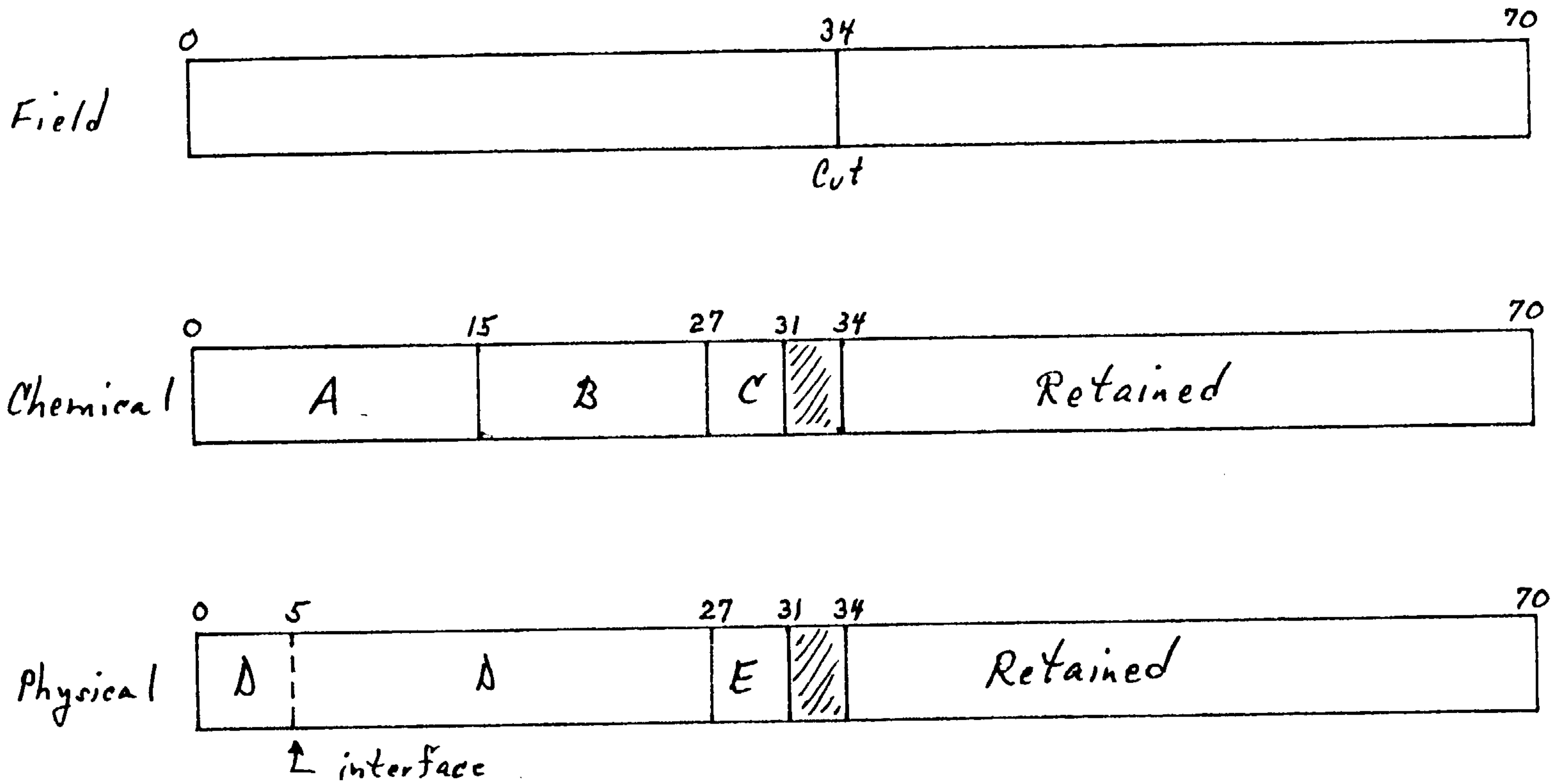


Δ: 0"-3" Black, soft, organic silt w̄ marine odor
3"-9" Olive green, dense, ~~sandy~~ silt w̄ trace of sand & marine odor

E: Olive green, dense, sandy silt w̄ shells

WES

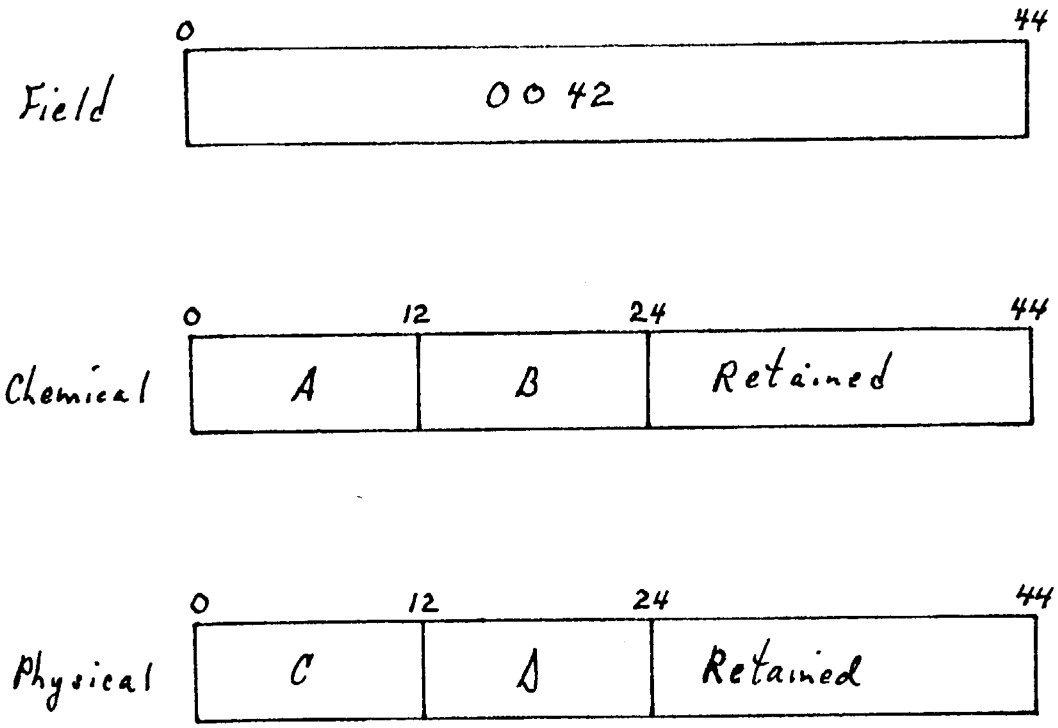
9922 G-29-1



D: 0"-5" Black, loosely packed medium to fine sand w̄ trace of silt & organics (leaves & roots)
5"-27" Olive green silt w̄ trace of sand w̄ shell fragments

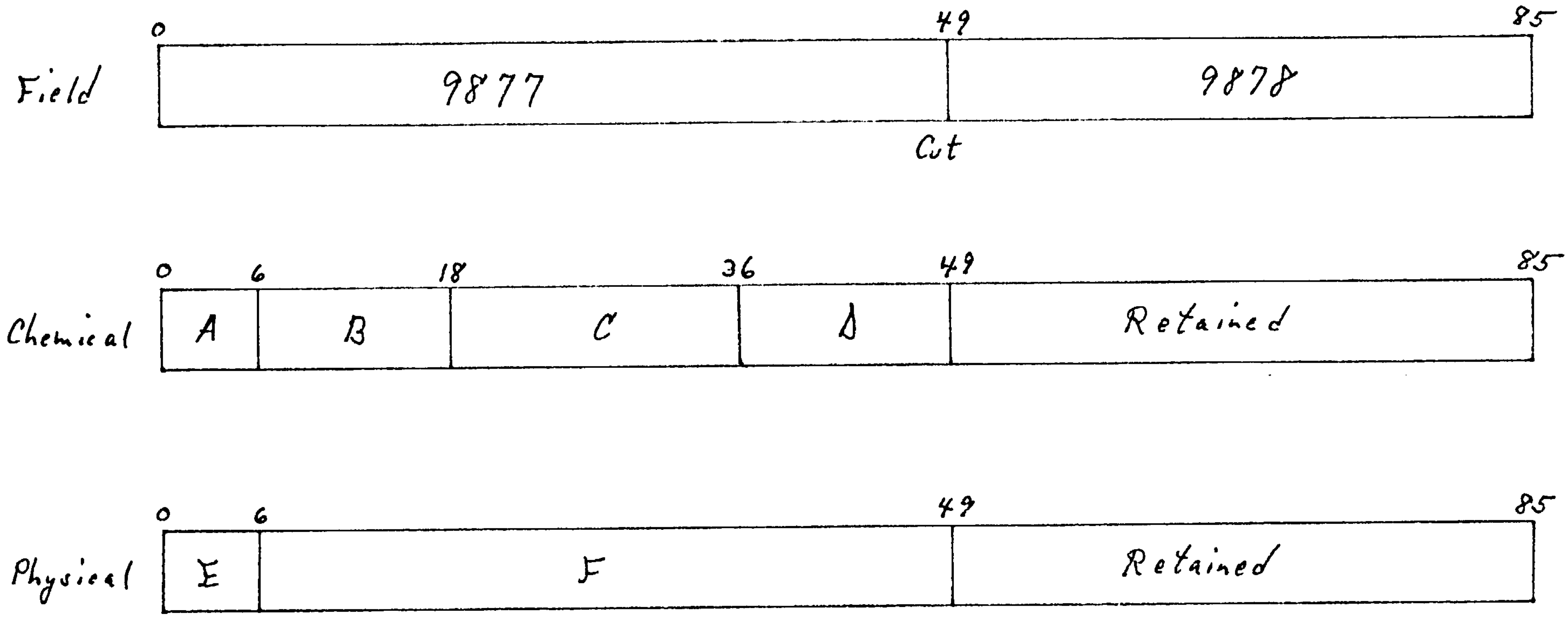
E: -NOT RETAINED- Olive green, dense, sandy silt with shells

WES



<u>NB</u>: No visual classifications were performed on these samples.

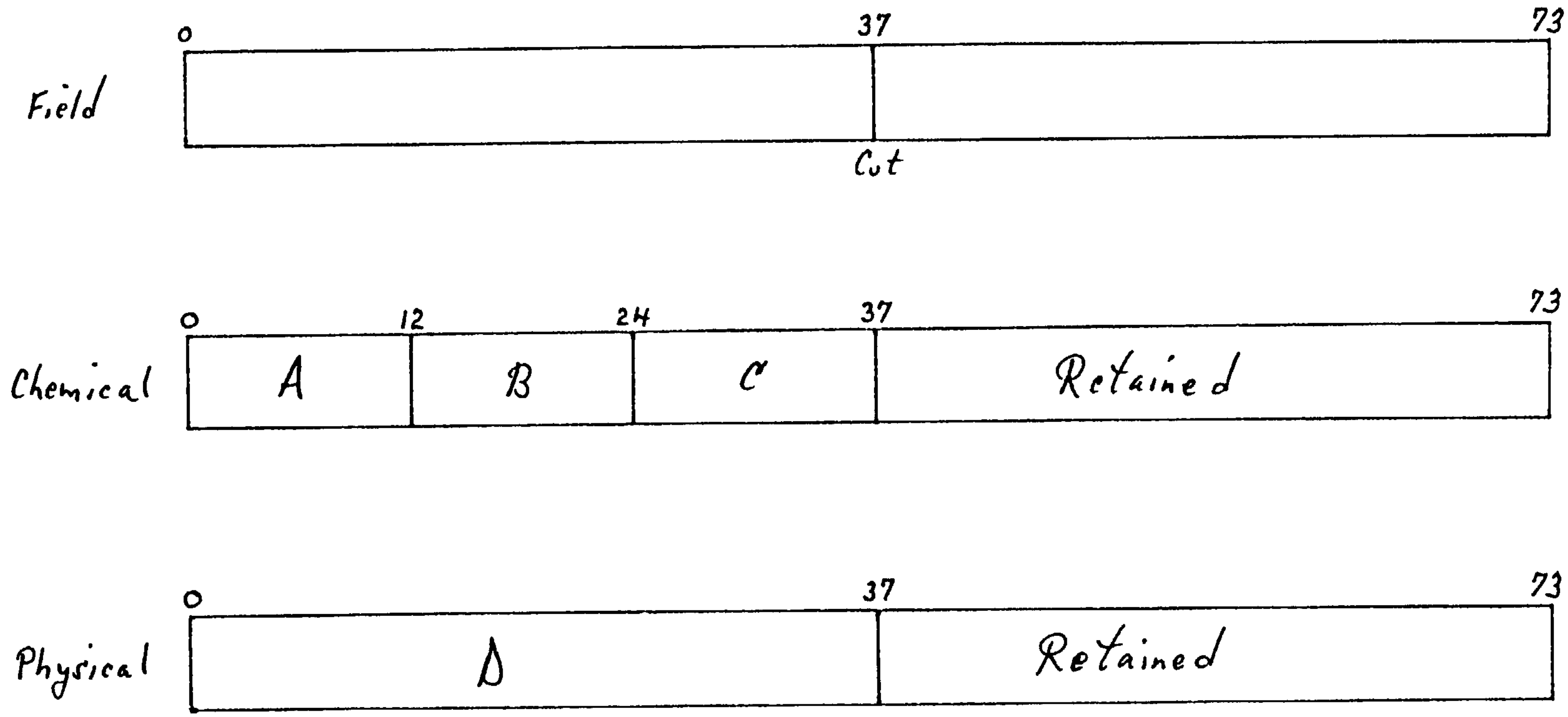
NED



E: Black, organic silt w̄ shells & marine odor

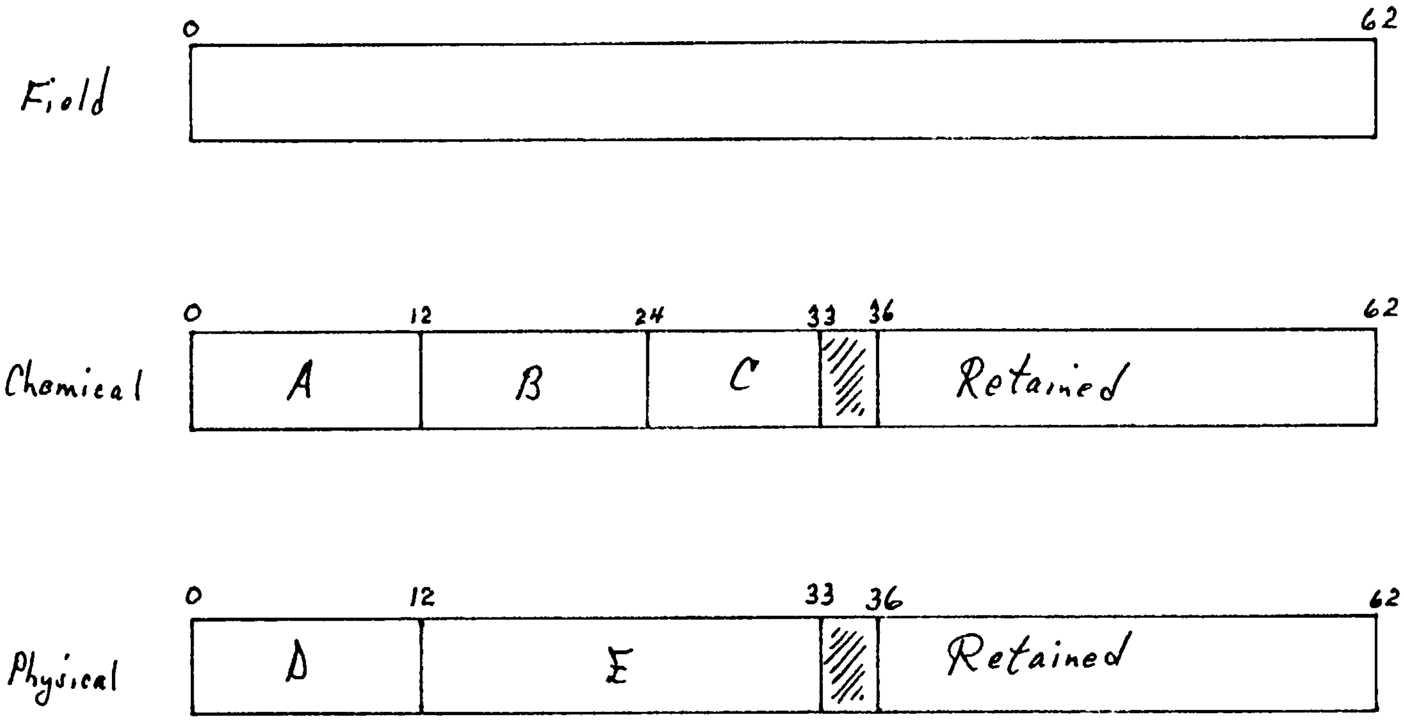
F: Olive green organic silty clay w̄ traces of sand, shell fragments, & leaves

WQL



D: Dark olive green, soft, organic silt w̄ clay and shells and marine odor

WQL

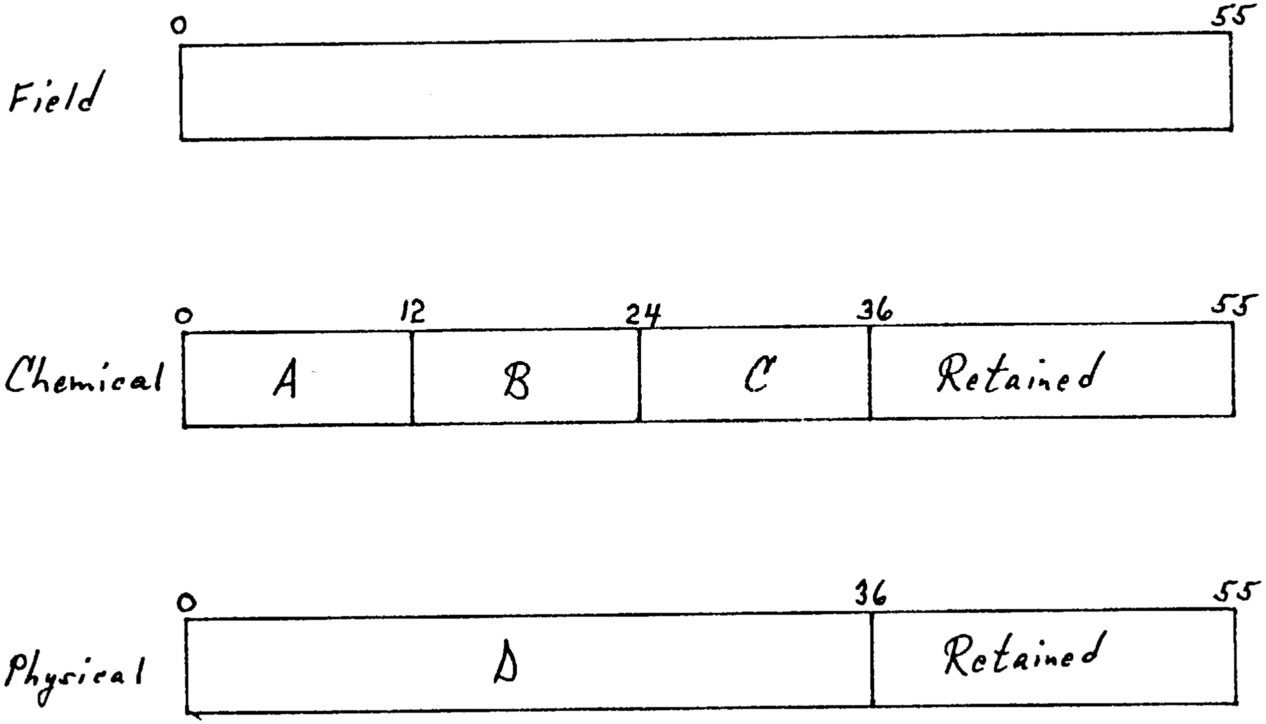


D: Black, soft, organic silt w̄ marine odor

E: Olive green, firm, medium to fine organic sandy silt with marine odor

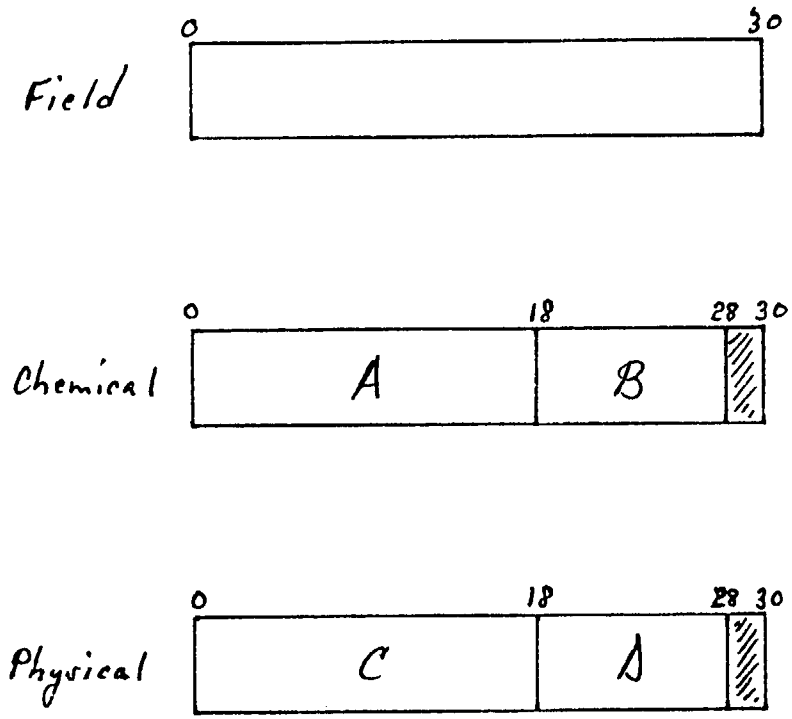
WQL

9859 H-33



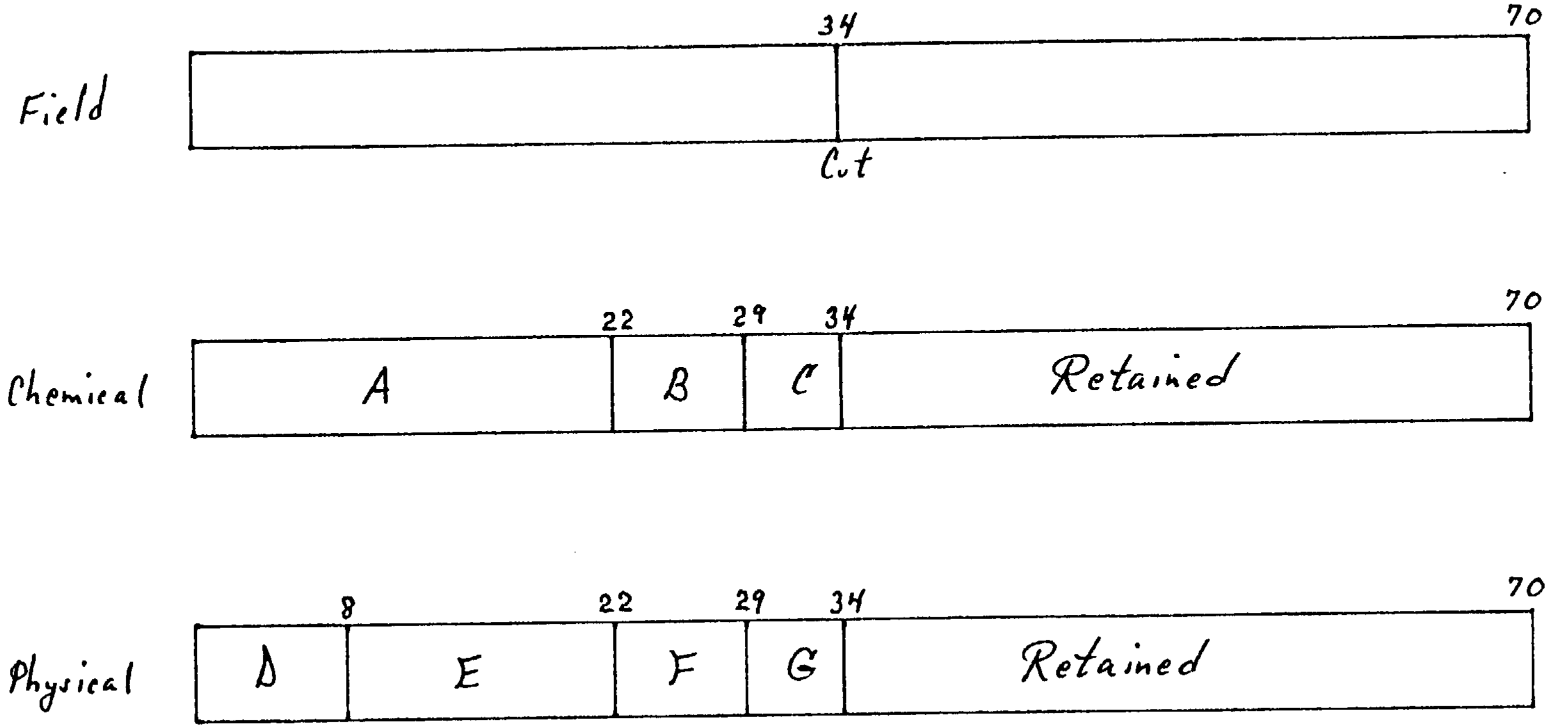
D: Olive green, firm organic silty clay w̄ shells

WQL



C : Dark olive green, loose, soft, fine sandy silt w̄ organics

D : Brown, compact, silty, sandy gravel w̄ organics



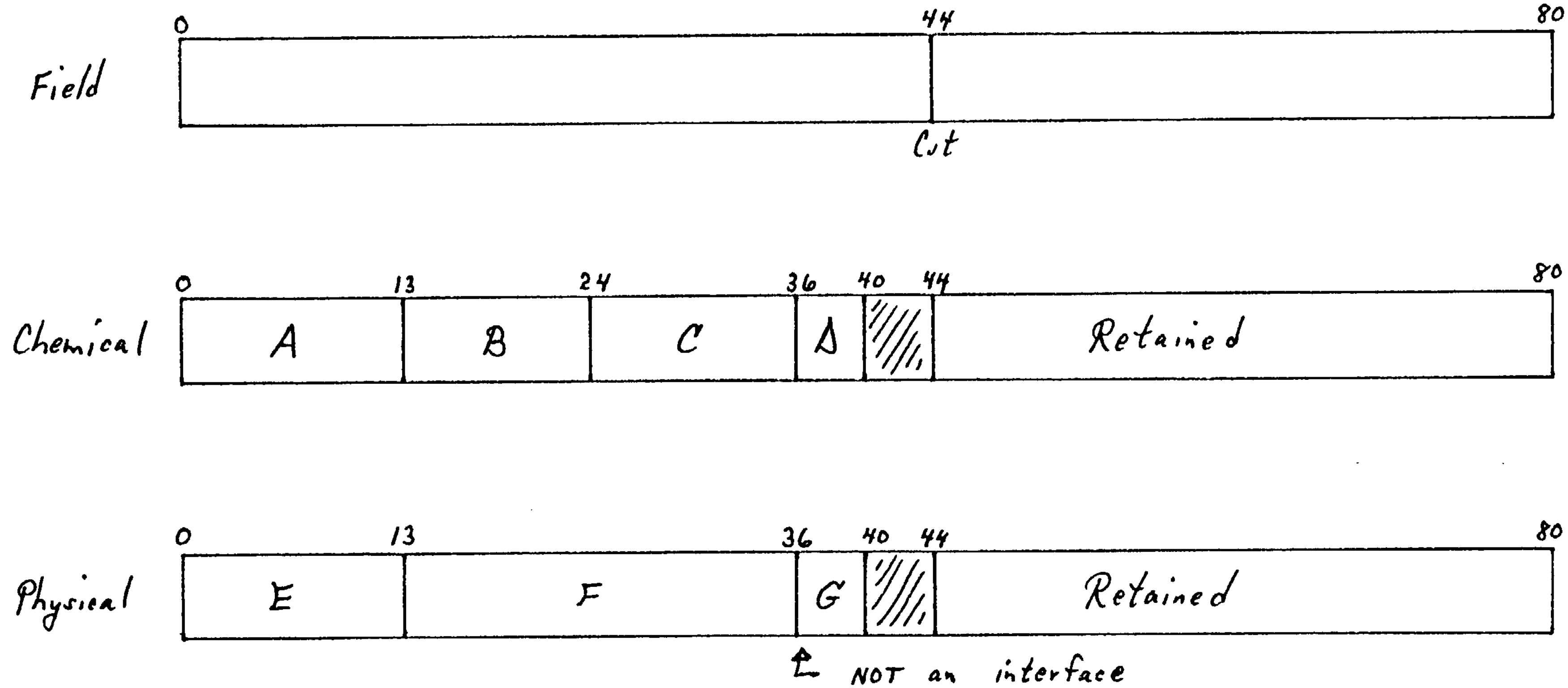
D: Black, loose, soft organic silt w̄ trace of fine sand

E: Olive green, dense, fine sandy silt

F: ~~Ol~~ Olive green, loose, soft fine silty & sandy gravel

G: Olive green, dense, organic silt w̄ roots & leaves

WES

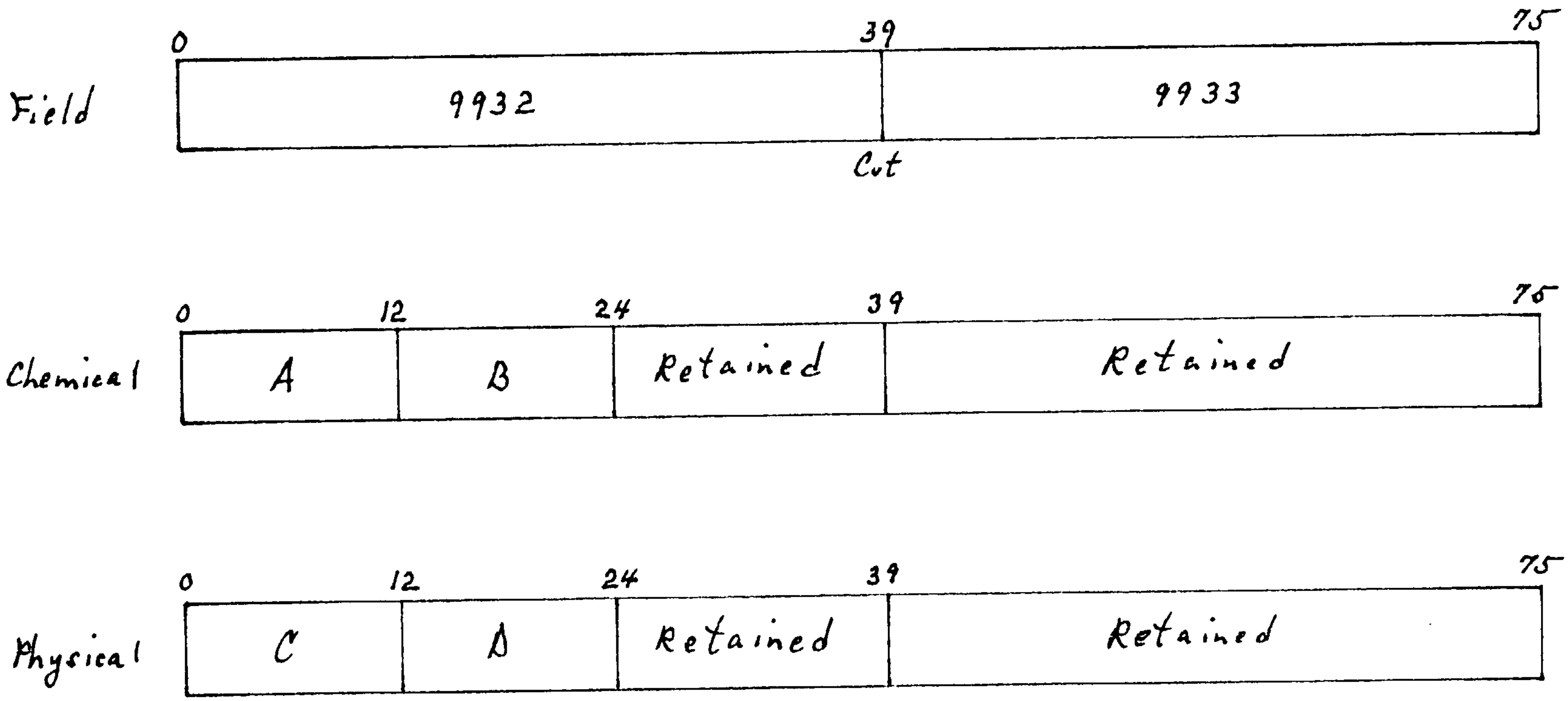


E: Black, soft organic silt w̄ trace of sand

F: Olive green, dense, fine silty sand w̄ shells & marine odor

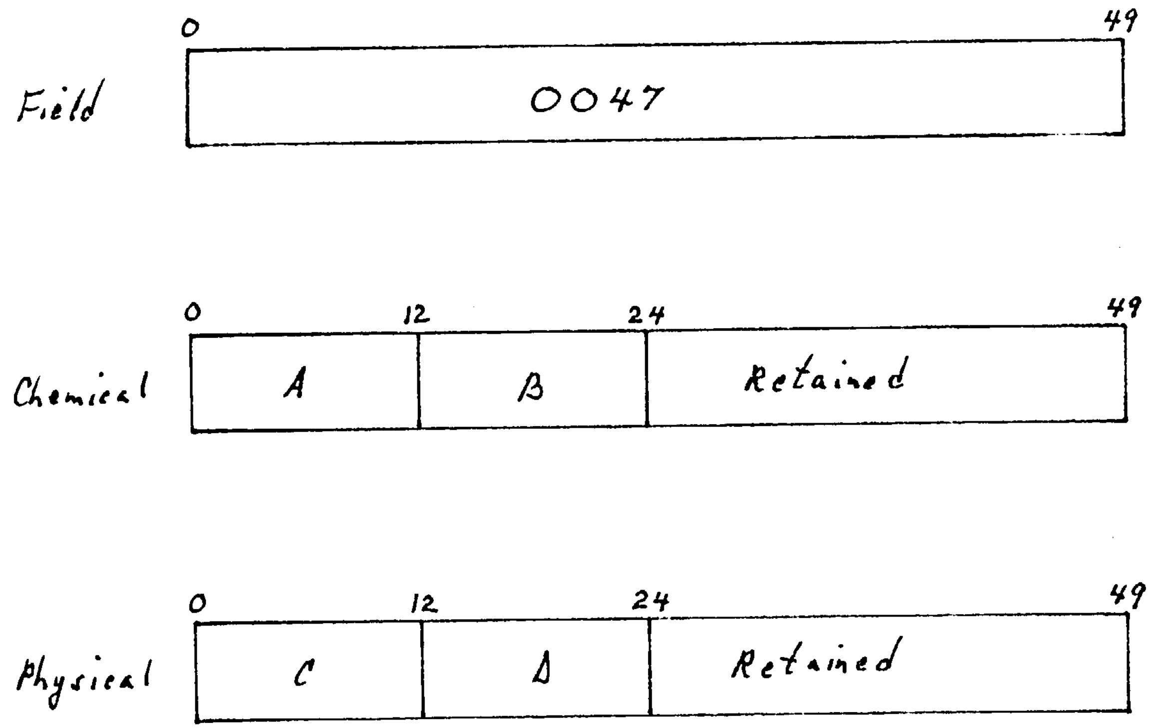
G: -NOT RETAINED- Same visual classification as "F", above

WES



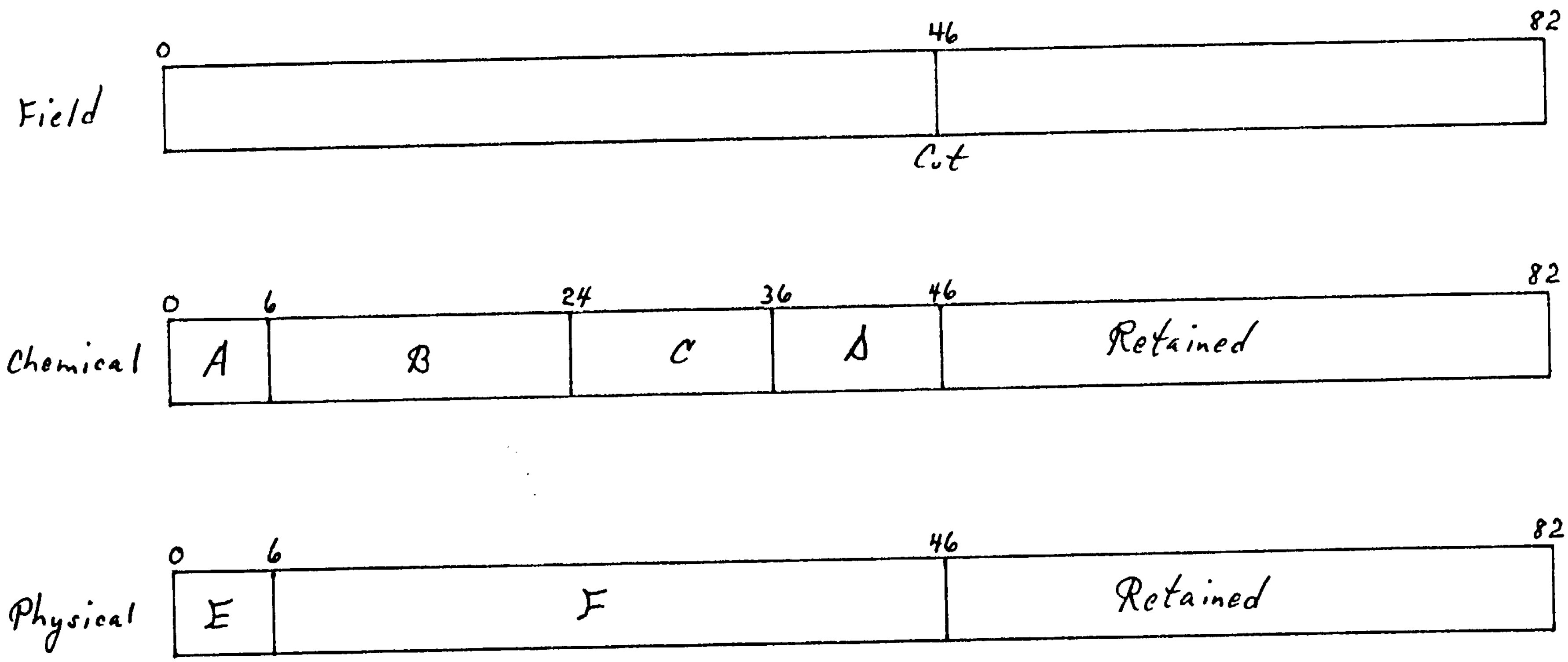
<u>NB</u>: No visual classifications were performed on these samples.

NED



NB: No visual classifications were performed on these samples.

NED

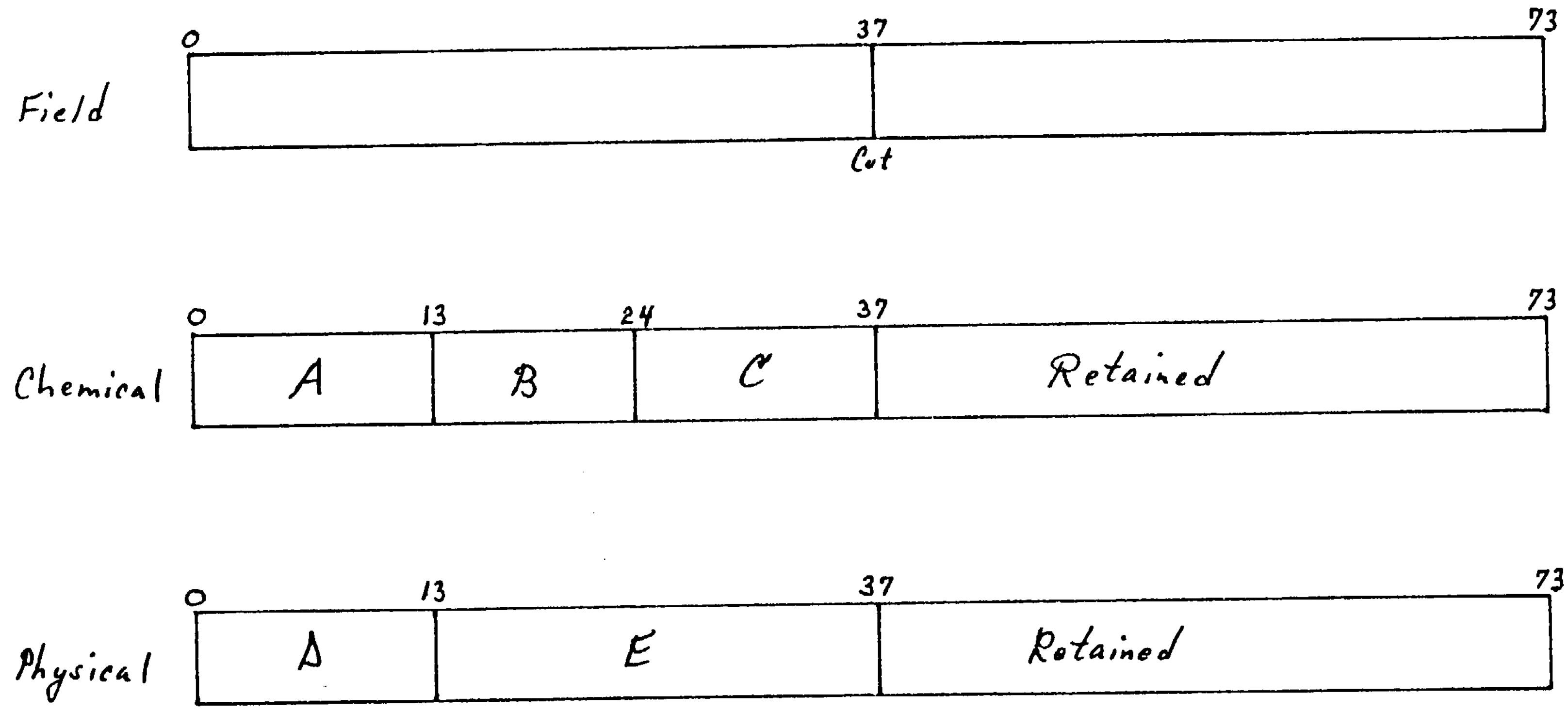


E: Black, soft organic silt w̄ marine odor

F: Olive green, firm silty clay w̄ marine odor

WQL

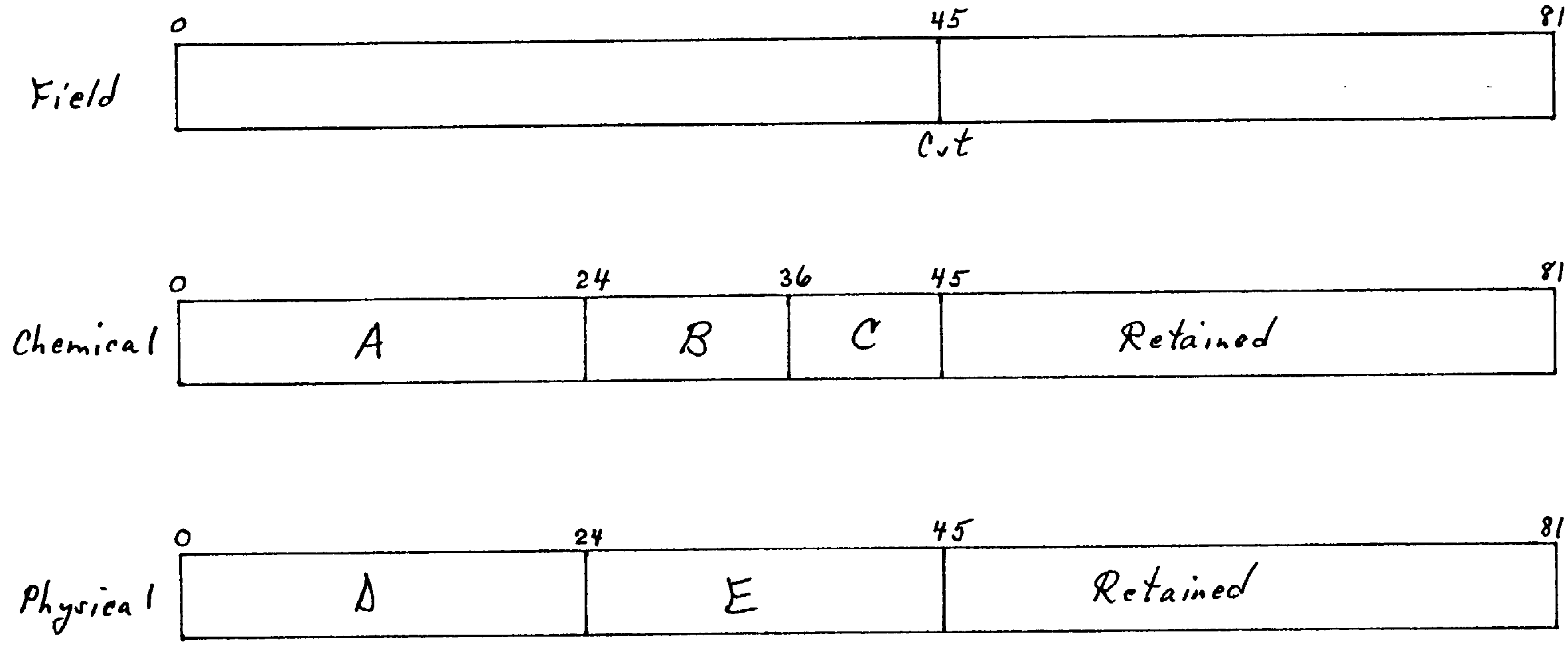
9786 I-19



D: Black, soft organic silt with sand & marine odor

E: Olive green, dense clay with sand & shell fragments

WES

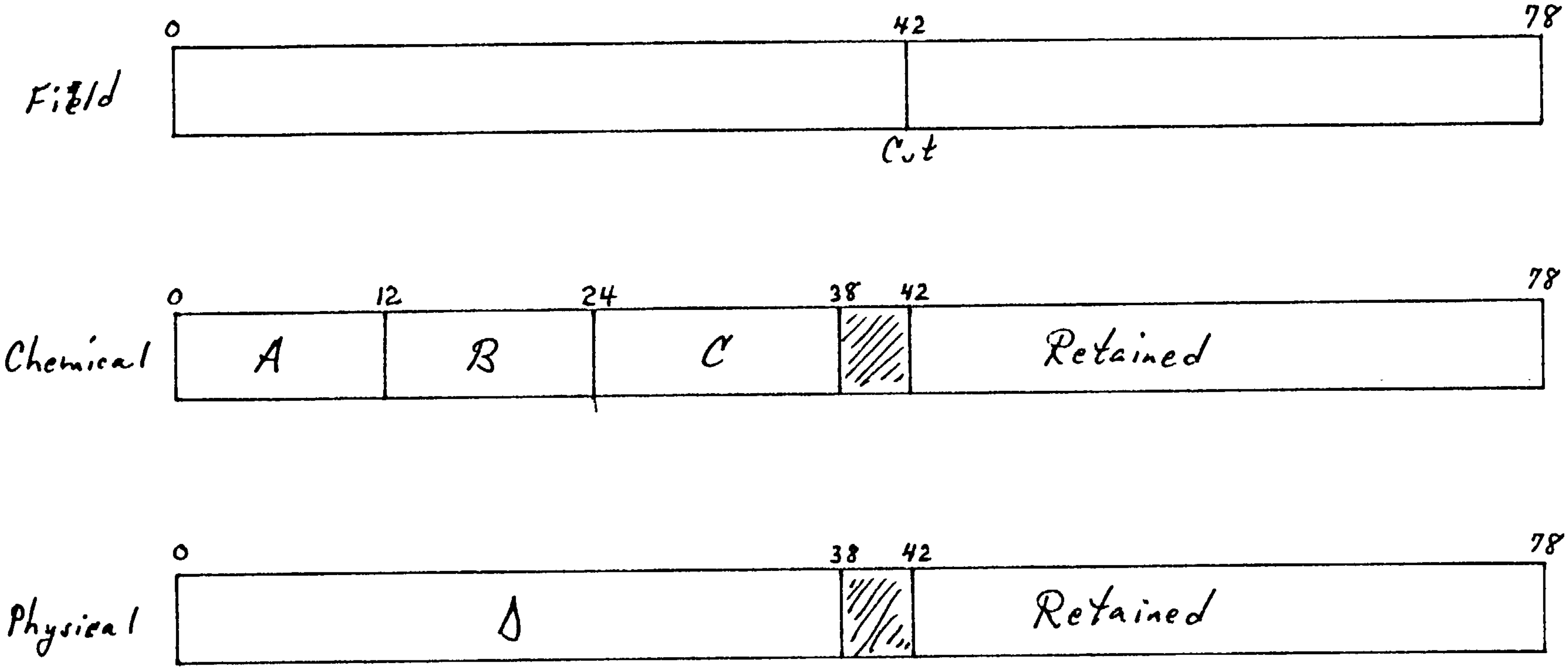


D: Black, soft organic silt w̄ marine odor

E: Olive green, firm organic silty clay w̄ marine odor

WQL

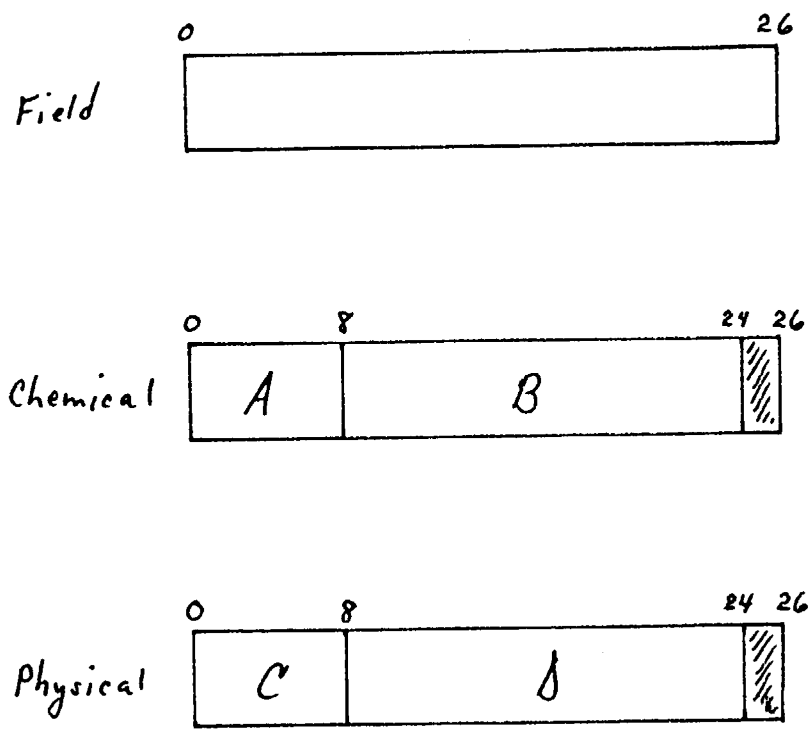
9848 I-28



D: Dark olive green, soft organic silt w marine odor & shells

WQL

9778 I-31

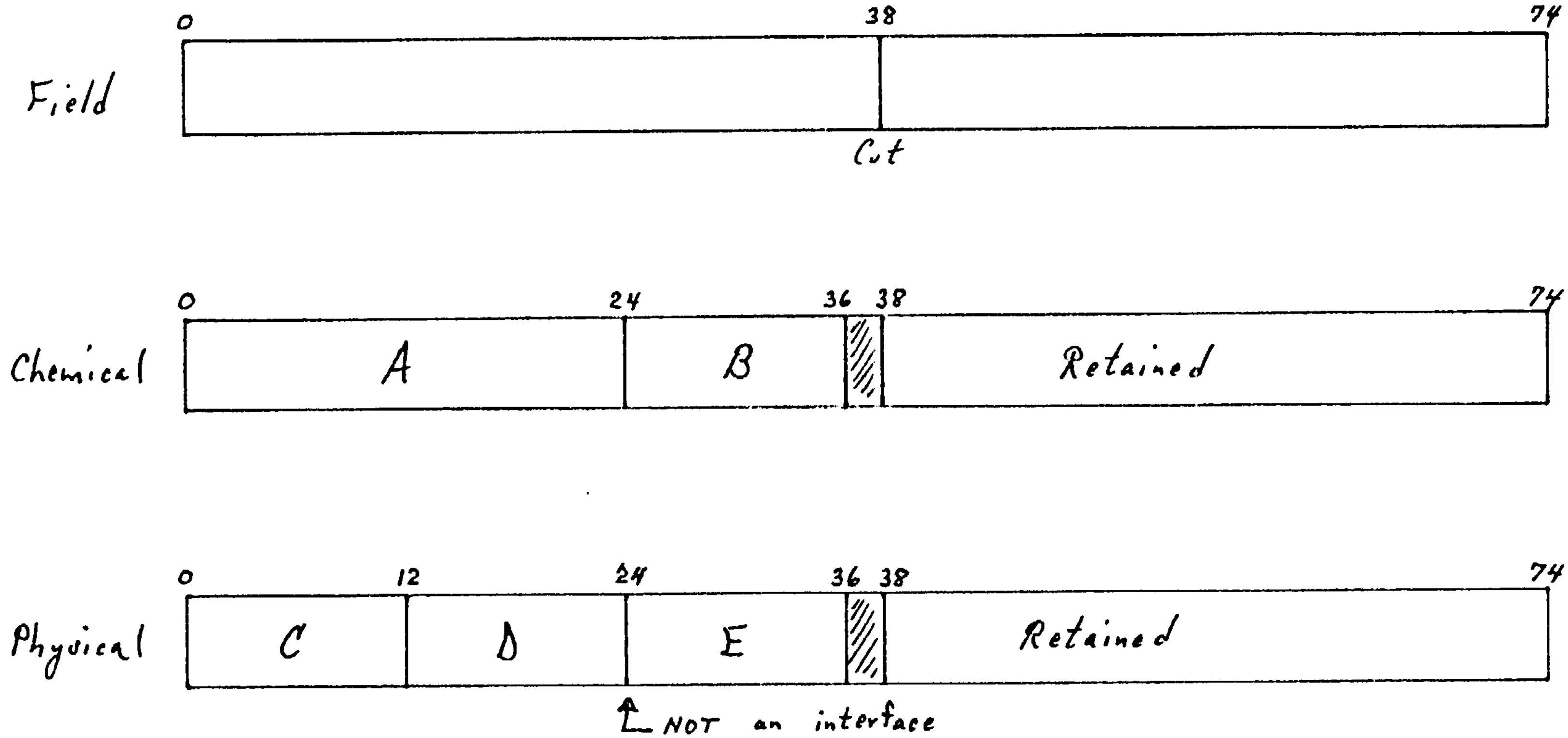


C: Black, soft, organic silty sand w̄ marine odor

D: Olive green, dense sand with trace of silt with shells

WES

9934 J-5-1



C: Dark olive green, loose, soft, organic, medium to fine sand w̄ silt & marine odor

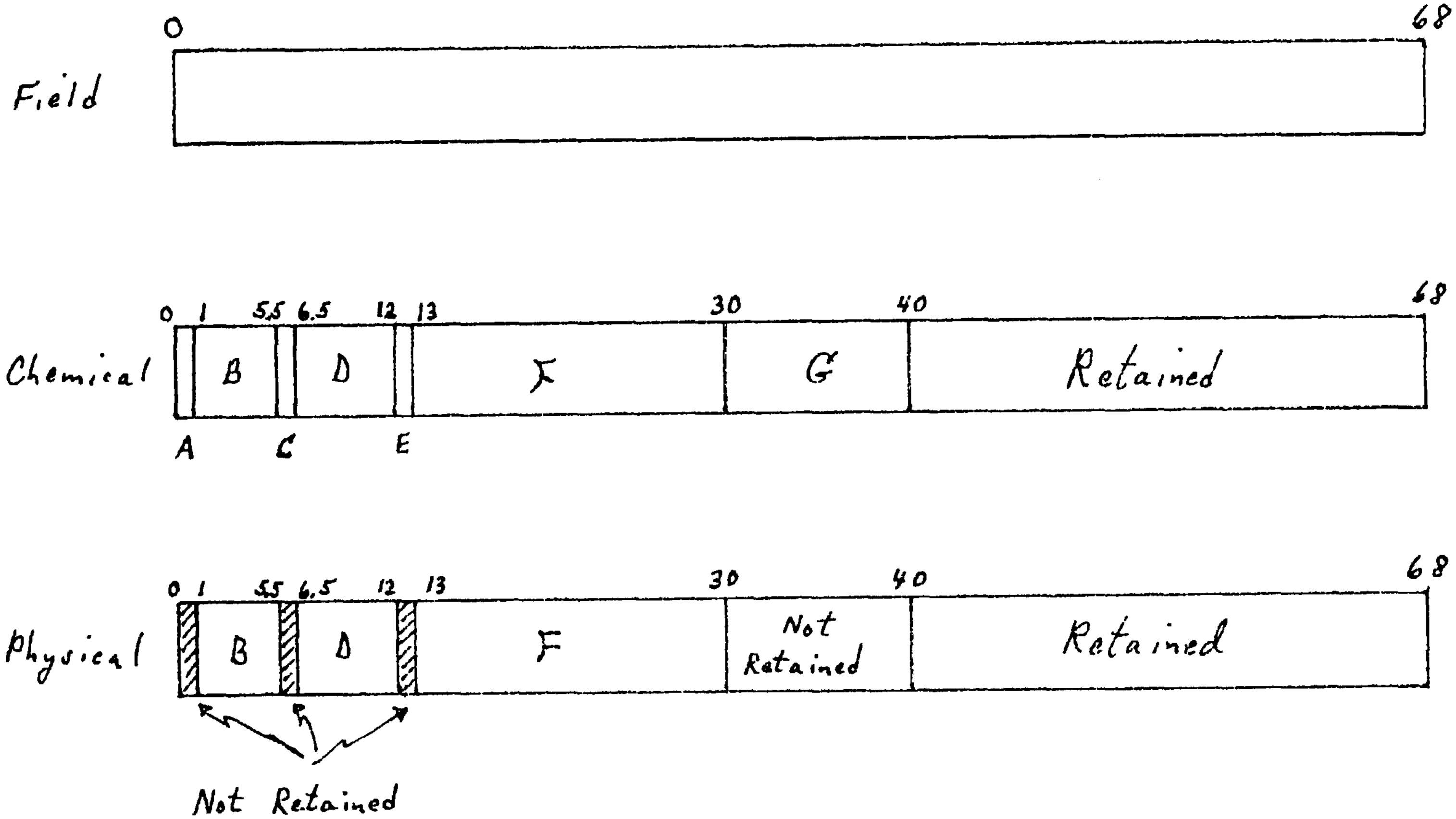
D: - NOT RETAINED - same visual classification as "E", below

E: Olive green, firm, fine sandy silt w̄ shells

WES

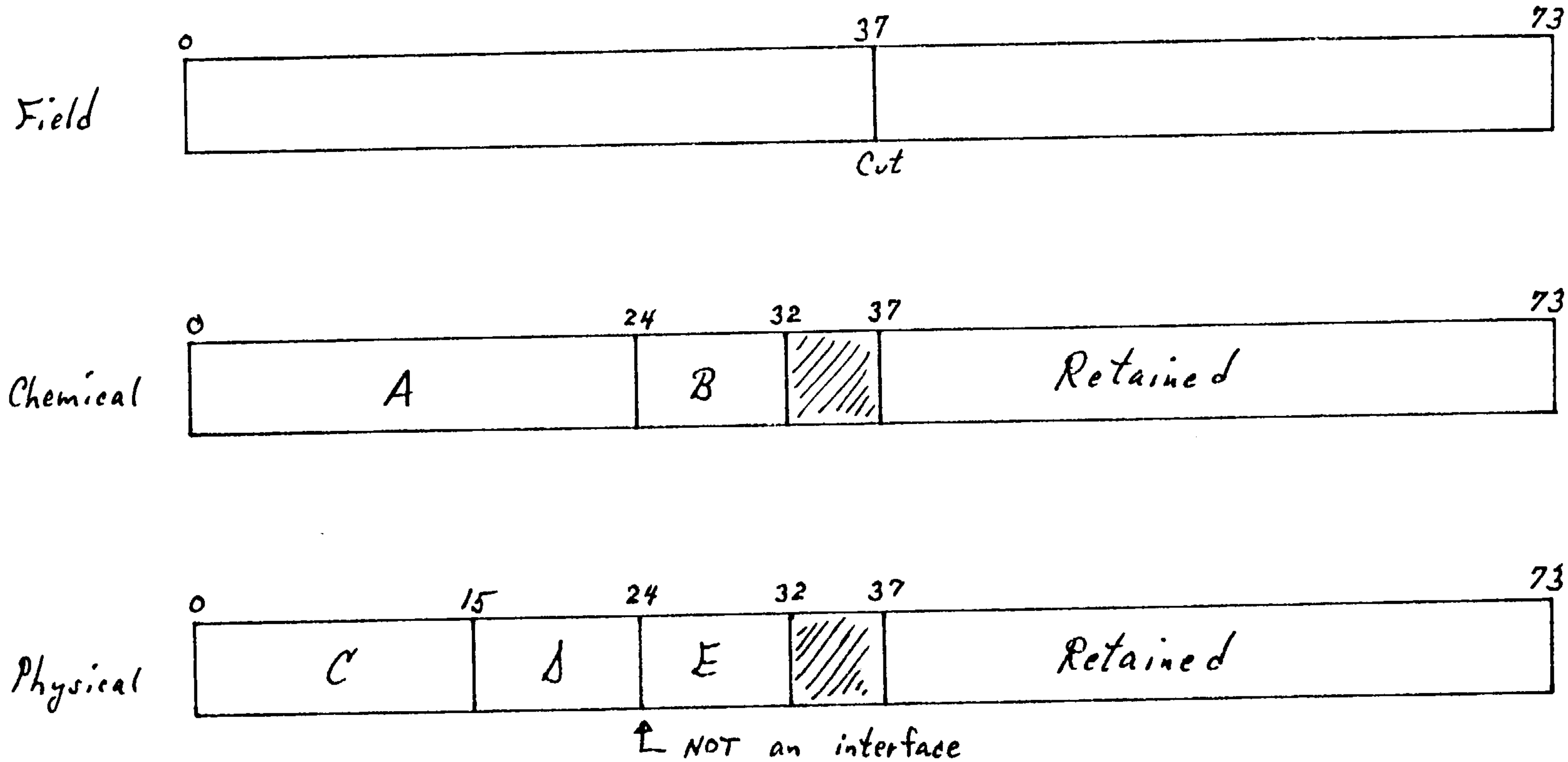
J-7

0052



NB: No visual classifications were performed on these samples.

EPA

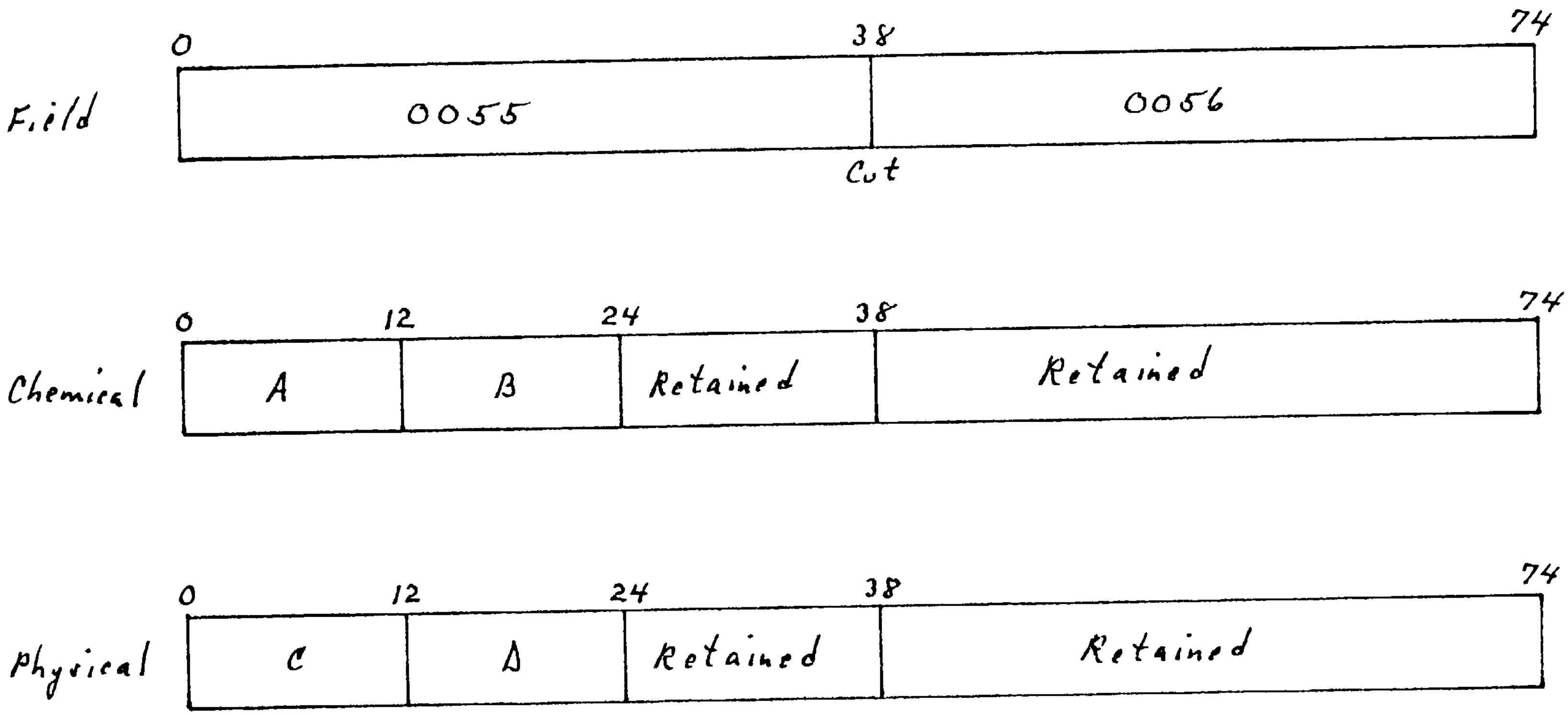


C: Black, loose, soft organic silt with sand

D: -NOT RETAINED- same visual classification as "E", below

E: Olive green, dense, fine sandy silt with shell fragments

WES



NB: No visual classifications were performed on these samples.

NED

J-12

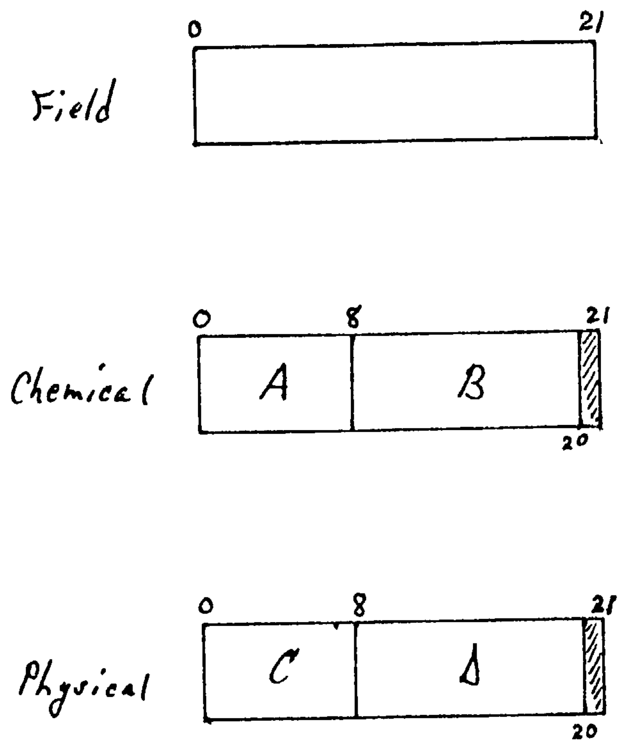
	0 5
Field	0058
Chemical	A
Physical	B

<u>NB</u>: No visual classification was performed on this sample.

D-28

NED

9941 J-13-2



C: Dark olive green, firm, medium silty sand w̄ shells

D: Olive green, firm, fine silty sand w̄ shell fragments

WES

9942 J-15-1

Field 0 — 16

Chemical 0 — 16 A

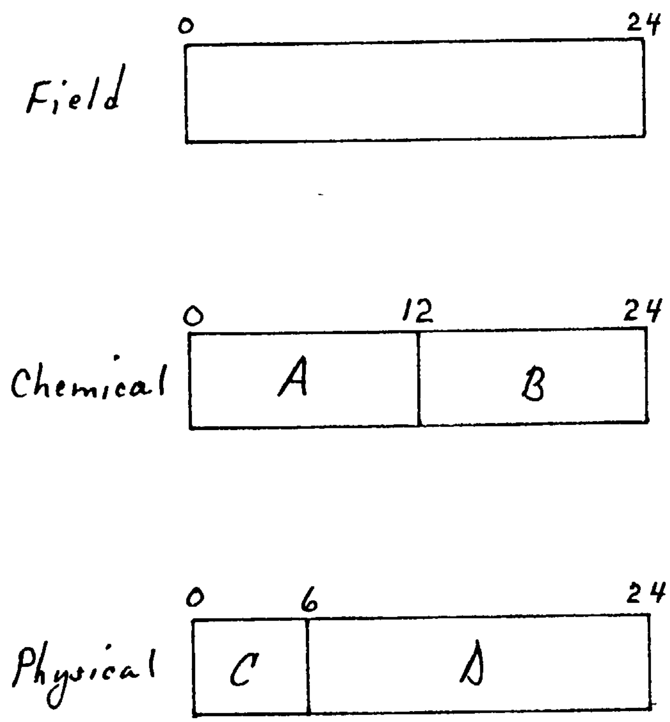
Physical 0 — 16 B ← See note

B: Olive green, firm, medium to fine sand with silt & trace of gravel

Note: apparent gravel layer at end of sample – this is probably what caused refusal.

WES

9945 J-17-2



C : Dark olive green soft organic silt w̄ sand

D : Olive green, dense, medium to fine silty sand w̄ gravel

WES

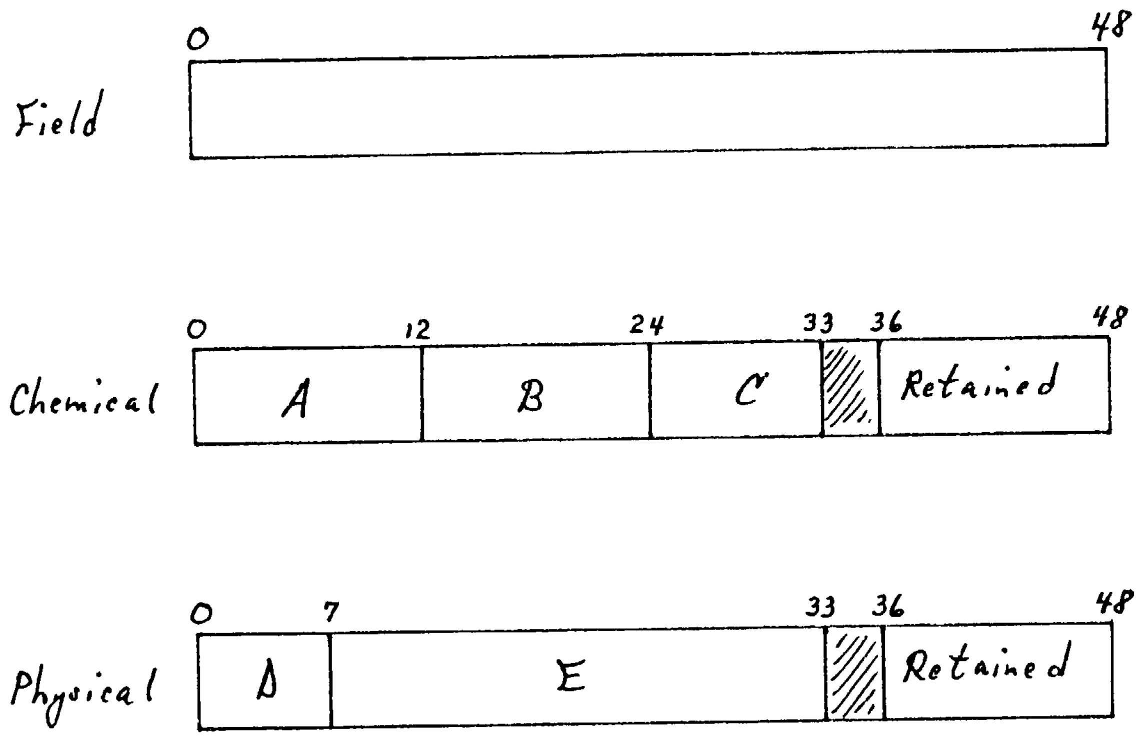
9947 J-20-2

	0 – 16
Field	
Chemical	A
Physical	B

B: Olive green, firm, organic coarse to fine sand w̄ silt & trace of gravel

WES

9949 K-5-2

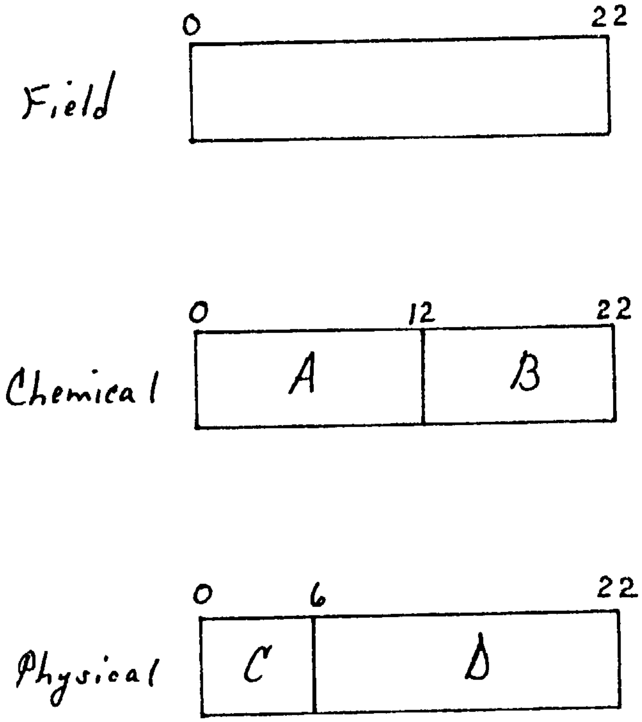


D: Black, soft organic silt w̄ marine odor

E: Olive green, dense silt w̄ trace of sand w̄ marine odor & shell fragments

WES

9950 K-26-1

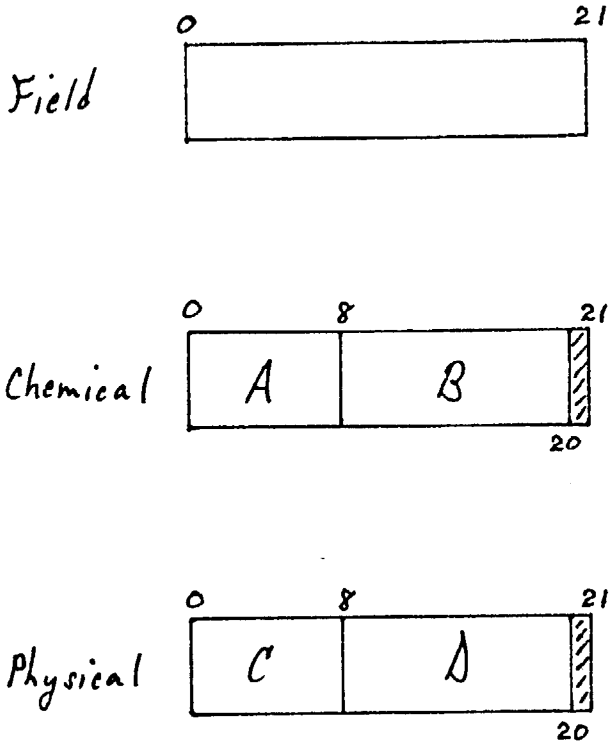


C : Dark Olive green, firm, fine sandy silt w̄ shells

D : Olive green, firm, medium to fine sand with silt & trace of gravel & shell fragments

WES

9953 K-28-2

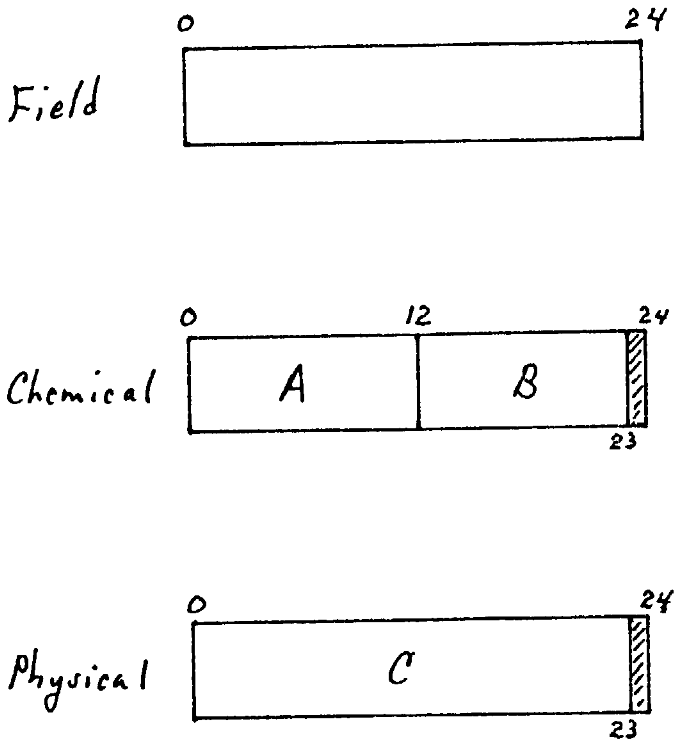


C: Green, firm, coarse to fine sand with silt & shells

D: Light green, firm, fine silty sand w̄ organics

WES

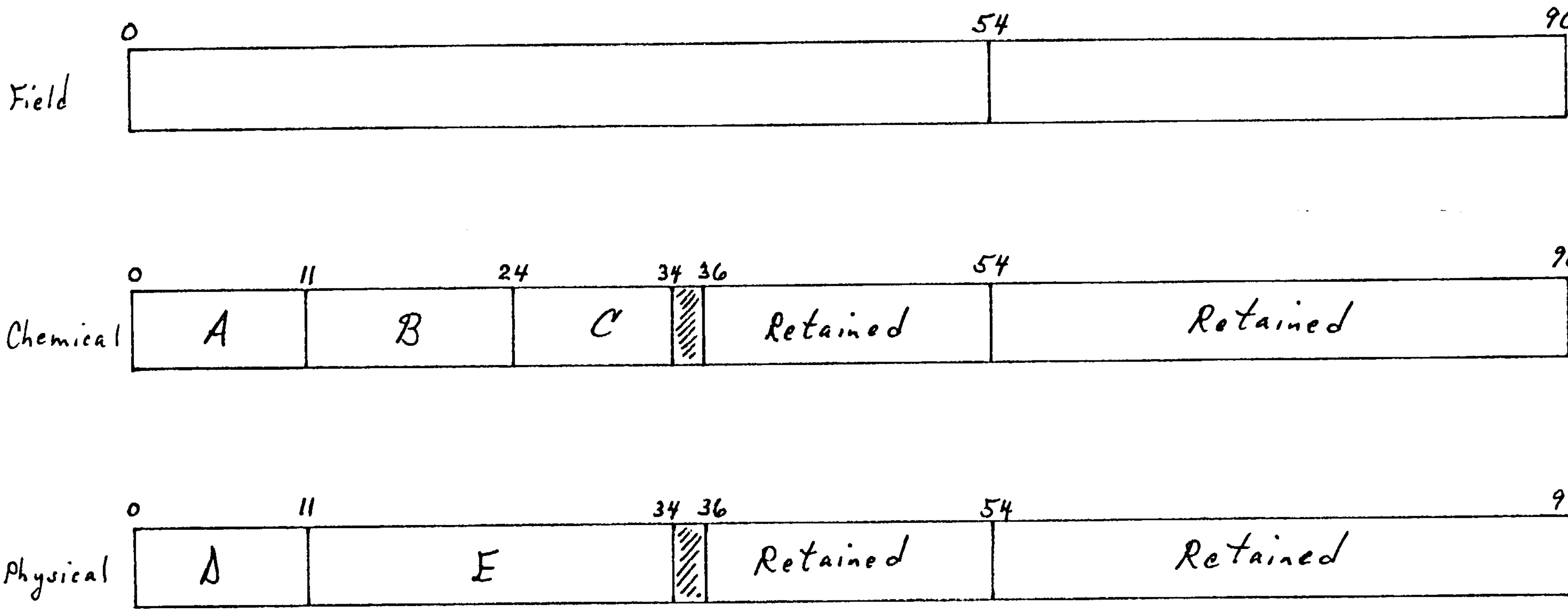
9954 K-32-1



C: Olive green, firm, fine organic sand w̄ silt & shell fragments

WES

9956 L-10-1

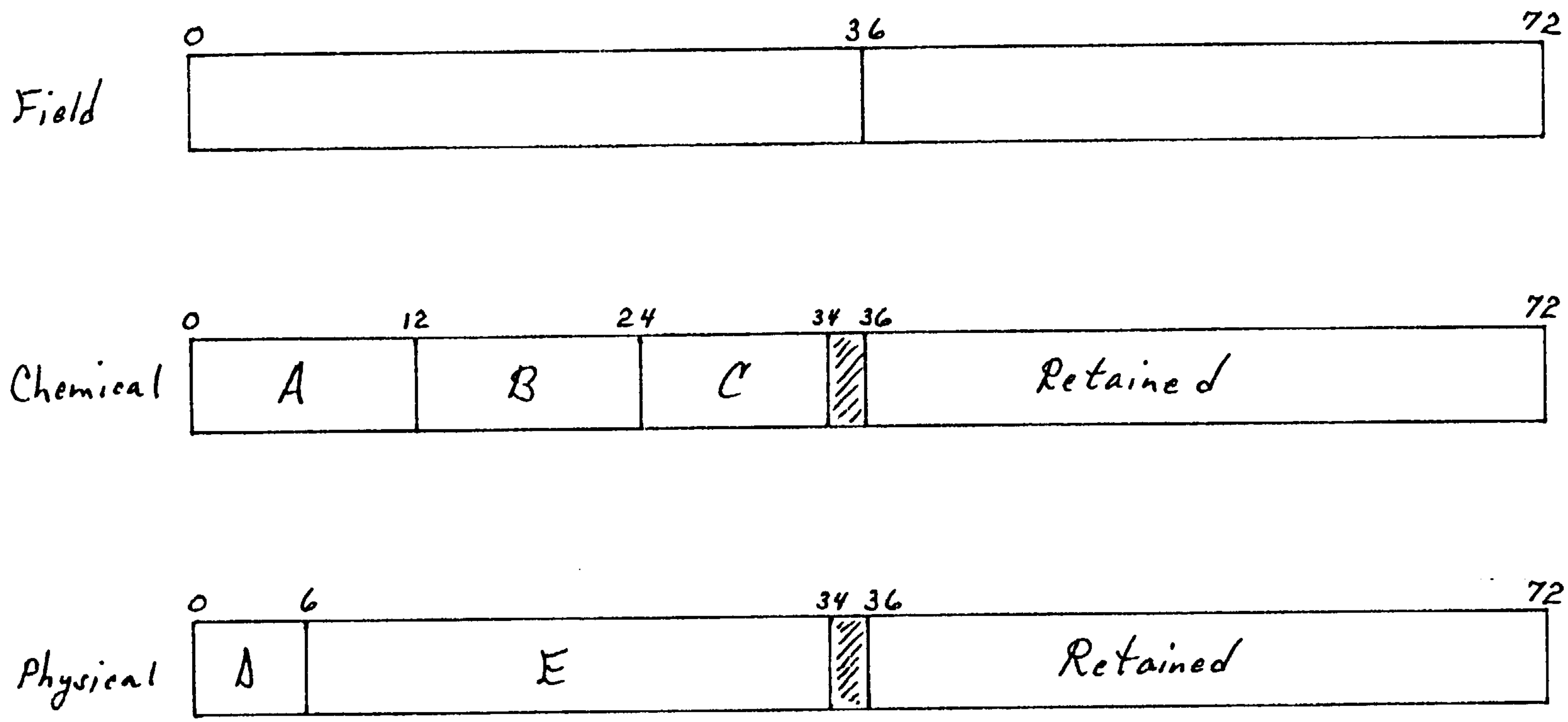


D: Olive green, soft silty clay w̄ marine odor

E: Olive green, firm organic clay with shell fragments & marine odor
very plastic

WES

9962 L-29-2

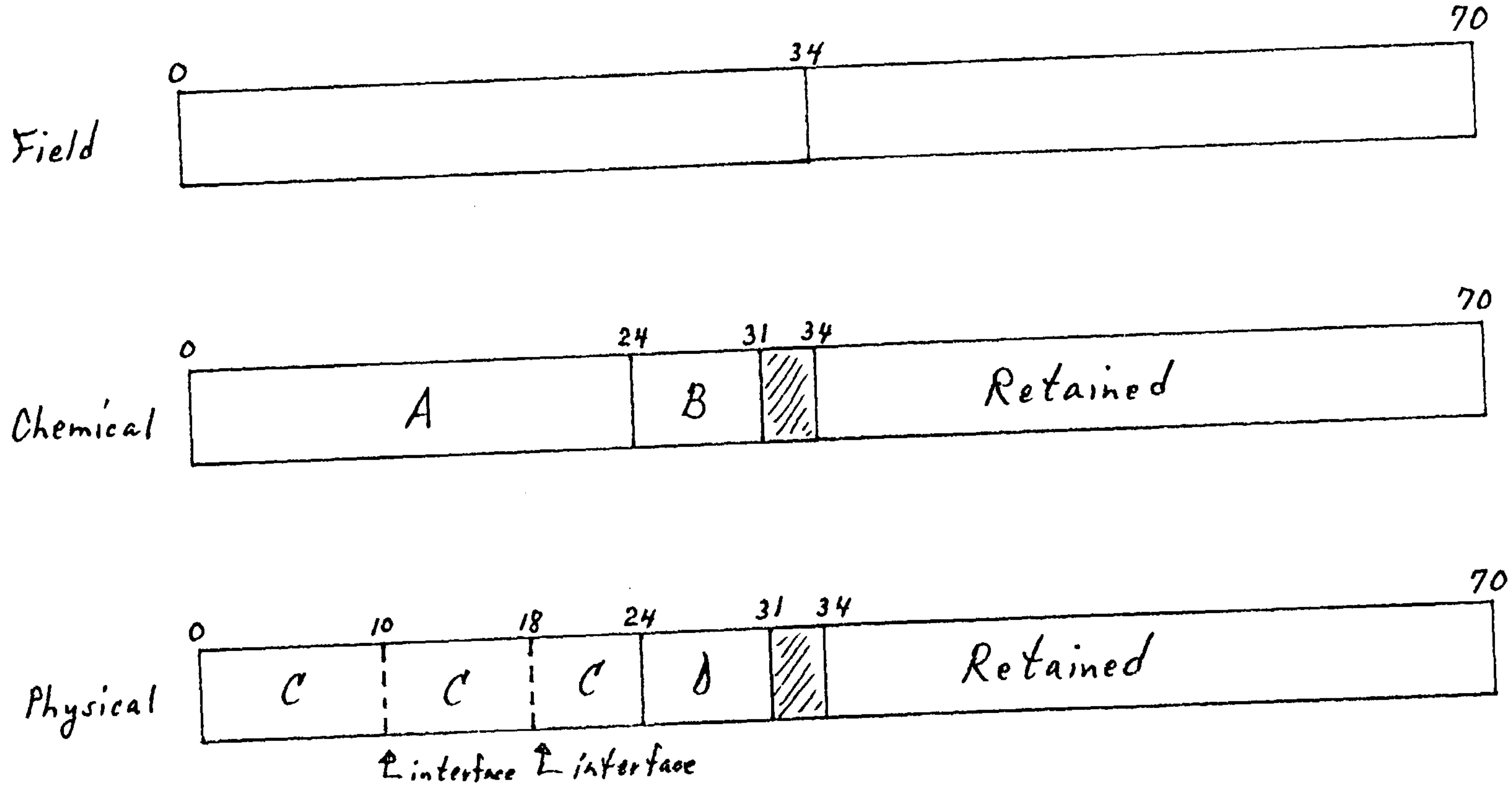


D: Olive green, soft, organic silt w̄ trace of clay & sand

E: Olive green, dense, organic clay w̄ shells

WES

9965 M-6-2



C: 0"-10" Dark olive green, soft organic silty sand w̄ marine odor & shells
10"-18" Olive green, medium to hard packed, medium to fine sand w̄ silt, shell fragments & odor
18"-24" Olive green, hard, fine silty sand w̄ shells - same as "D" below

D: - Same visual classification as 18"-24" layer of "C", above

D R A F T

CHEMICAL LABORATORY

QUALITY ASSURANCE/QUALITY CONTROL

PROGRAM

New Bedford Harbor
Superfund Project

U.S. Army Corps of Engineers
New England Division
Water Quality Laboratory
Hubbardston, MA 01452

August 2, 1985

APPENDIX E

TABLE OF CONTENTS

INTRODUCTION

The New England Division's Water Quality Laboratory (WQL) has been in existance since 1969. Since its birth, WQL has striven for quality and excellence in all of its endeavors, both field and laboratory. In keeping with this search for excellence, WQL has instituted a series of comprehensive quality control and quality assurance measures to ensure data validity. Standardized methodologies, frequent instrument calibrations, high purity reagents, scrupulously clean glassware, and trained personnel are but a few of the measures routinely utilized to produce reliable analytical results. The QA/QC procedures detailed herein are by no means all inclusive, but are the control measures most applicable to the New Bedford project.

ORGANIZATION

The Water Quality Laboratory's permanent professional staff consists of six individuals as described in Table 1. The project assignments are as listed in Table 2. The large number of sample cores (150) will require a sampling team which will change in composition as the sampling progresses. It is anticipated that all of the individuals in Table 1 with the exception of Mr. Small will be involved in sampling activities. Messrs. Condike, Lubianez, Spano, and Vieira will be those involved in sample preparation activities such as extracting the sample cores from the acrylic cylinders.

TABLE 1

WQL PERSONNEL

TITLE	GS	NAME	DEGREE	MAJOR	YEARS EXPERIENCE TOTAL	YEARS EXPERIENCE CORPS
Chief, WQL	12	Robert X. Brazeau	AS	Civil Engineering	28	28
Chief Chemist	12	Brian J. Condike	BS MBA	Chemistry Management	13	12
Chemist	11	David J. Lubianez	BS	Chemistry	6	6
Chemist	11	Walter J. Small	AS	Chemistry	35	5
Physical Science Technician	7	Paul A. Spano	BA	Geography	6	5
Biologist	7	John Vieira	BS	Marine Biology	4	4

TABLE 2

New Bedford Project

Personnel Assignments

Project Manager:	Robert Brazeau
Quality Assurance Officer:	Brian Condike
Chief Analyst:	David Lubianez
Sample Custodian:	Walter Small

SAMPLING

Sample cores will be taken by manually pushing the coring device (see Figure 1) to refusal, followed by driving the core further with a slam-hammer. The objective will be to obtain core lengths in the range of 3 to 6 feet. Each sample core will be taken in a new acrylic cylinder (2 7/8" ID x 3" OD x 8' L). The excess cylinder will be cut off from the top using a hack saw or other suitable cutting device. The cylinder ends will be sealed with polyethylene caps and the caps secured with several turns of duct or electrical tape. Cores will be identified with water-resistant tags affixed with duct or electrical tape and labeled with waterproof spirit marker. The cylinders will be kept in an upright position during all transportation and storage.

PRESERVATION

The sample cores will be iced upon sampling and will be stored in local refrigerated storage until refrigerated transportation to NED's Water Quality Laboratory (WQL) can be arranged. Storage at WQL will be in walk-in cooler maintained at $4^{\circ}C$.

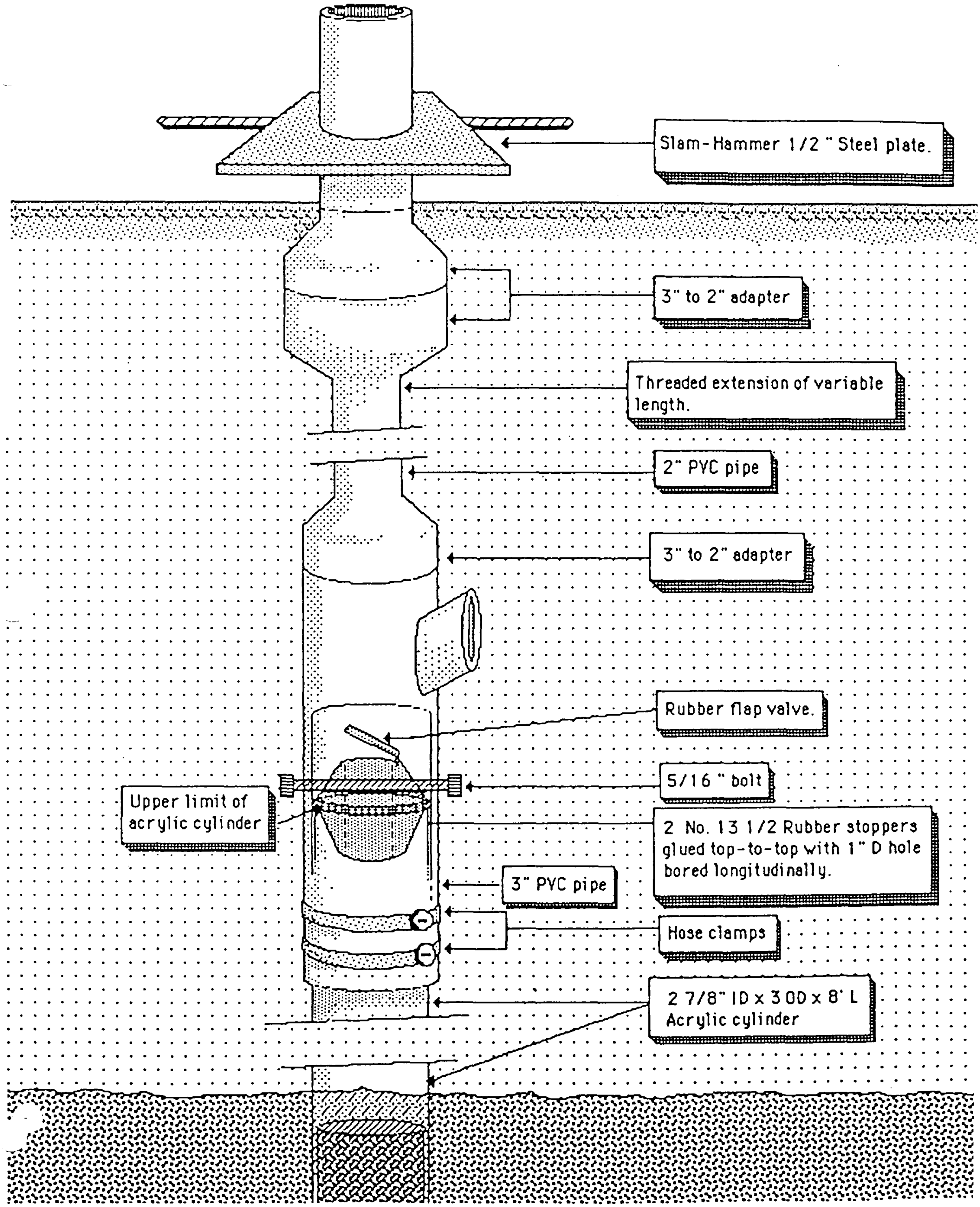
CHAIN-OF-CUSTODY

A chain-of-custody form (see sample attached) will be initiated for each core at the time of sampling. The custody form will specify the project, date, time, field sample number, location description, sampling crew names and signatures, sample length, transportation, preservation, and dates, times, and signatures for each transfer of custody.

Upon arrival at the laboratory, the sample cores will be accepted by the sample custodian and will be assigned a laboratory log number. During

FIGURE 1

Sediment Core Sampler



U.S. Army Corps of Engineers
Water Quality Laboratory
Hubbardston, MA 01452

CHAIN-OF-CUSTODY RECORD

PROJECT: ______________________________

DATE: ____________________ TIME: ____________

STATION NO. ____________________ LAB ID. NO. ____________
SUBSAMPLE NO. ____________

STATION DESCRIPTION: ______________________________

NAME		SIGNATURE
SAMPLERS: 1.)	(crew chief)	
2.)		
3.)		
4.)		

PUSH TO DEPTH: ____________ SAMPLE LENGTH: ____________

TRANSPORTATION: ____________ PRESERVATION: ____________

RELINQUISHED BY: (signature)	RECIEVED BY:(signature)	Date/Time

LABORATORY ANALYSES

PCB's

Sediment samples will be air-dried for three days, taking care to avoid the possibility of cross-contamination during the drying process. The samples will be ground with a mortar and pestle (washed with hot soapy water, and rinsed with Milli-Q water, acetone, and hexane between each sample). Five - gram aliquots will be extracted with 1:1 acetone - hexane in a Soxhlet extraction apparatus. Paper thimbles will be pre-extracted with the acetone-hexane mixture.

Because of the potential for high concentrations, the extracts will be dried with anhydrous sodium sulfate, measured for volume, and analyzed without concentration. Elemental sulfur will be removed as necessary prior to analysis via activated copper. If the extract reveals non-detectible levels of PCB's, then it will be concentrated, cleaned as necessary, and re-analyzed for a lower detection limit.

The gas chromatograph currently in use is a Packard Model 433 equipped with a Nickel-63 ECD, electronic digital plotter/integrator, and a 6' x ¼" OD x 2 mm ID glass column packed with 1.5% SP-2250/1.95% SP-2401 on 100/120 mesh Supelcoport. Operating conditions are: injector, 250°C; oven, 200°C; detector, 300°C; column flow, 20 ml/min; make-up flow, 20 ml/min; carrier gas, UHP nitrogen.

By the time analyses are begun, the WQL should have access to its new GC, a Shimadzu Model GC 9A with twin ECD's, auto-sampler and data system. This would be the instrument of choice for this work because of its capability for unattended operation. References for this methodology include EPA's "Test Methods for Evaluating Solid Waste", SW-846, 1980; Federal Register Vol. 49, No. 209, Friday, Oct. 26, 1984 (Corrected Friday January 4, 1985), "Guidelines Establishing Test Procedures for the Analyses of Pollutants sample preparation, sub-samples representing various strata within the cores will be taken. Each sub-sample will be assigned a unique laboratory log number and will be cause for initiating a new chain-of-custody document. The new custody document will reference the log number of the original core in addition to the newly assigned sub-sample number. The "sampling crew" for the sub-samples will constitute those individuals involved in the sample preparation. The sample custodian will again accept formal custody of the samples following completion of sample preparation.

SAMPLE PREPARATION

The sample cores will be cut to pre-determined lengths (probably 1 foot). The sub-samples will be extruded from these shorter cores with a device designed to perform the same operation on Shelby tube cores, but adapted to this use.

The extruded wet sediment core will be halved along the logitudinal axis with a polystyrene knife. Sub-samples will be taken from the center of these half-cylinders for chemical analyses using polystyrene spoons. Plastic is the material of choice here because trace metal analyses are requested. Although polystyrene is not the most desirable material to use in PCB analyses, the lowest action levels for this project are in the 1-2 mg/Kg range. Any interferences from plasticizers would be insignificant at this concentration range and will probably not be a factor given the small contact time of the sample to the polystyrene implements. The sub-samples will be stored and dried in disposable polyethylene containers for trace metal analyses, and in glass containers for PCB analyses.

Under the Clean Water Act",Method 608; and the EPA/Corps' "Procedures for Handling and Chemical Analysis of Sediment and Water Samples", May 1981.

TRACE METALS (Cd, Cr, Cu, Pb, Ni, & Zn)

Sediment samples will be dried at 60°C overnight in a forced-flow oven, and then ground in a mortar and pestle. One-gram aliquots will be digested with Ultrex nitric acid and 30% hydrogen peroxide according to the attached method from the EPA/Corps' "Procedures for Handling and Chemical Analysis of Sediments and Water Samples", May 1981. The digestate will be filtered through a 0.45 micron membrane filter and analyzed by flame atomic absorption spectrophotometry (AAS). The instrument to be used will be a Perkin-Elmer Model 5000 AA equipped with appropriate hollow cathode lamps, electrodeless discharge lamp for lead, a Model 3600 data station with printer, Model 56 chart recorder, and automatic burner control.

ARSENIC

Sediment samples will be dried at 60°C overnight in a forced-flow oven, and then ground in a mortar and pestle. One-quarter gram aliquots will be mixed with 2.5 gram portions of potassium pyrosulfate and fused at 325°C for 15 minutes according to the EPA/Corps' "Procedures for Handling and Chemical Analysis of Sediment and Water Samples". The residue is dissolved in warm, dilute hydrochloric acid and is analyzed via arsine generation followed by atomic absorption spectrophotometry. The instruments used will include a Varian Model 65 Vapor Generation Accessory and the Perkin-Elmer Model 5000 AAS as described above, equipped with an arsenic electrodeless discharge lamp.

MERCURY

The procedure for mercury is the classic cold vapor technique. Samples are dried as above and digested with sulfuric and nitric acids in the presence of excess permanganate. Further oxydation with persulfate is followed by reduction to the elemental state and quantification of the cold vapor via flameless AAS. The Perkin-Elmer Model 5000 AAS and accessories as described above are used for this analysis.

OIL & GREASE

Samples are dried as above, and a ten gram aliquot is weighed into a pre-extracted thimble and covered with a plug of pre-extracted glass wool. The thimble of sample is Soxhlet extracted with freon for 4-6 hours and the extract is quantified via infrared (IR) spectrophotometry. A Perkin-Elmer Model 1320 IR with Model 3600 data station is used in the analysis.

QUALITY ASSURANCE/QUALITY CONTROL

PCB's

Only standardized, accepted methodologies will be used with some minor modifications that have proved historically effective (e.g., omission of extract concentration step in cases of high sample PCB concentrations). Glassware is routinely washed with hot soapy water, rinsed with hot tap water, Milli-Q water, acetone, and hexane. Analytical solvents are Burdick and Jackson pesticide quality.

Each new GC column will be conditioned at least 16 hours at 250°C prior to use. Newly conditioned columns will be calibrated with three standards of each of the following Aroclors: 1016, 1242, 1254, and 1260. Daily injections of p,p'DDE will calibrate relative retention times. Daily injections of single concentrations of A-1016 and A-1242 will check system and standard stabilities.

Day-to-day variations in repsonse factors in excess of 15% will be cause for making complete new sets of standards and for system recalibration. Quantitation will be performed via computerized peak-by-peak relative retention time and area comparisons.

For each set of 15 samples, the following will also be analyzed: one method blank, one sample repeat, one sample spike, one EPA standard reference material (SRM), and one control sediment. Spiking samples will be difficult, as the expected concentration range of the samples will be from 1 mg/Kg to 50,000 mg/Kg. It is proposed that the results of each set of replicate analyses be used as a basis for determining the spike level for that sample. This means that the sample chosen for replicate analysis would be analyzed in duplicate, the results averaged, a suitable spike level chosen, and the spiked sample re-analyzed.

Periodic performance audit samples submitted by WES or other second party would augment the QA analyses outlined above.

TRACE METALS

Only standardized, accepted methodologies will be used. Glassware is routinely rinsed with tap water, mechanically washed in hot soapy water, rinsed with hot tap water, washed with 25% nitric acid followed by 25% hydrochloric acid, rinsed in four successive distilled water baths, followed by a final mechanical rinsing with distilled water. Ultrex grade nitric acid and Baker analyzed reagent grade 30% hydrogen peroxide are used in the digestion procedure.

The instrument will be calibrated daily with a reagent blank and two standards, utilizing the concentration mode on the AA. Computations will be performed by the microcomputer dedicated to the AA, and will include precision and accuracy calculations for QA.

For each set of 10 samples, the following will also be analyzed: one sample repeat, one sample spike, and one NBS standard reference material. With each batch of samples analyzed, one method blank and one control sample will also be analyzed.

Periodic performance audit samples submitted by WES or other second party would augment the QA anlayses outlined above.

ARSENIC

Glassware cleaning for this analysis is the same as that noted for trace metals, above. Baker analyzed reagent grade hydrochloric acid and potassium pyrosulfate will be used in the digestion procedure. Alfa brand sodium tetrahydridoborate will be used to generate the hydrogen-arsine mixture in the quantitation step.

A daily calibration curve will be constructed from a series of 9 standards ana a reagent blank. The curve itself is calculated using least-squares polynomial regression with selectable order from 1 to 6. The curve regression and subsequent data interpolation is contained in a computer program supported by any of two Perkin-Elmer microcomputers.

For each set of 10 samples the follwoing will also be analyzed: one sample repeat, one sample spike, and one NBS standard reference material. With each batch of samples analyzed, one method blank and one control sample will also be analyzed.

MERCURY

Glassware cleaning for this analysis is the same as that noted for trace metals, above. Ultrex grade nitric acid, along with Baker analyzed reagent grade sulfuric aicd will be used in the digestion step. Baker grades of potassium persulfate, potassium permanganate, hydroxylamine hydrochloride, and stannous chloride which are "suitable for mercury determinations" will be used throughout the procedure.

A daily calibration curve will be constructed from a series of 6 standards and 3 reagent blanks. The standard curve is calculated on the computer as described for arsenic, above.

For each set of 10 samples, the following will also be analyzed: one sample repeat, one sample spike, and one NBS standard reference material. With each batch of samples analyzed, one method blank and one control sample will also be analyzed.

OIL AND GREASE

Glassware cleaning for this analysis is essentially the same as that described for trace metals, above, with the addition of one final rinse with freon after the glassware has been air-dried following all previous washing steps. Burdick and Jackson spectral quality freon will be utilized throughout the analysis.

Two daily calibration curves will be constructed from a series of 6 standards for each curve covering two concentration ranges. The concentration ranges will be accessed by using cells of two path lengths, 1 cm and 5 cm. The standard curve will be calculated on the computer as described for arsenic, above.

For each set of 10 samples, one sample repeat and one sample spiked with No. 2 heating oil will also be analyzed. With each batch of samples analyzed, one method blank and one control sample will also be tested. There is no readily available standard reference material for oil and grease in sediments.

SPLIT SAMPLES

In addition to the replicate analyses performed internally at WQL, it is proposed that 10% of all samples be split for chemical analysis by a second party. We recommend that the second party be a laboratory experienced in analyzing marine sediment samples for the parameters of interest in this project, for example, WES.

APPENDIX F

COMMENTS ON DRAFT QA/QC PLAN (MRD)

DEPARTMENT OF THE ARMY
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS
P. O. BOX 103, DOWNTOWN STATION
OMAHA, NEBRASKA 68101-0103

MRDED-L

15 August 1985

SUBJECT: New Bedford Harbor Superfund Project - Chemical Laboratory, Quality Assurance/Quality Control Program

Commander, New England Division
ATTN: M. Carroll/B. Condike, Water Quality Laboratory

1. Reference informal request from B. Condike for review of document, SAB.

2. Enclosed is a copy of review comments on subject document. Major comments include the following: Topics required by the laboratory protocol and by ER 1110-2-246 which have not already been covered (e.g. such as required final report, calibrations, statistical handling of the data, complete chronological resumes from personnel, etc.) should be addressed. The latest available version of SW-846 methods should be used and is not. The QA laboratory for this project is WES which should also participate in the review. Performance audit samples provided by WES should be analyzed for PCB's in sediments (3 samples) and for trace metals in sediments (2 samples) on at least 8 RCRA metals.

3. Additional comments are attached.

4. It is assumed that these corrections recommended here will be made and that the document can be approved on that assumption.

5. If there are any questions or comments, please call Dr. D. Eastwood, FTS 864-3928.

FOR THE COMMANDER:

Encl

WILLIAM P. TODSEN, P.E.
Chief, Engineering Division

☐ MRD ☐ ________ District	CORPS OF ENGINEERS ENGINEERING REVIEW COMMENTS	TO: Brian Condike/ Mike Carroll NED Lab
PLANS & SPECIFICATIONS AND/OR DESIGN REPORT ☐ PRELIM ☐ FINAL ☐ AS-ADV.	DESIGNED BY: ☐ AE ☐ DIST	PROJECT: New Bedford Harbor, QA/QC
LOCATION OR BASE:	INVITATION NO.:	BID OPENING DATE:
COMMENTS BY: D. Eastwood	BRANCH OR SECTION: MRDED-L	DATE: 14 Aug 85

DRAWING NUMBER OR PARAGRAPH NUMBER	ITEM NUMBER	COMMENTS SHEET 1 OF 7	PHONED TO: (Name/Date)
General		Topics covered in the Laboratory Protocol and ER 1110-2-246 which have not already been addressed (e.g. such as required report, calibrations, statistical handling of the data, complete chronological resumes from personnel, etc.) should be addressed.	
		The latest available version of SW-846 should be used (the 1980 edition is now outmoded and some of the methods have been changed or modified in the later versions). Methods used should follow EPA standard methods <u>exactly</u> unless modifications are approved by QA laboratory.	
		Some of the QA samples run by WES should be confirmatory GC-MS for PCB's as well as confirmation of GC results. (QA samples should be at least 10% splits or duplicates and at least 5% field blanks or control sediments.)	
		In addition to the above review, the final QC plan should also be approved by the QA laboratory, WES. Additional comments by MRD chemists (Leuschen, Dickey and Arora) as attached, are for advisory purposes and should be considered by WES in its review and by NED laboratory.	

☐ MRD ☐ ______ District	CORPS OF ENGINEERS ENGINEERING REVIEW COMMENTS	TO: Brian Condike/ Mike Carroll NED Lab
PLANS & SPECIFICATIONS AND/OR DESIGN REPORT ☐ PRELIM ☐ FINAL ☐ AS-ADV.	DESIGNED BY: ☐ AE ☐ DIST	PROJECT: New Bedford Harbor QA/QC
LOCATION OR BASE:	INVITATION NO.:	BID OPENING DATE:
COMMENTS BY : D. Eastwood	BRANCH OR SECTION : MRDED-L	DATE: 14 Aug 85

DRAWING NUMBER OR PARAGRAPH NUMBER	ITEM NUMBER	COMMENTS SHEET 2 OF 7	PHONED TO: (Name/Date)
General		This quality management plan was reviewed in accordance with the requirements of ER 1110-2-246 (latest version), the new laboratory validation protocol and our general policy for contract laboratories. This plan should also be thoroughly reviewed by the QA laboratory (WES). A few performance audit samples for trace metals and PCB's in sediments will be required.	
p. 2		Complete chronological resumes for technical staff listing all relevant education and experience are required.	
p.3		Sampling procedures appear adequate if sampling is for PCB's and metals although obviously might not be suitable for volatile organics. This was also checked with QA laboratory. In general discussion should address history of the site, likely chemicals to be expected, intended use of the data, locations from which samples are to be taken (sampling grid if applicable), and EPA/Corps references on sampling, chain of custory, etc. if applicable.	

☐ MRD ☐ ______ District	CORPS OF ENGINEERS ENGINEERING REVIEW COMMENTS	TO: Brian Condike/ Mike Carroll NED Lab
PLANS & SPECIFICATIONS AND/OR DESIGN REPORT ☐ PRELIM ☐ FINAL ☐ AS-ADV.	DESIGNED BY: ☐ AE ☐ DIST	PROJECT: New Bedford Harbor QA/QC
LOCATION OR BASE:	INVITATION NO.:	BID OPENING DATE:
COMMENTS BY: D. Eastwood	BRANCH OR SECTION: MRDED-L	DATE: 14 Aug 85

DRAWING NUMBER OR PARAGRAPH NUMBER	ITEM NUMBER	COMMENTS SHEET 3 OF 7	PHONED TO: (Name/Date)
p. 6		Will assume containers have been precleaned and/or have been prechecked for possible metal contamination.	
p. 7		Check with QA laboratory on drying and compositing (if applicable) procedures.	
p. 7		Detection limit required for PCB's should be considered. If action level is 50 ppm do you need to go lower or is the action level different in this case? Are total PCB's all that are needed and are individual PCB components to be identified? At least 10% of samples should be confirmed using either a different chromatographic column or GC-MS (at WES).	
p. 8		Trace metals to be analyzed should include at a minimum the 8 RCRA metals (possibly include CERCLA on some for a total of 14), Detection limit and number of analytical method should be listed.	
pgs. 8-9		Arsenic, Mercury, and Oil and Grease - sounds correct but again exact reference and number	

☐ MRD ☐ ______ District	CORPS OF ENGINEERS ENGINEERING REVIEW COMMENTS	TO: Brian Condike/ Mike Carroll NED Lab
PLANS & SPECIFICATIONS AND/OR DESIGN REPORT ☐ PRELIM ☐ FINAL ☐ AS-ADV.	DESIGNED BY: ☐ AE ☐ DIST	PROJECT: New Bedford Harbor QA/QC
LOCATION OR BASE:	INVITATION NO.:	BID OPENING DATE:
COMMENTS BY: D. Eastwood	BRANCH OR SECTION: MRDED-L	DATE: 14 Aug 85

DRAWING NUMBER OR PARAGRAPH NUMBER	ITEM NUMBER	COMMENTS SHEET 4 OF 7	PHONED TO: (Name/Date)
		should be listed and any deviation from usual	
		EPA procedure documented and approved by QA laboratory.	
p. 10		Normally we suggest at least 1 field blank and	
		1 split or duplicate per 10 samples or 1 per set,	
		whichever is greater in addition to the QC checks	
		such as reference standards, method blanks and	
		spikes. Sample repeat is not clear - is this lab	
		or field duplicate or merely repeat of aliquot of	
		same extract (the latter would not be sufficient	
		check of whole procedure). Will assume control	
		sediment same as field blank. Will assume that	
		approximately 10% splits or duplicates and 5%	
		control sediments or field blanks will be provided	
		to WES for QA analysis. WES will also be requested	
		to provide performance audit trace metal (in sedi-	
		ment) and PCB samples since not done recently.	
p. 10		Trace Metals - Exact methods with numbers, detection	
		levels and metals to be analyzed for should be	
		listed.	

☐ MRD ☐ ______ District	CORPS OF ENGINEERS ENGINEERING REVIEW COMMENTS	TO: Brian Condike/ Mike Carroll NED Lab

PLANS & SPECIFICATIONS AND/OR DESIGN REPORT ☐ PRELIM ☐ FINAL ☐ AS-ADV.	DESIGNED BY: ☐ AE ☐ DIST	PROJECT: New Bedford Harbor, QA/QC
LOCATION OR BASE:	INVITATION NO.:	BID OPENING DATE:
COMMENTS BY: Tom Leuschen	BRANCH OR SECTION: MRDED-L	DATE: 14 Aug 85

DRAWING NUMBER OR PARAGRAPH NUMBER	ITEM NUMBER	COMMENTS SHEET 5 OF 7	PHONED TO: (Name/Date)
	1.	Page 7 of the draft refers to SW-846, 1980 edition. This addition has been replaced. The latest edition that the MRD Laboratory has is the 1982 edition of SW-846 (with addendum 1984).	
	2.	Method 8080 (SW-846 1982 edition) recommends two columns (for dual column confirmation): boiling point 3% OV-1 mixed polar phase 1.5% SP-2250/1.95% SP-2401 The QC draft mentions only the mixed polar phase.	
	3.	Method 8080 requires 95:5 argon: methane as carrier gas (which would give greater sensitivity than nitrogen). The QC draft uses UHP nitrogen (not mentioned in SW-846).	
Additional comments		The QC draft might be enhanced if it included comments on the handling of "weathered PCB's" or difficult sample matrices. In analyzing samples is there any provision for "dual column confirmation" or GC/MS analysis under these conditions?	

MRD ____ District

CORPS OF ENGINEERS
ENGINEERING REVIEW COMMENTS

TO: Brian Condike/ Mike Carroll NED Lab

PLANS & SPECIFICATIONS AND/OR DESIGN REPORT: ☐ PRELIM ☐ FINAL ☐ AS-ADV.

DESIGNED BY: ☐ AE ☐ DIST

PROJECT: New Bedford Harbor, QA/QC

LOCATION OR BASE:

INVITATION NO.:

BID OPENING DATE:

COMMENTS BY: Chris Dickey

BRANCH OR SECTION: MRDED-L

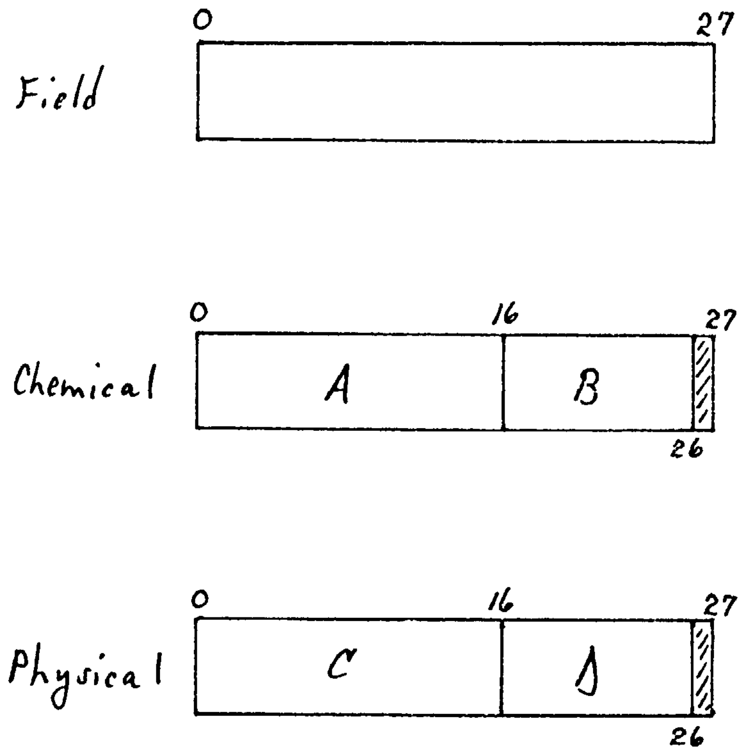
DATE: 14 Aug 85

DRAWING NUMBER OR PARAGRAPH NUMBER	ITEM NUMBER	COMMENTS SHEET 6 OF 7	PHONED TO: (Name/Date)
p. 8 Trace Metals		I think wet sediment is preferable - calculate	
		on moisture loss.	
		In the new CLP, Inorg Analysis, SOW No. 784, July	
		84, pg. D-4 - As is run along with other metals.	

☐ MRD ☐ ______ District	CORPS OF ENGINEERS ENGINEERING REVIEW COMMENTS	TO: Brian Condike/ Mike Carroll NED Lab
PLANS & SPECIFICATIONS AND/OR DESIGN REPORT ☐ PRELIM ☐ FINAL ☐ AS-ADV.	DESIGNED BY: ☐ AE ☐ DIST	PROJECT: New Bedford Harbor, QA/QC
LOCATION OR BASE:	INVITATION NO.:	BID OPENING DATE:
COMMENTS BY : PREM N. ARORA	BRANCH OR SECTION : MRDED-L	DATE: 14 Aug 85

DRAWING NUMBER OR PARAGRAPH NUMBER	ITEM NUMBER	COMMENTS SHEET 7 OF 7	PHONED TO: (Name/Date)
Oil and Grease	1.	The method is not applicable to measurement of low-boiling fractions that volatilize at temperatures below 60°C. (Ref. Standard Methods for the Examination of Water & Waste Water - 503.)	
	2.	If the sample has fair amount of moisture, the sample can be dried with magnesium sulfate monohydrate. After drying, the oil and grease can be Soxhlet extracted with trichlorotrifluoroethane and the extract is quantified via IR spectrophotometer. (Ref. Standard Methods for the Examination of Water & Waste Water - 503-D)	

9967 M-27-1



C: Dark olive green, firm, medium to fine sandy silt w̄ trace of gravel & marine odor

D: Olive green, firm, coarse to fine silty sand w̄ gravel & organics

WES

APPENDIX G

RESUMES OF KEY PERSONNEL

BRIAN J. CONDIKE

WALTER J. SMALL

DAVID J. LUBIANEZ

PAUL A. SPANO

JOHN VIEIRA, JR.

PETER J. TRINCHERO

DOUGLAS J. SABALL

LAYNE R. MOULTON

RICHARD I. BERGER

STEPHEN T. ROY

PAUL S. JOSEFEK

ROBERT X. BRAZEAU

ROY CLARK

ROBERT MABB

CHRISTOPHER TUREK

BRIAN J. CONDIKE

(617)-355-4087 (H) | Farrington Road, Barre, MA 01005 | (617)-928-4711 (0)

EXPERIENCE AND SKILLS SUMMARY

- 13 years applied experience in environmental chemistry.
- Extensive practical expereience with quality assurance programs.
- Skilled in statistical data interpretation.
- Over 10 years experience in technical program management.
- Excellent oral and written communication skills.

PROFESSIONAL EXPERIENCE

Assistant Laboratory Manager

U.S. Army Corps of Engineers Water Quality Laboratory Hubbardston, MA	5 years 1981 through present

Laboratory Director

Lycott Environmental Research Southbridge, MA	<1 year 1980 - 1981

Chief Chemist

U.S. Army Corps of Engineers Water Quality Laboratory Hubbardston, MA	4 years 1976 - 1980

Teaching Assistant

University of Florida Gainesville, FL	<1 year 1975 - 1976

Analytical Chemist

U.S. Army Corps of Engineers Water Quality Laboratory Hubbardston, MA	3 years 1972 - 1975

BRIAN J. CONDIKE

EDUCATION

M.B.A. in Management	Anna Maria College, Paxton, MA May 1978
B.S. in Chemistry	University of Massachusetts at Amherst - May 1971 Minors, English and Mathematics

Additional Graduate Courses

- Chemistry & Laboratory Techniques	500 hours
- Hazardous Waste Technology	120 hours
- Management and Communication	250 hours
- Computers and Mathematics	200 hours

HONORS

- Six Commendations for Outstanding Performance
- Cum Laude Degree with Honors in Chemistry
- Merck Award in Chemistry
- Phi Beta Kappa and Phi Eta Sigma

PUBLICATIONS AND PRESENTATIONS

Two at the Corps of Engineers' National Chemists Conference, Worcester, MA, on Increasing Productivity and on Laboratory Management, 1985

One at the Corps of Engineers' Superfund Conference, Omaha, NB, on Managing Quality Assurance at Superfund Projects, 1983

One at the Third World Conference on Water Resources, Mexico City, Mexico, on Data Interpretation, 1978

Two through the U.S. Environmental Protection Agency, Washington, DC, on Data Handling and Interpretation, 1975 and 1976

Two through the U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH, 1976

SPECIAL INTERESTS

Archery, Canoeing, Fishing, Photography, Reading, Woodworking

REFERENCES

Available upon request

RESUME OF WALTER J. SMALL

PROFESSIONAL EXPERIENCE:

Water Quality Laboratory
Corps of Engineers
Hubbardston, MA
Nov 1980 to Present

Position: Chemist

Modify procedures, primarily from Standard Methods, for fresh waters, salt water, and sediment matrices

Apply above modifications to analyses of: Trace metals, Flame Atomic Absorption and Zeeman Furnace, Pesticides & PCB's - Gas Chromatography, Nutrients, Oil & Grease, other constituents, Technicon, U.V., I.R.

Assure high level of Quality Control for all of above

Most of above procedures are computer operated,analytical results are obtained by computers

Automated Clinical Systems
Dorchester, MA
June 1976 - Nov 1980

Position: President

Set up company to develop and market automated systems applied to routine clinical chemical analyses

Dupont entered field resulting in a reverse of investor confidence and eventually failure of company

Carney Hospital
Dorchester, MA
1972-1976

Position: Chemist

Research into metabolism and roal of trace metals in humans blood. Emphasis on the metal manganese. A methods of addition Atomic Absorption technique was developed. Papers on the subject were published as well as presentations at various scientific meetings.

Ames Co.
Division of Miles Laboratory
Elkhart, Indiana
Oct 1963 - 1972

Position: Product Development Manager - Instruments Systems

Encourage and evaluate product suggestions from all sources. Prepare feasibility studies and proposals on most promising suggestions

Manage and schedule development of instrument systems from concept to introduction to market with a view to budgets and optimum utilization of development manpower

Recommend marketing strategies and plans for instrument systems including generation and final approval of copy for manuals, advertising, and labeling

Participate in development from the applications viewpoint

Coordinate the efforts of legal and medical staffs as they affect development of new products

Tracerlab
Division of LFE
Waltham, MA
Feb 1963 - Oct 1963

Position: Sales Manager - Technical Products

Establish technical products as a separate product line from other Tracerlab products

Initiate and execute programs to improve Tracerlab's share of market for technical products

Field sales of products throughout entire U.S.

Atomium Corp.
Billerica, MA
Feb 1960 - Feb 1963

Position: New Products/Application

Participate in development of nuclear instruments for life sciences research and clinical-medical market from applications viewpoint including setting up and participation in field evaluation studies

Introduce the developed products to market including marketing services such as manuals and advertising preparation

Field sales of instruments throughout U.S.

Applications of instruments for specialized customer requirements

New England Medical Center
Blood Research Lab
Boston, MA
June 1958 - Feb 1960

Position: Research Chemist

Research project, N.I.H. grant, on platelet chemistry and metabolish

Application of radioactive tracer methods to problems in Hematology

Advise and assist post-doctoral Fellows in instrumentation and methodology of nuclear medicine

PRODUCT AND APPLICATIONS KNOWLEDGE:

Physiochemical Life Science Research; Diagnostic clinical medicine; Health physics; Water treatment systems for nuclear power plants; Radiochemistry; Blook Chemistry

EDUCATION:

Franklin Technical Institute - Graduate in Chemistry - 1948

Extensive course work in Chem., Phys., and Math. Equivalent to M.S.

PERSONAL:

Married -- 6 children

DAVID JOHN LUBIANEZ
108 West Street
Worcester, MA 01609
(617) 755-8410

Date of Birth:	October 22, 1957
Place of Birth:	Phoenixville, PA
Education:	Graduate of Fitchburg State College, Fitchburg, MA, 1979 with a B.S. Degree in Chemistry and a 3.52 grade point average
Work Experience:	U.S. Army Corps of Engineers Water Quality Laboratory Hubbardston, MA 01452 Employed from June 1979 to present as a Chemist performing trace level analysis on marine sediment and water as well as fresh water for heavy metals and organics via Atomic Absorption Spectrophotometry and Gas Chromatography prepare for and conduct microbiological testing of fresh water for total and fecal coliform bacteria, perform automatic analysis of fresh water for nutrients Great American Chemical Corporation 650 Water Street Fitchburg, MA 01420 Employed part-time from Jan 1977 to June 1978 analyzing poly (vinyl chloride) through gas chromatography to measure residual amounts of vinyl chloride monomer
Instrumental and Computer Experience:	Gas chromatography, Atomic Absorption, UV-Vis, and IR spectrophotometry, polarimetry, potentiometry, Technical Auto Analyzer, Total organic Carbon Analyzer, Refractometry and computer experience in PASCAL and BASIC
Honors and Activities:	Deans List for 4 years; member of Chemistry Club, member of Student Evaluation Committee, Commendation for special services performed on Superfund sampling
Hobies and Diversions:	Music and guitar playing; films; playing baseball and hockey; skiing; golf and shooting pool

PAUL A. SPANO
33 Adams Street
Gardner, MA 01440

1980 - Present:	Physical Science Technician U.S. Army Corps of Engineers New England Division Water Quality Laboratory
Responsibility:	Manage water quality field sampling and monitoring program. Logistics of sampling and monitoring 31 Corps of Engineers (COE) flood control projects, in four New England states. Sample coastal waters and marine sediment. Manage and maintain field sampling equipment and electro-mechanical monitoring equipment. Group leader for hazardous materials sampling team, including personnel protection and safety and all aspects of sampling methods and techniques.
1979 - 1980:	Teacher, Grades 9-12 Earth Science and Ecology Clinton High School Clinton, MA

EDUCATION

Bachelor of Science in Education, minor areas of study, Geography and Physical Science, Fitchburg State College, Fitchburg, MA

SPECIALIZED TRAINING

Two hundred and forty hours of U.S. Environmental Protection Agency (EPA) and U.S. Geological Survey (USGS) courses in Field monitoring and Sampling of Hazardous Materials and Waste, Personnel Protection and Safety, Quality Control in Water and Wastewater Laboratories, Stream Surveillance and Monitoring, and Water Quality Instrumentation.

Forty hours repair, troubleshoot and maintain Schneider Automatic Water Quality Monitors and Telemetering systems, in plant training.

Fifteen credit hours of electronics.

CERTIFICATION

Massachusetts certification, Secondary Education/Geography

HONORS AND AWARDS

Magna Cum Laude, Fitchburg State College

Exceptional Performance Award, U.S. Army Corps of Engineers, 1985

Commendation for Special Services, U.S. Army Corps of Engineers, 1986

PERSONAL

Married
One Child
Age, 33
Health, Excellent

ORGANIZATIONS

Massachusetts Audubon Society
American Legion

HOBBIES AND INTEREST

Photpgraphy, Electronics, Gardening, Woodworking, Fishing

JOHN VIEIRA, JR.
82 Richmond Street, Apartment 4
Gardner, Massachusetts 01440
(617) 632-7710

EXPERIENCE AND SKILLS SUMMARY

- Comprehensive wildlife habitat evaluations including botanical, hydrological and physical descriptions.
- Assessment and management of biological communities to promote recreation.
- Computerized statistical analysis of experimental data including complex hypothesis testing.
- Proficient at oral and written presentations of scientific data to technical and non-technical audiences.
- Planning and executing multidisciplinary environmental study projects.
- Expert in nature photography specializing in macrophotography of botanical specimens.

PROFESSIONAL EXPERIENCE

May 1983 - Present
January 1981 - January 1983

BIOLOGIST - U.S. Army Corps of Engineers, Water Quality Laboratory, Hubbardston, Massachusetts 01452. (617) 928-4711

- Supervised and managed multidisciplinary study teams of up to 7 professionals.
- Made recommendations on recreational management at 8 Federal facilities in New England.
- Authored 2 comprehensive environmental reports, each in excess of 200 pages.
- Performed on site wildlife habitat evaluations at 60 Federal sites throughout New England.
- Oral presentation to national conference "Practical Applications of Computerized Statistics."
- Identified, catalogued and photographed resident vegetation at 43 Federal sites.
- Devised graphic representation of U.S. Fish and Wildlife habitat evaluation data.
- Developed specifications for a $200,000 contract. Responsibilities included bid review and selection committee member.

- Performed quality control inspections to evaluate Federal contractor performance and compliance.
- Participated in USEPA Superfund survey team at New Bedford harbor hazardous waste site.
- Hands on experience with sophisticated laboratory instrumentation and computers.

EDUCATION

DEGREE

- 1976 B.S. Biology, Southeastern Massachusetts University, North Dartmough, Massachusetts. Graduated with honors.
- Over 200 post graduate classroom hours in ecology and resource management.
- Personnel protection and safety training course (USEPA).
- Certified Habitat Evaluation Procedure Specialist (USFWS).

HONORS

- Commendation for Special Services rendered in Superfund related sampling, September 1985.
- Commendation for Meritorious Personal Efforts and Achievements, January 1981 - January 1983.
- Scroll of Appreciation for Exceptional Performance, Summer 1982.

MEMBERSHIPS

- Photographic Society of America, Boston Camera Club

PERSONAL

- Born in New Bedford, Massachusette - Excellent Health - Single

INTERESTS

- Natural History, Botany, Wildfoods, Nature Photography, Oriental Culture, Architecture, Reading

REFERENCES

- Available upon request.

PETER J. TRINCHERO
Box 543
67 Winchendon Road
Ashburnham, MA 01430
(617) 827-6030

OCCUPATIONAL SKILLS

- Teacher of the biological/chemical sciences at the college level
- Environmental Scientist
- Creative Problem Solver

EDUCATION

- Providence College 1964 A.B. Natural Sciences
- Providence College 1967 M.S. Biochemical Embryology
- University of Rhode Island 1967-1971 All but Dissertation in Invertebrate Physiology
- University of Massachusetts 1980-1983 C.A.G.S. Animal Science/Education
- Various NSF supported short courses
- Bioassay Procedures - 3 day course - Nov 1984 Waterways Experimental Station, U.S. Army Corps of Engineers, Vicksburg, MS
- Riverine Sampling Techniques - 4 day course - Mar 1985 Waterways Experimental Station, U.S. Army Corps of Engineers, Vicksburg, MS

OCCUPATIONAL EXPERIENCE

- Instructor Biological/Chemical Sciences - Providence College 1967-1971
  Developed, managed and taught General Biology and Biochemistry Laboratories
- Professor Biological Sciences - Mount Wachusett Community College, Gardner, MA, 1971-Present
  Developed, managed and taught courses in Zoology, Anatomy and Physiology, Microbiology, and Human Sexuality
- Biologist - Water Quality Laboratory - U.S. Army Corps of Engineers, New England Division, Summers 1967-1986
  All aspects of Environmental Sampling and Chemical Testing
- Sabbatical - Water Quality Laboratory - Fall 1985 - U.S. Army Corps of Engrs., NED
  Developed and initiated Bioassay set-up
- Co-authored and managed NSF funded CAUSE Grant - 1980-1983
- Assistant Director of Continuing Education - Mount Wachusett Community College, 1973-1977

Douglas John Saball
1 Battery Road
West Townsend, Mass. 01477
(617)597-2548

WORK EXPERIENCE:

1981 - 1986 — AQUATIC BIOLOGIST - Head of entomological research with Surber sampler, Ekman dredge and drift nets. Assist and conduct backpacking and boat electroshocking. Identify fish, innertebrates, zooplankton and phyto-plankton. Coordinate innertebrate sampling and supervise subordinates up to five at a time. Bioossay investigation and chemical analysis of A.C.E. Projects. Assist Habitat Evaluation Procedures (H.E.P.) and General Limnological Servey of projects.
U.S. Army Corps of Engineers (A.C.E.) Water Quality Laboratory, Hubbordston, Mass. 01452. (617) 752-1095

Sept. 1981 - May 1982 — TEACHING ASSISTANT - Laboratory preparation and lab instruction of Environmental Pollution, Freshwater Ecology, Zoology and Geology of Environmental Problems. Assist in Limmological survey of Lake Winnicook.Back-packing electroshocking, fyke, tremble and gill nets sampling. Assist with brown trout tagging and recapture program.
Unity College, Unity, Maine 04988

Jan 1979 - Sept. 1980 — Laboratory Technician Assistant- Preparation of following classes, Biology, Zoology, Botany, Microbiology. Tend greenhouse and Lab animals, fish, rabbits, mice, rats, and chickens. Preparation of fruitfly and bacteriological cultures, Devised experiments for classes.
Mount Wachusett Community College
242 Green St., Gardner, Mass. 01440

May 1979 - Dec. 1983 — Volunteer Scientific Consultant - Conduct chemical and fisheries sampling of the Squanocook River and its tributaries. Interpreted and advised on scientific data. Investigate Industrial and Municipal pollution proglems.
Townsend Conservation Commission
Townsend, Mass. 01469

Education:

Mount Wachusett College, Gardner, Mass 01440
A.A. in General Studies (Science) May 1982

Unity College, Unity, Maine 04988
BS in Environmental Science. June 1983

Activities:

President, Unity College Chapter American Fisheries Society 1980 - 1982

Vice President, Mount Wachusett Community College Darvinian Society Science Club 1978 - 1980

Scholarships/Honors:

U.S. A.C.E., N.E.D., W.Q.L., Scroll of Appreciation 1982
Dean list unity College, N.M.R.S. Scholarship 1978
References are available upon request.

LAYNE R. MOULTON
7 Stonybrook Lane
Malvern, P.A. 19355
(215) 647-0917

CAREER OBJECTIVE: A field or laboratory related position utilizing my Marine and Biological education and environmental lab experience.

EDUCATION: Fairleigh Dickinson University, Madison, N.J.
Bachelor of Science, October 1984
Major: Marine Biology

RESEARCH PROJECT: Fairleigh Dickinson's West Indies lab, St. Croix, U.S. Virgin Islands. Eighteen credits were taken, nine of which were devoted to a three week research project. Damsel fish were studied to determine why the juvenile and some adult Damsel fish predominantly reside in the lagoonal area. Evidence was brought out that there is a relationship on the seaward gradient between spacial complexity of the habitat and the species and age of Damsel fish.

LAB EXPERIENCE: BCM Eastern Inc., Laboratory Division, Plymouth Meeting, P.A. Analytical lab technician. Run Technicon AutoAnalyzer II system, TKN digestions, and distillations of ammonia, cyanide, and phenols. Also familiar with EPA methods for chemical analysis of water and wastes. 9/84 - present

University of Pennsylvania, Philadelphia, P.A.
Lab technician with Physiology Department. Ran olfaction experiments on German Shepherds. I observed and recorded results of each trial. 1/81 - 2/81

Fairleigh Dickinson University, Madison, N.J.
Lab technician with Allied Health Department.
Photographic copy stand work of human anatomy. 6/83 - 8/83

WORK EXPERIENCE: Fairleigh Dickinson University, Madison, N.J.
Student Coordinator: Assistant to the Director of Student Activities. Supervised work crew of twenty students for major campus events. Also responsible for equipment and room reservations for all campus organizations. 10/80 - 6/81

Fairleigh Dickinson University, Madison, N.J.
Night Manager of Student Activities Building. Responsible for giving information on events and directions to students, faculty, and general public; for maintaining safety in building and locking up at night. 9/81 - 6/83

Exxon Research and Engineering Company, Madison, N.J., Main Gate Security: Sergeant one night a week, supervising three officers, and security officer four days a week. 1/83 - 8/83

White Manor Country Club, Malvern, P.A., Waiter. 7/79 - 1/83

PROFFESSIONAL AFFILIATION: Tri-Beta, National Biological Honor Society.

ˇtudent ACTIVITIES: President of Cinematech, Program Manager of WFDM Radio, Member of Financial Board, Member of Student Activities Program Board, and Assistant Photo Editor of "Columns" yearbook.

Berger, Richard I.

Education:

Northeastern University, Boston, MA
BBA Degree, Engineering and Management Associate Degree, Chemical Engineering

Work Experience:

USM Chemical Corp, Middleton, MA
Assistant Chemist 1950-1970

Stone & Webster Engineering Corp, Boston, MA
Engineering Associate 1971-1983

Polymerics Incorporated, Waltham, MA
Quality Control Technician 1984-1985

U.S. Army, Corps of Engineers
Civil Engineering Technician 1985-present

Roy, Stephen T.

Education:

A.S., Civil Engineering Technology, 1978
Bristol Community College, Fall River, MA

B.S., Civil Engineering Technology, 1980
Roger Williams College, Bristol, RI

Work Experience:

Homar, Inc., Rumford, RI
Field Engineer 1980

U.S. Army, Corps of Engineers, Waltham, MA
Civil Engineering Technician 1980-present

Josefek, Paul G

Education:

A.A.S., Civil Engineering Technology, 1980

National Technical Institute for the Deaf, Rochesster Institute of Technology, Rochester, NY

Work Experience:

Fact Technical Services, Rochester, NY
Materials Technician 1979

U.S. Army, Corps of Engineers, Waltham, MA
Civil Engineering Technician 1980-1981

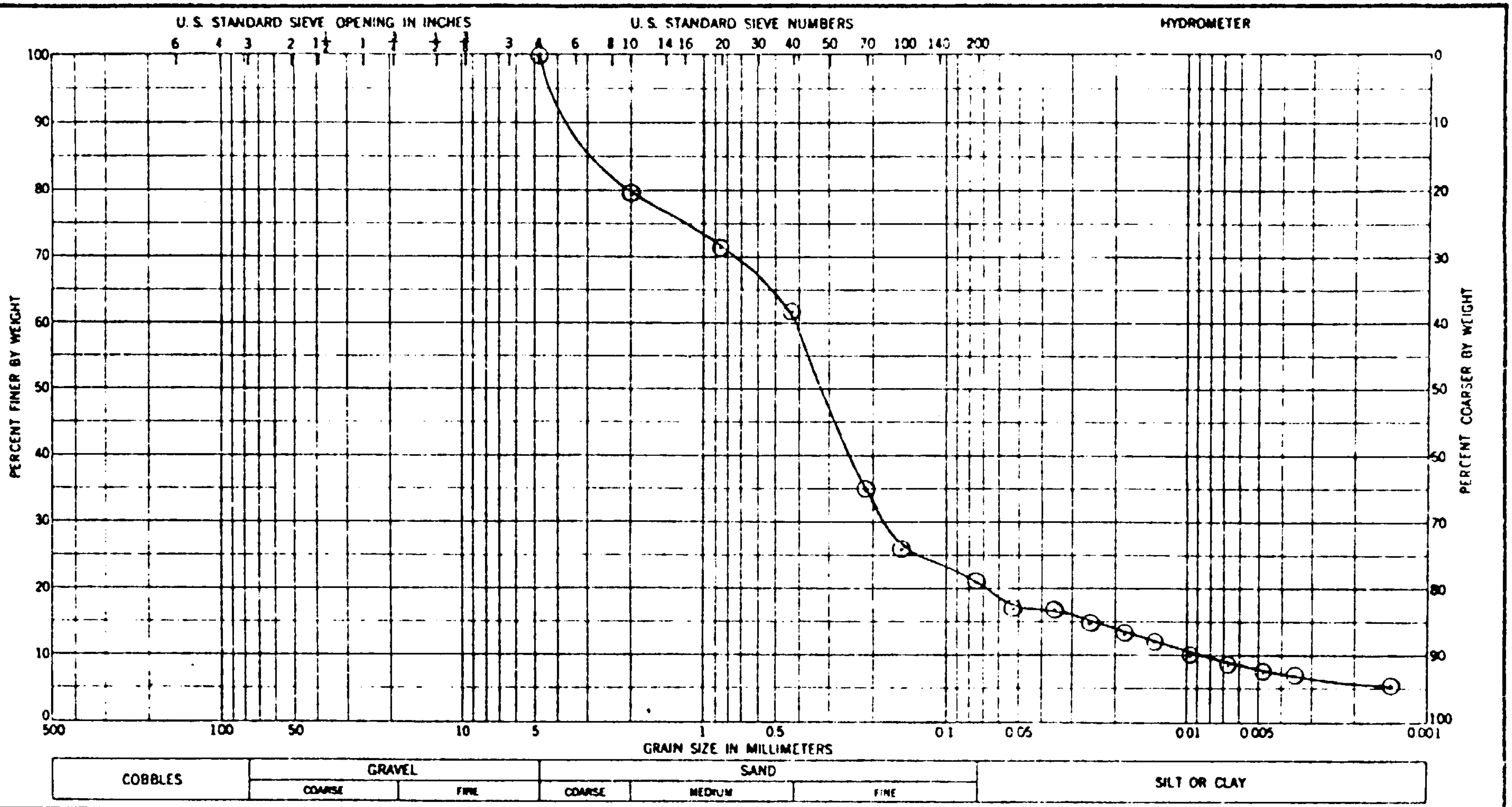
U.S. Army, Corps of Engineers, Los Angeles, CA
Civil Engineering Technician 1981-1982

Tibbetts Engineering Corp, New Bedford, MA
Materials Technician 1982-1983

U.S. Army, Corps of Engineers, Weltham, MA
Civil Engineering Technician 1983-present

APPENDIX H

RESULTS OF PHYSICAL ANALYSES - ATTERBERG LIMITS, GRAIN SIZE AND SPECIFIC GRAVITY



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9778C	0" - 8"	Black - silty clayey c-f SAND (SC) w/shell frag + mar odor Sp. Gr. = 2.65		80	32	48

Project: NEW BEDFORD, MA

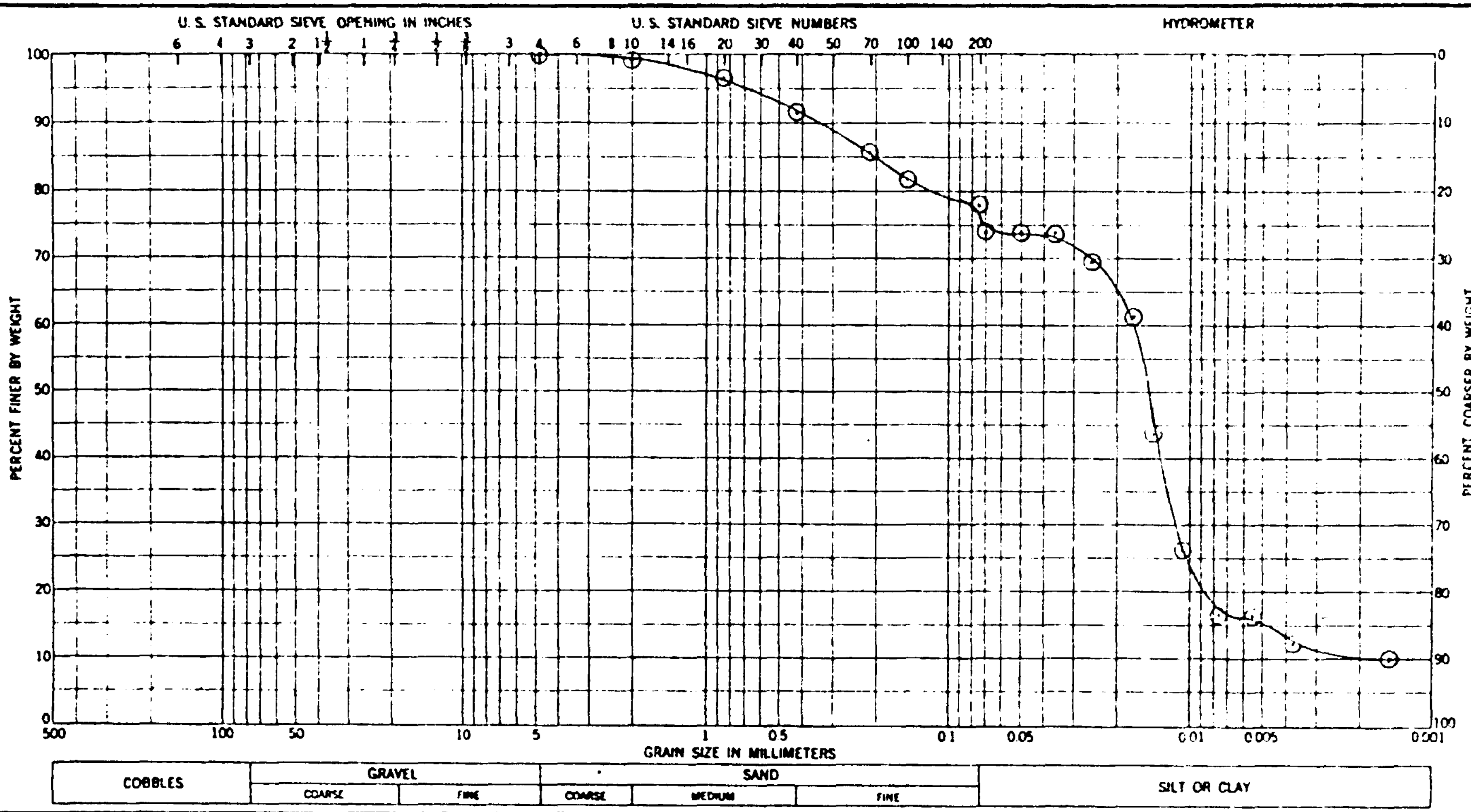
~~Area~~ 9778 C

FB SER ~~Boring~~ No. 100 - 422 - 1

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9786D	0"-13"	Black org. sandy silty CLAY (OH) w/ mdr odor Sp. Gr. = 2.40		162	56	107

Project NEW BEDFORD, MA

~~Area~~ 9786 D

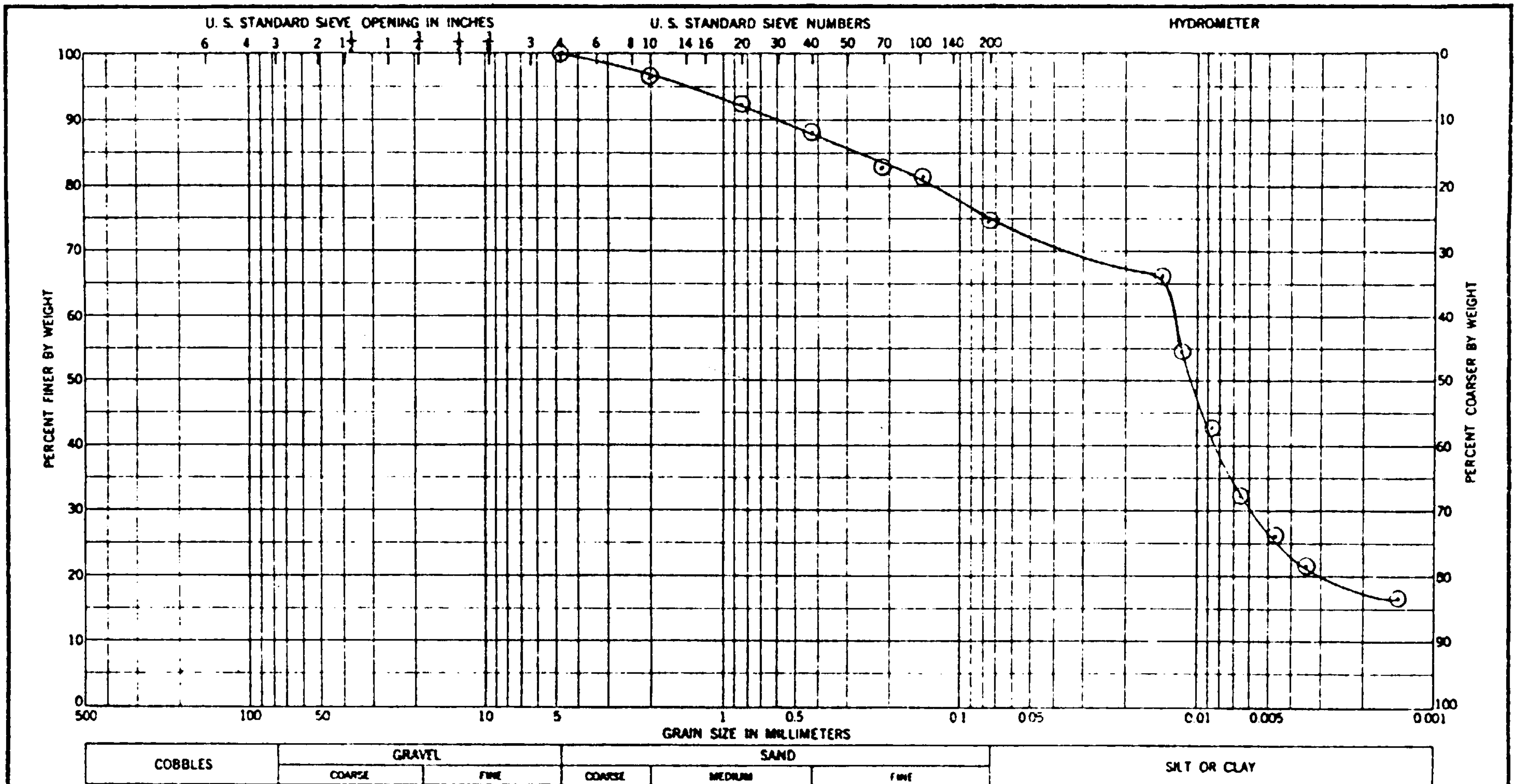
~~Boring~~ -3 SER No. 100-422-2

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-3



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9840 E	24"-45"	Olive green - org. sandy, clayey SILT (OH) w/ mdr odor Sp. Gr. = 2.47		142	55	87

Project NEW BEDFORD, MA

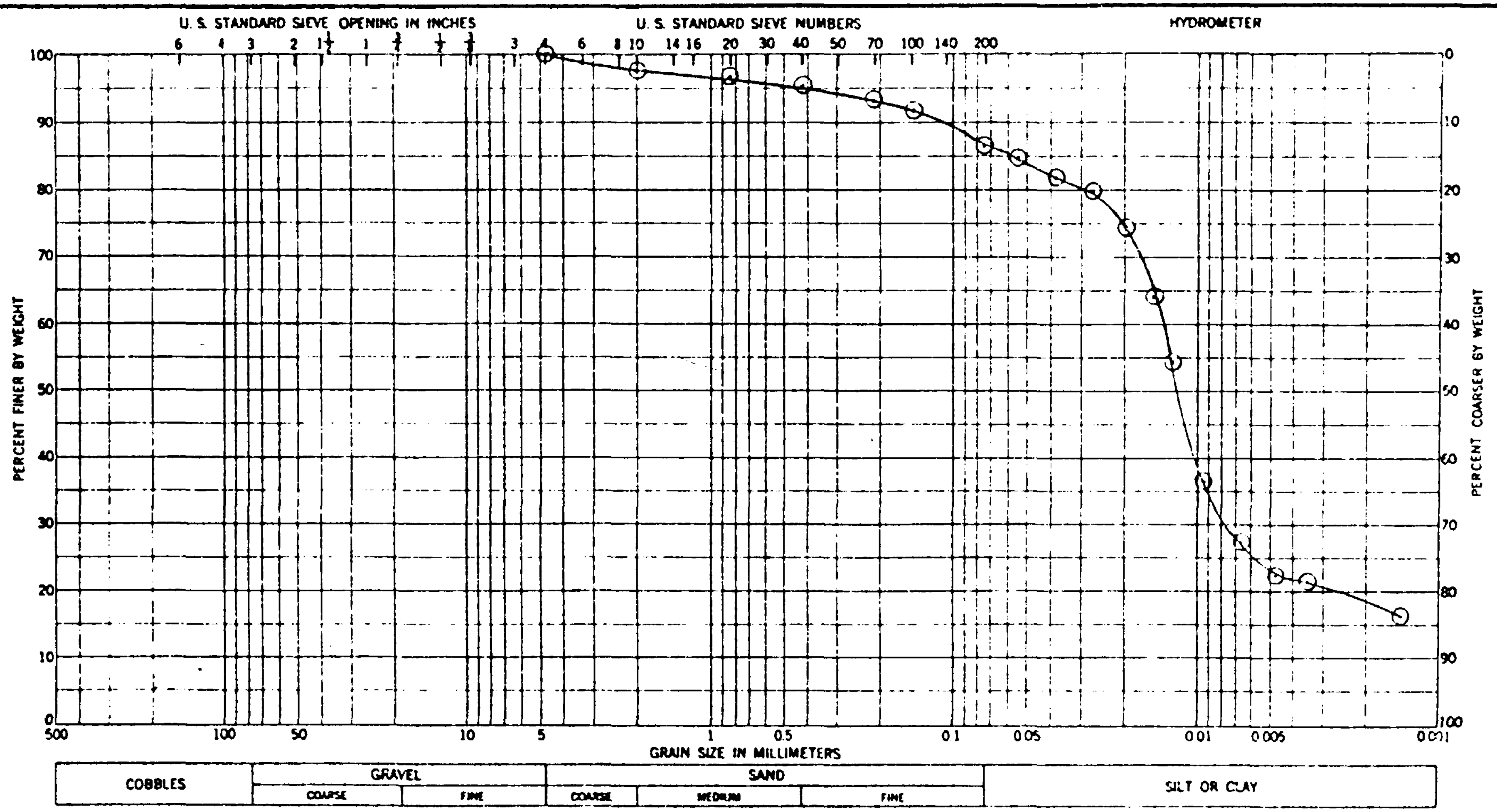
~~Area~~ 9840 E

LAB SER ~~Boring~~ No. 100-422-3

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9848 D	0"-38"	Dk olive green-org. sandy silty CLAY (OH) w/shell frag + mdr odor Sp. Gr = 2.49		132	47	86

Project: NEW BEDFORD, MA

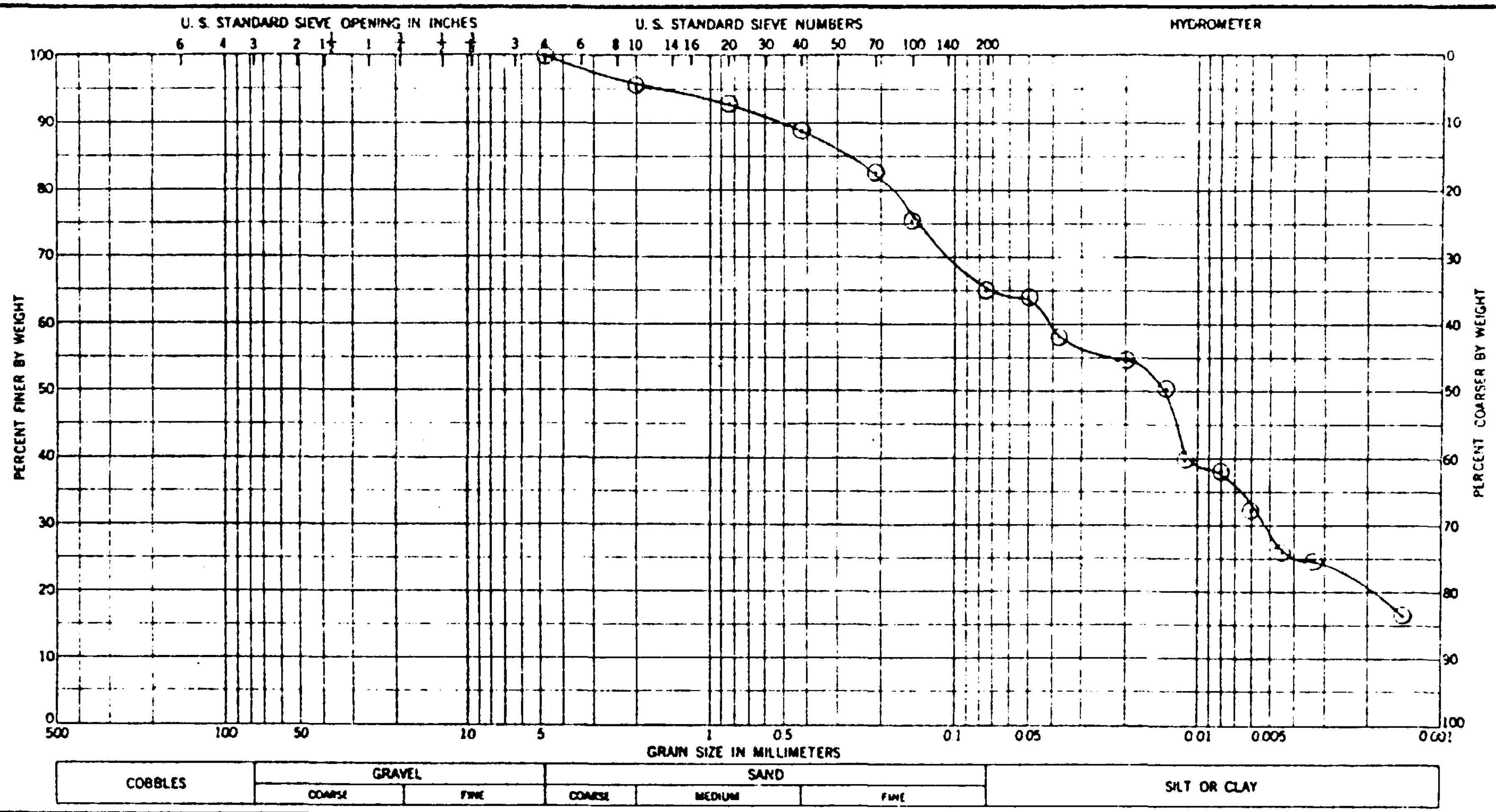
Area: 9242 D

LAB SER. Boring No.: 100-422-4

Date: 9/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9859D	0"-36"	Olive green-org. sandy, silty CLAY (OH) w/mdr odor Sp. Gr. = 2.54		82	29	53

Project: NEW BEDFORD, MA

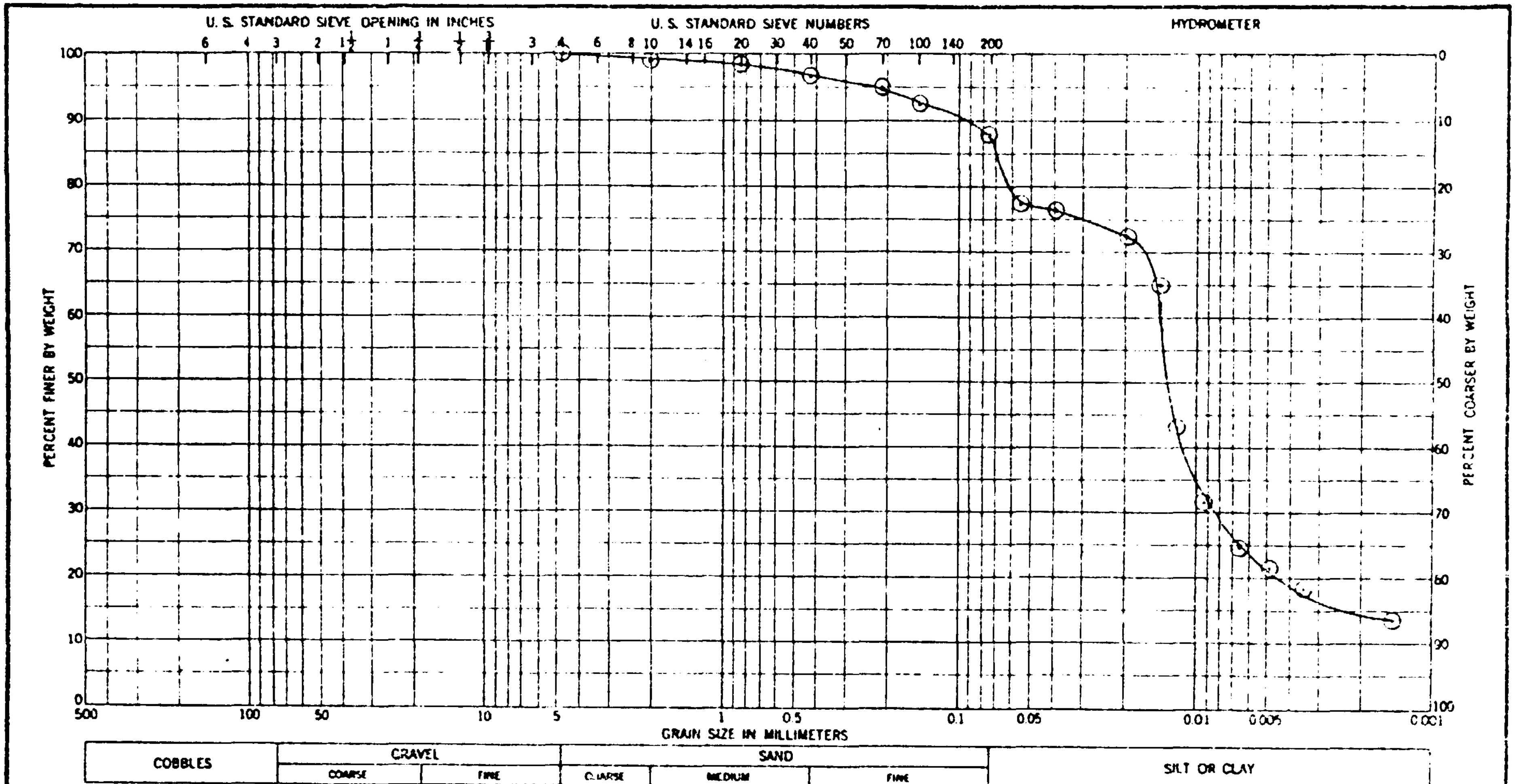
Area: 9859 D

CAE SER ~~Boring~~ No. 100-422-5

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9869D	0"-37"	Dk. olive green - org. sandy silty CLAY (OH) w/ mar. odor Sp Gr = 2.52		153	49	104

Project: NEW BEDFORD, MA

Area: 9869 D

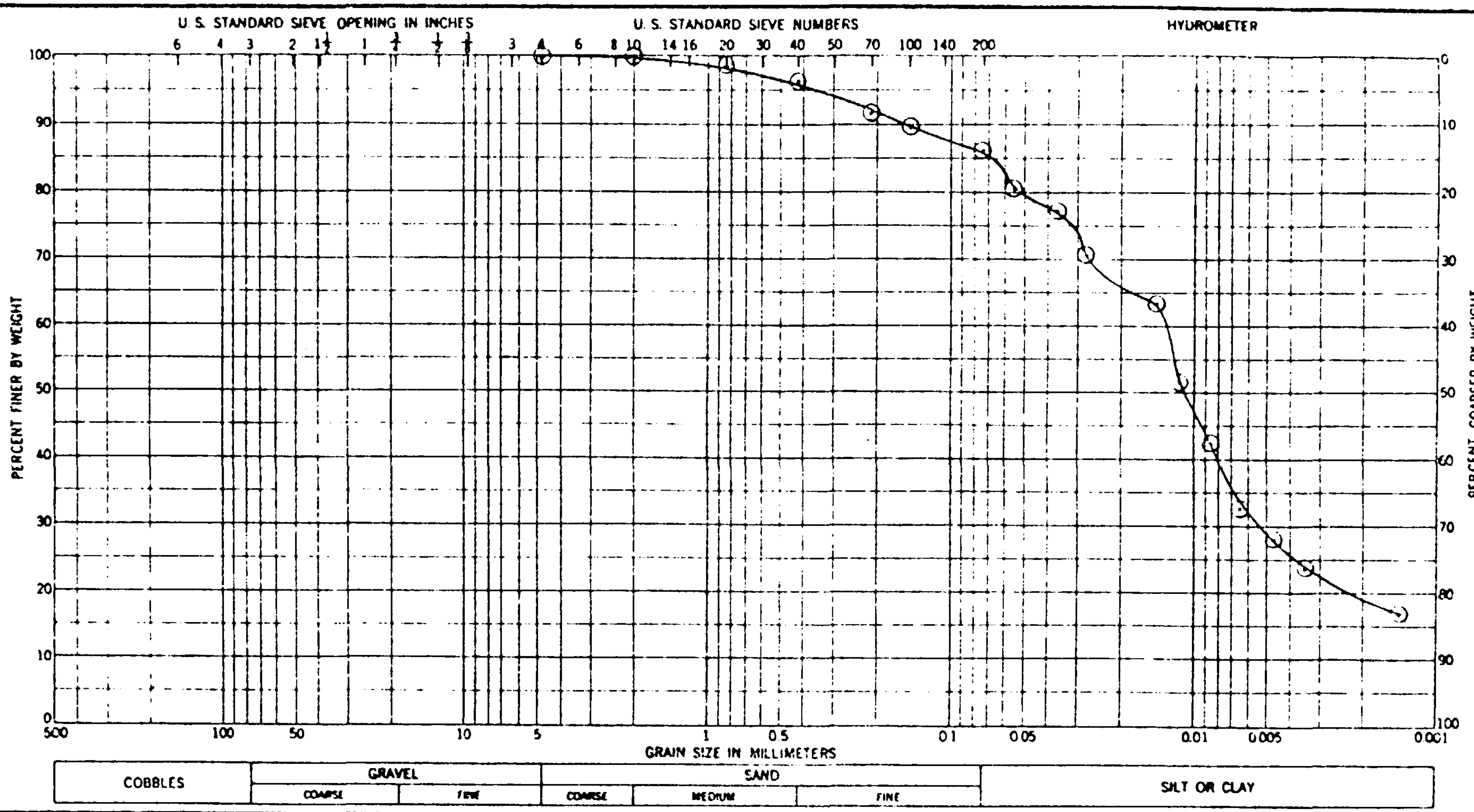
LAB SER ~~Boring~~ No.: 100-422-6

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-7



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
9902 F	6"-46"	Olive green - org. sandy silty CLAY (OH) w/ mar. odor Sp. Gr. = 2.60		125	43	82

Project: NEW BEDFORD, MA

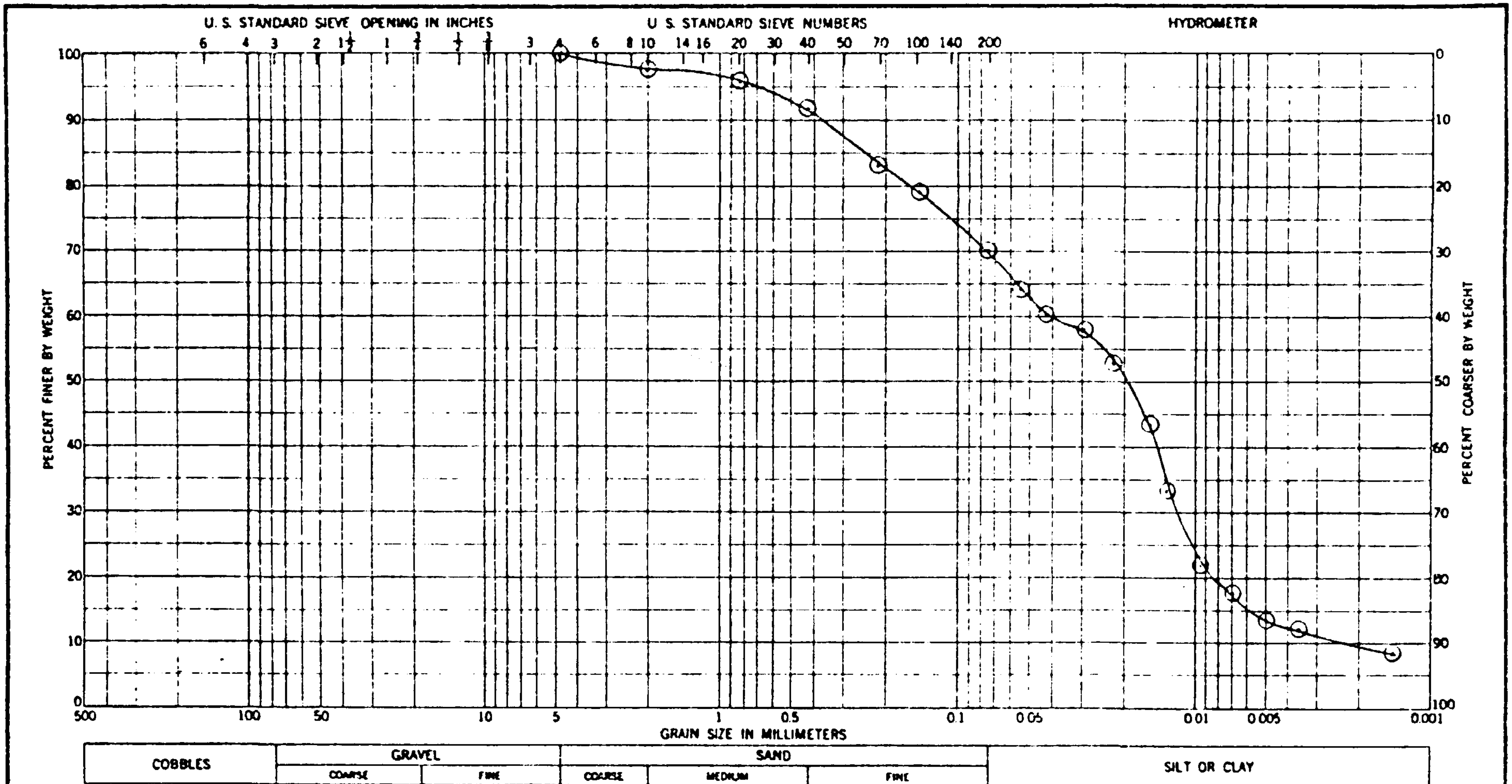
Area: 9902 F

Boring No: 100-422-7

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9907D	0"-12"	Black-org-sandy, silty CLAY (CH) w/ mar odor Sp. Gr. = 2.44		135	48	87

Project: NEW BEDFORD, MA

Area: 9907 D

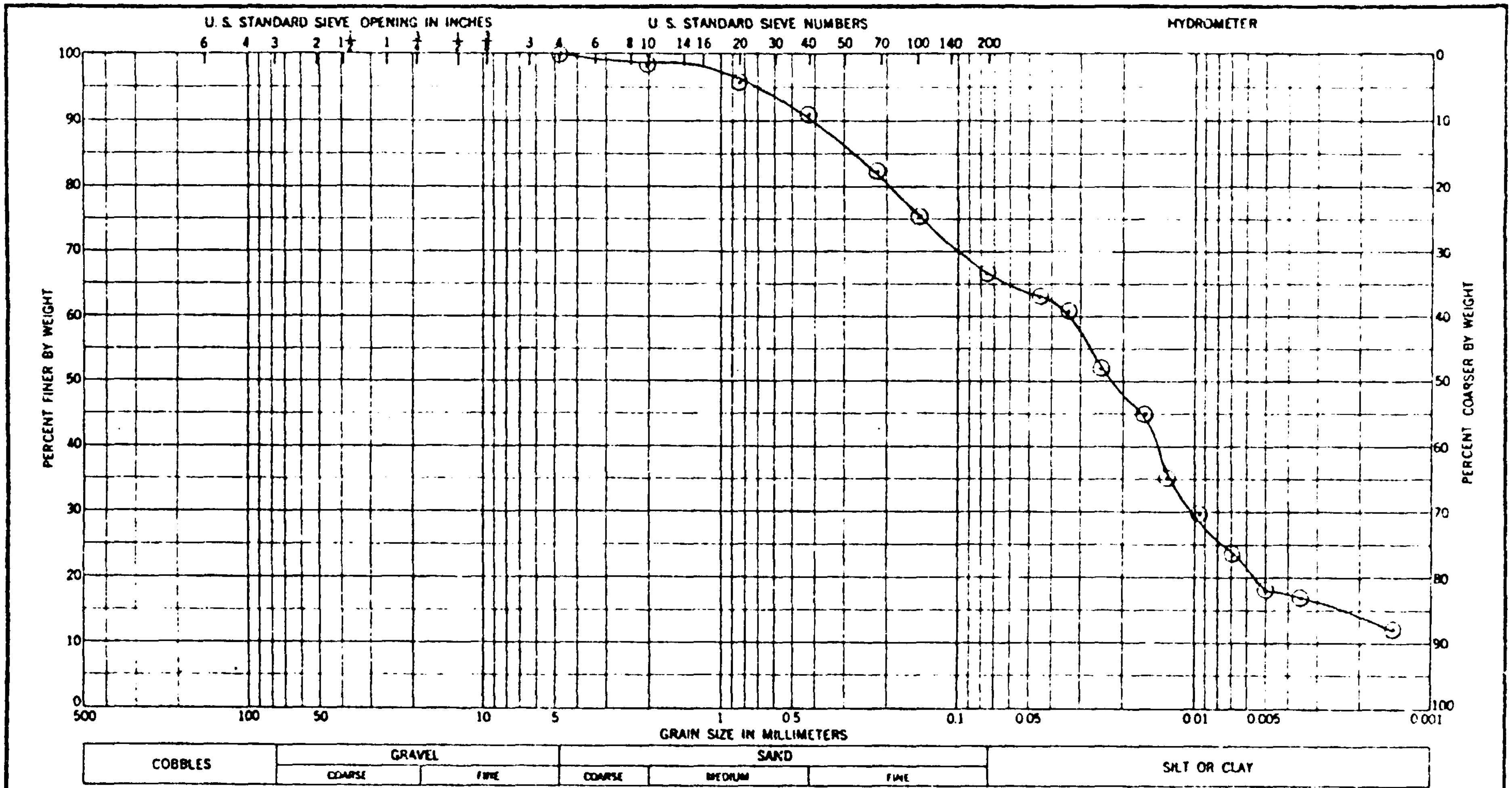
Lab. No. / Boring No: 100-422-8

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-8



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
9910 E+F	0"-24"	Olive green - org. sandy, silty CLAY (OH) w/mar. ... Sp.Gr = 2.50		123	46	76

GRADATION CURVES

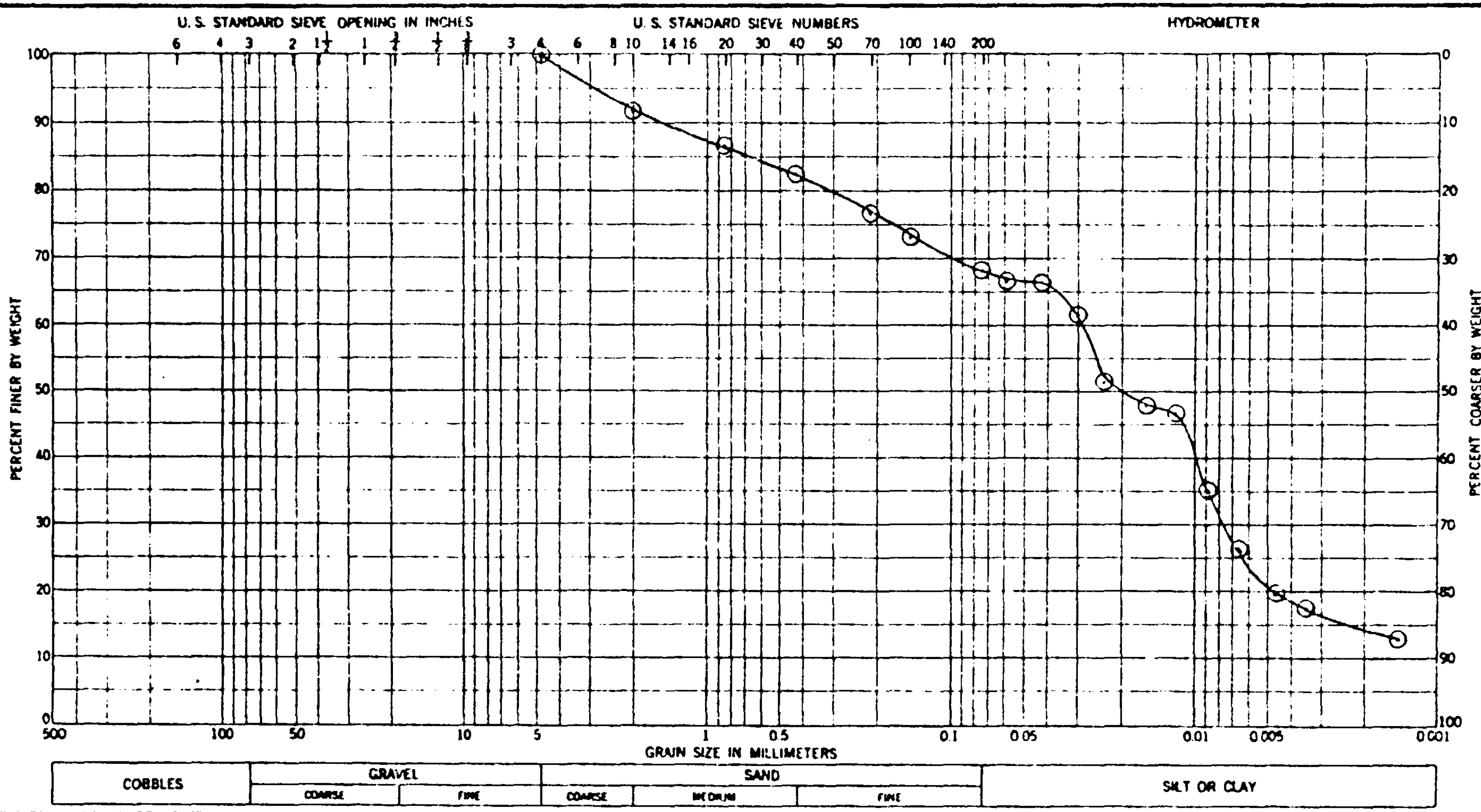
Project: NEW BEDFORD, MA

Area: 9910 E+F

LAB SER Boring No.: 100-422-9

Date: 10/31/85

ENG FORM 1 MAY 63 2087



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
9912C	0"-18"	Black-org. sandy silty CLAY (OH) w/mdr odor Sp. Gr. = 2.53		136	43	93

Project NEW BEDFORD, MA

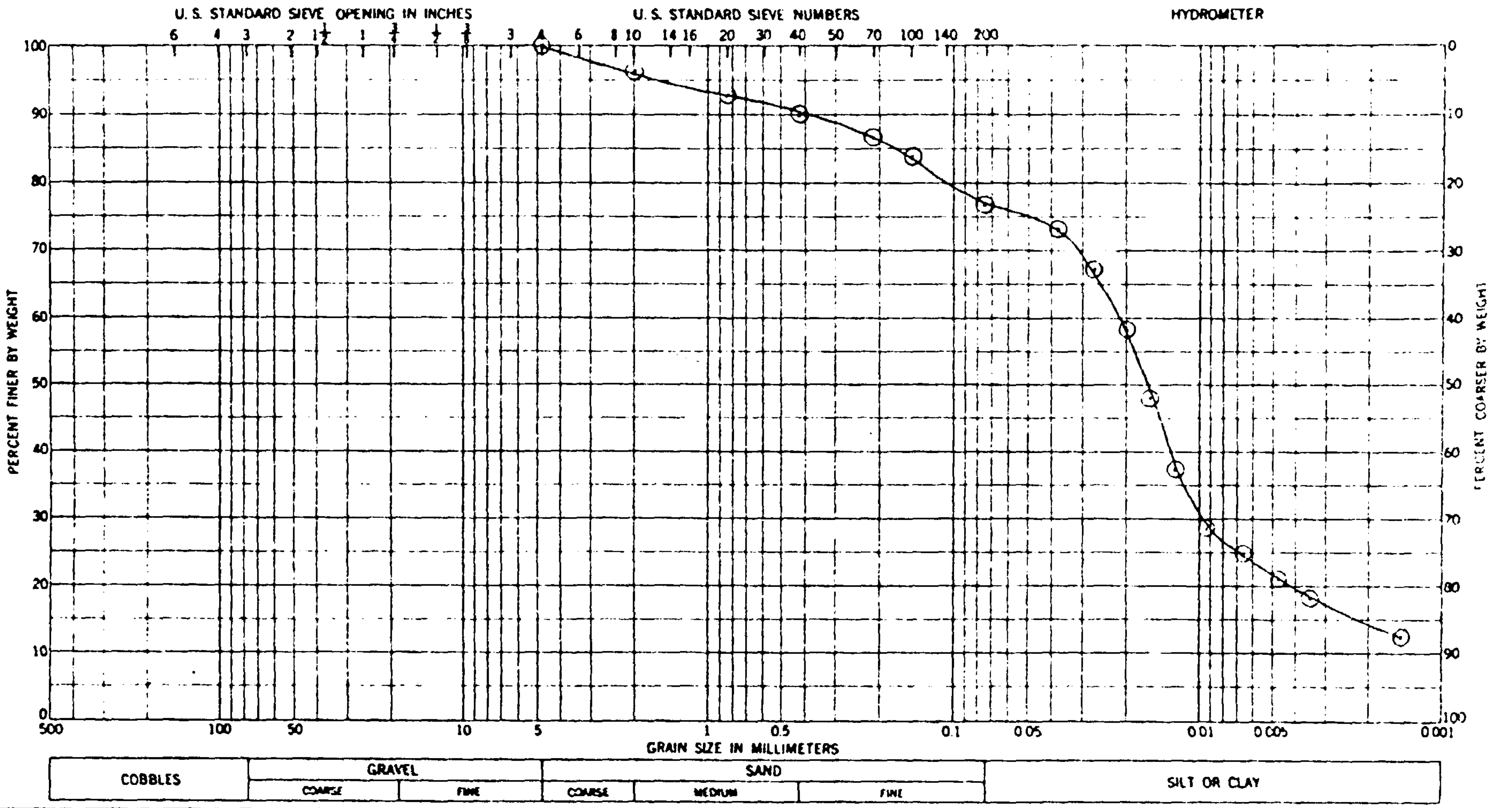
Area 9912 C

LAB SER. Boring No. 100 - 422 - 10

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9914 E	0"-10"	Black-org. sandy silty CLAY (OH) w/ mar. odor Sp. Gr. = 2.40		111	42	70

Project: NEW BEDFORD, MA

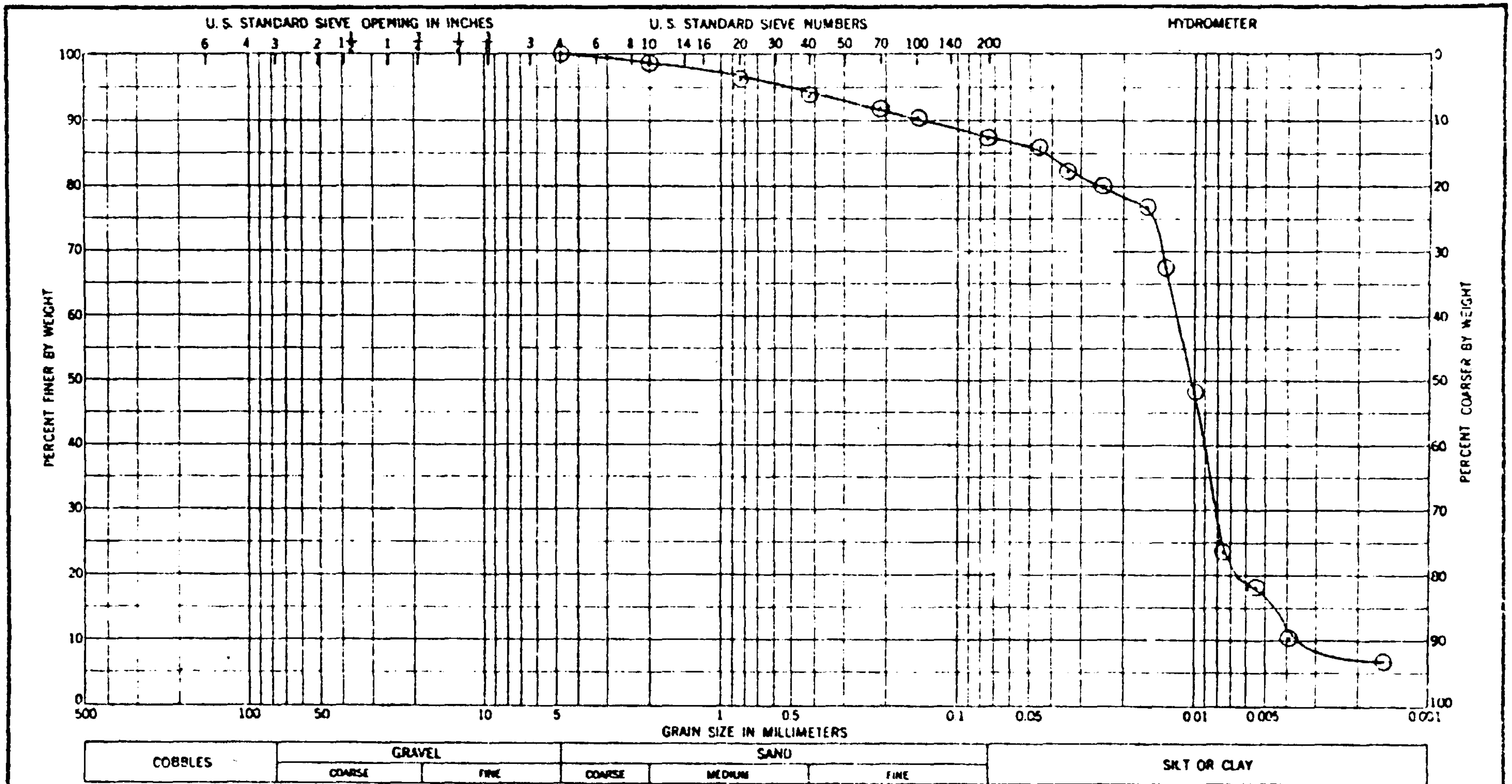
Area: 9914 E

LAE SER Boring No.: 100-422-11

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9918C	0"-38"	Black-org. sandy clayey SILT (OH) w/oily odor Sp. Gr. = 2.30		184	89	96

Project: NEW BEDFORD, MA

Area: 9918C

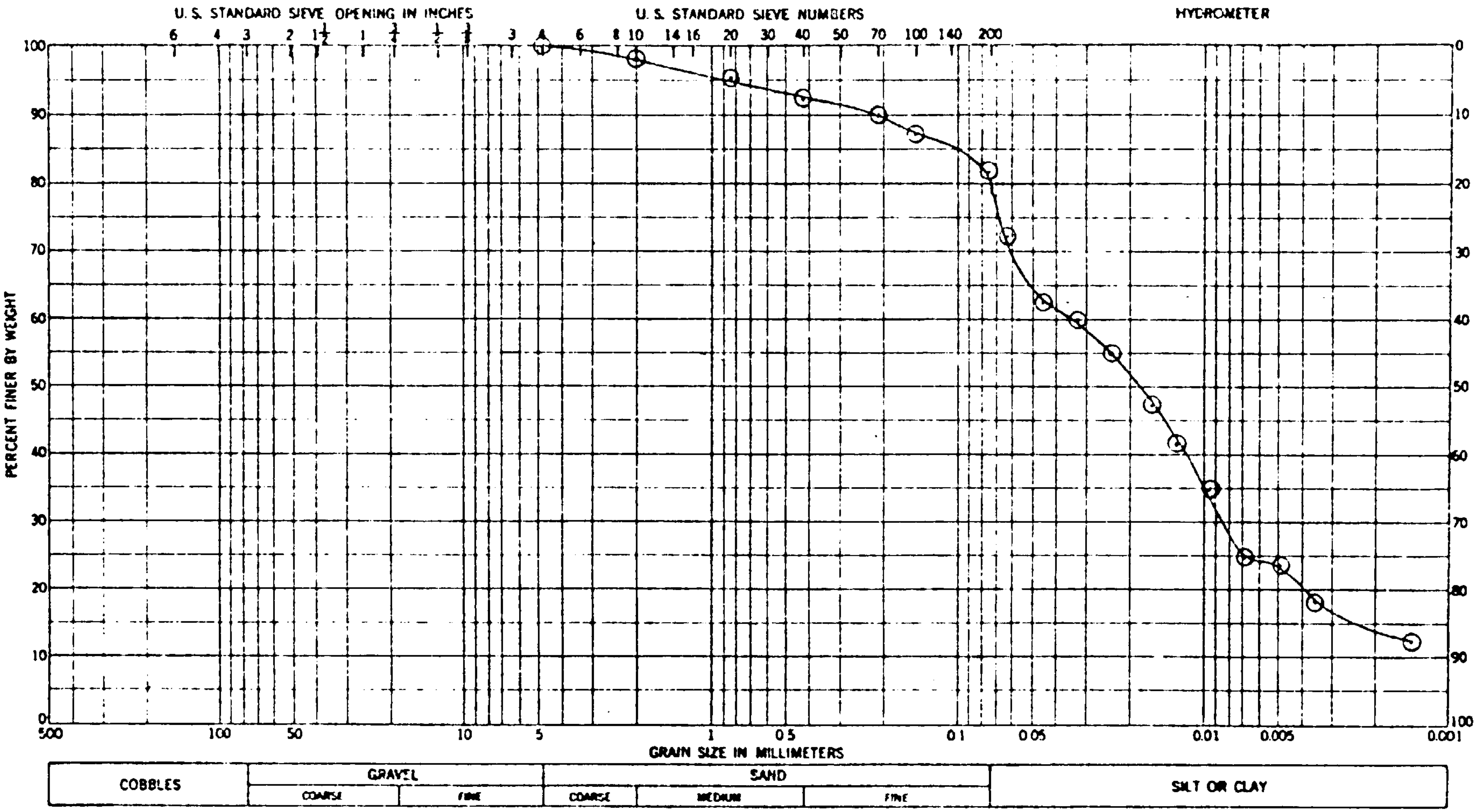
LAB SER. Boring No: 100-422-12

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-13



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
9922D	0"-27"	Black-olive green-org. sandy silty CLAY (OH) w/ mar odor Sp. Gr. = 2.57		124	36	88

Project NEW BEDFORD, MA

Area 9922 D

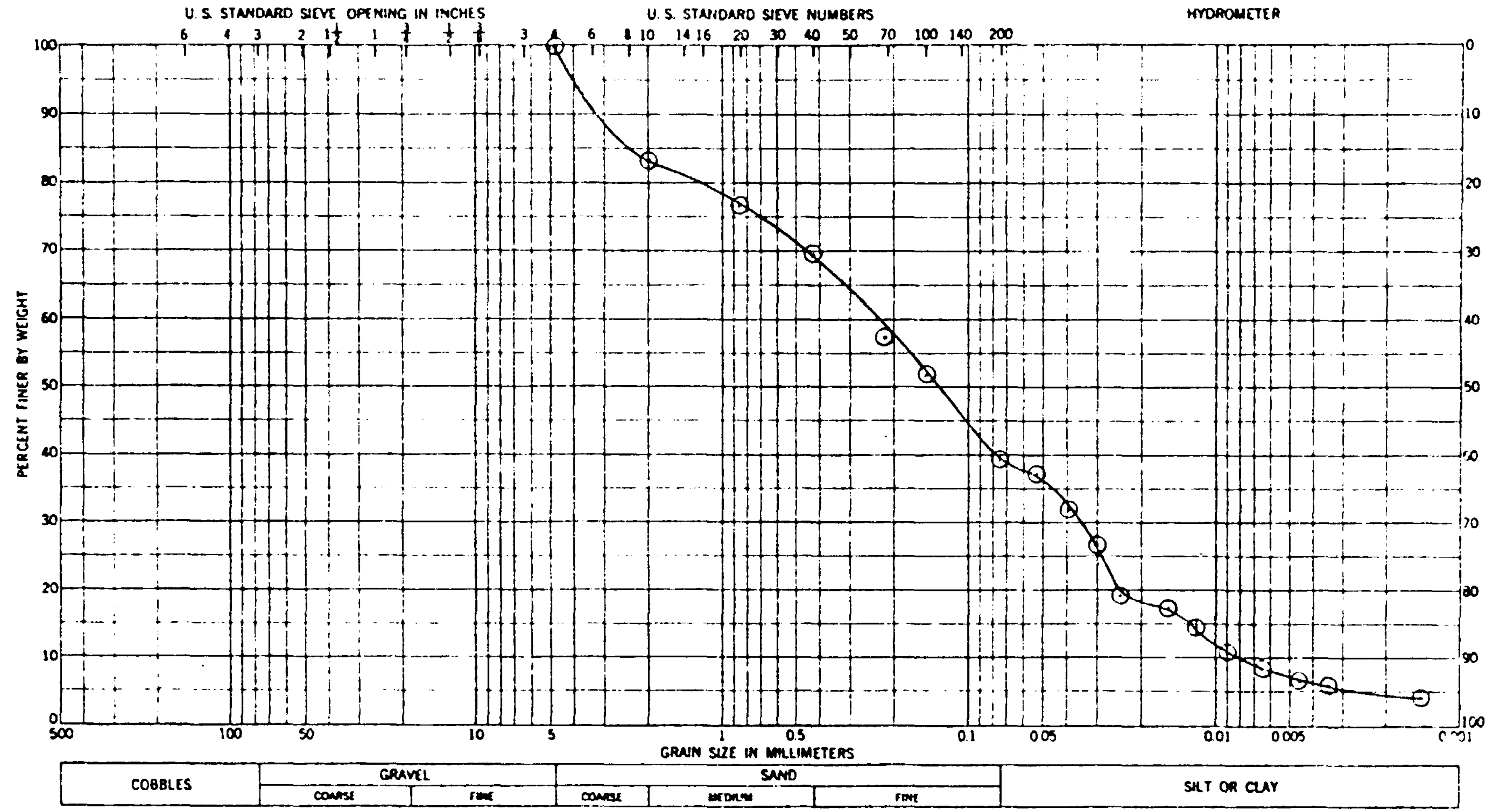
LA3 SER Boring No. 100-422-14

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-14



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9925 D	18"-28"	Brown - silty c-f SAND (SM) w/ minor odor		72	42	30
		Sp. Gr. = 2.76				

Project NEW BEDFORD, MA

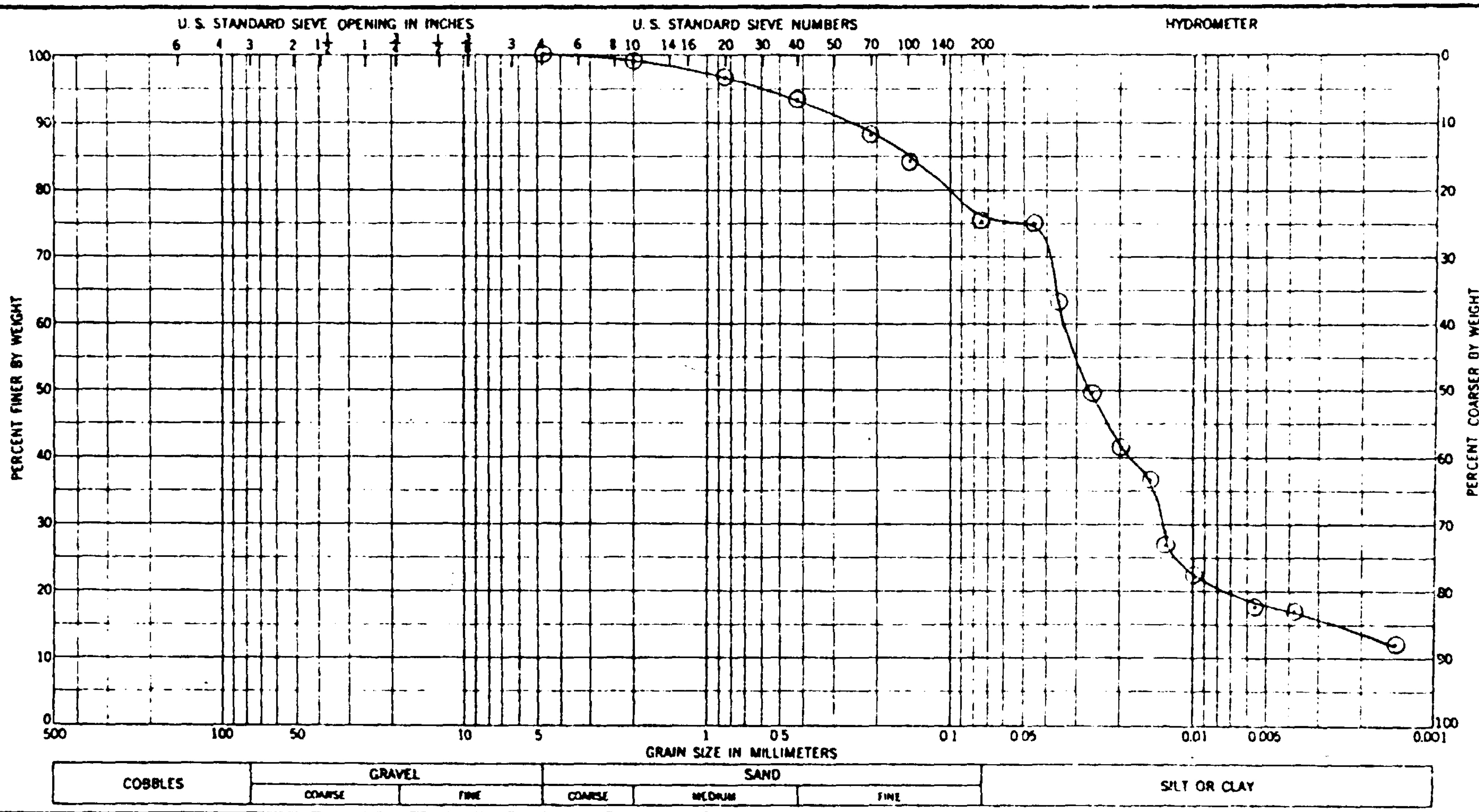
Area 9925 D

LAB SER / Boring No. 100-422-15

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9927D	0"-8"	Black-org. sandy clayey SILT (OH) w/mar odor Sp.Gr. = 2.28		150	61	87

Project NEW BEDFORD, MA

~~Area~~ 1927 D

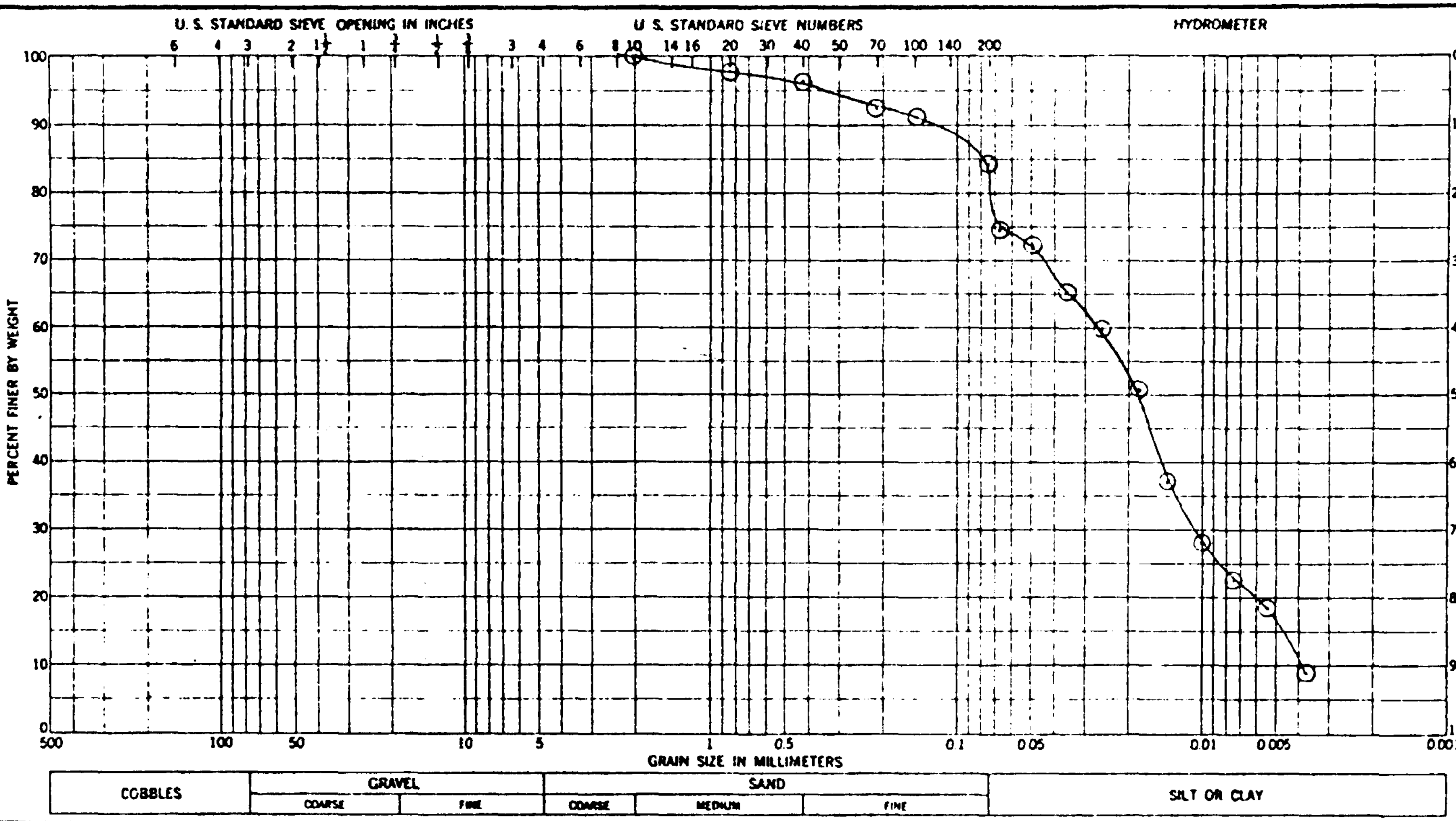
Lab Ser / ~~Boring~~ No 100-422-16

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-16



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
9930 E	0"-13"	Black-org. sandy clayey SILT (OH) w/ mar odor		153	73	80
		Sp. Gr. = 2.28				

Project NEW BEDFORD, MA

Area 9930 E

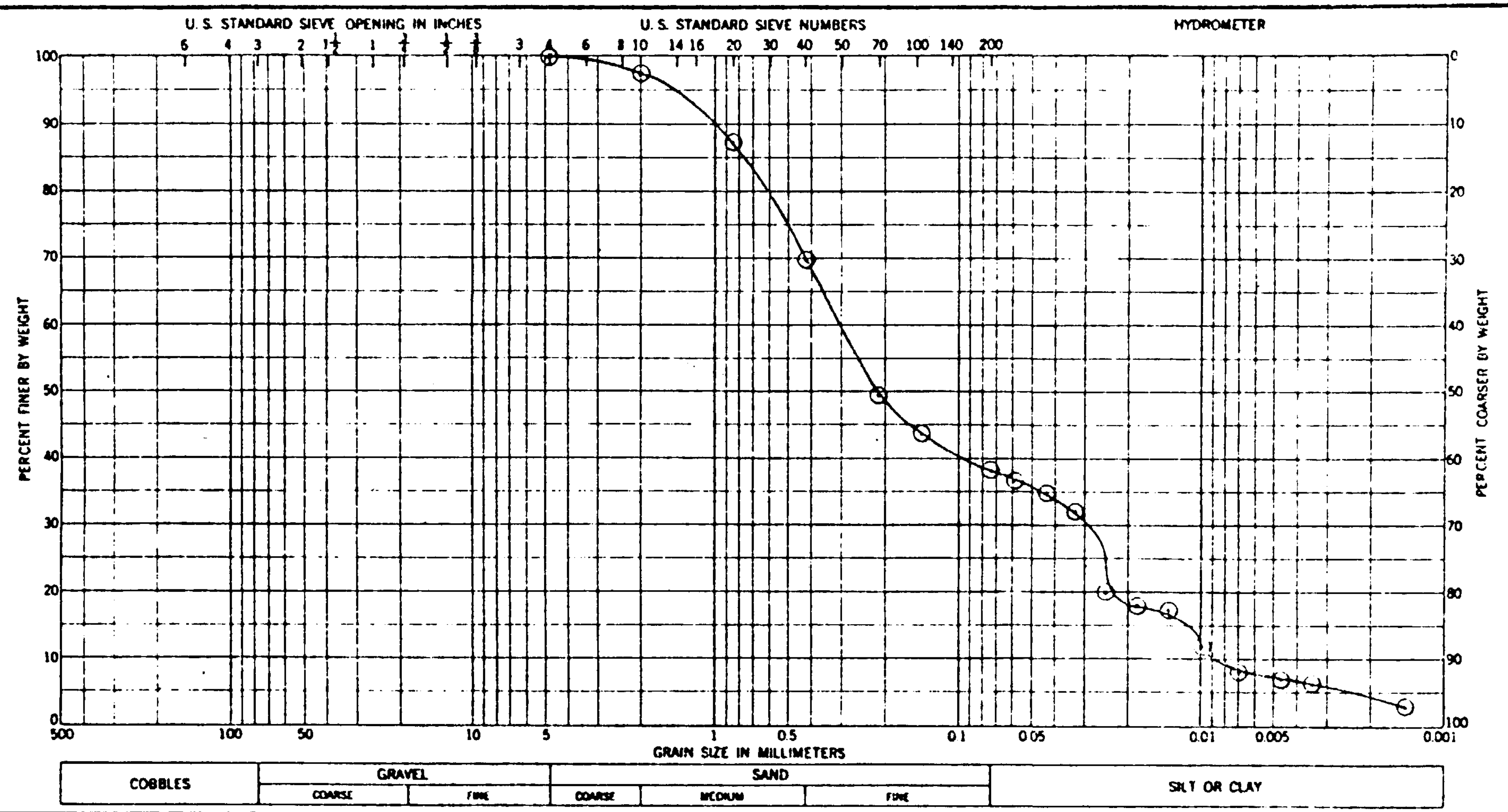
LAB. Boring No 100-422-17

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-17



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9934C	0"-12"	Dk olive green-org. sandy, clayey m-f SAND (SC) w/mdr odor Sp.Gr.=2.56		134	45	90

Project NEW BEDFORD, MA

Area 9934C

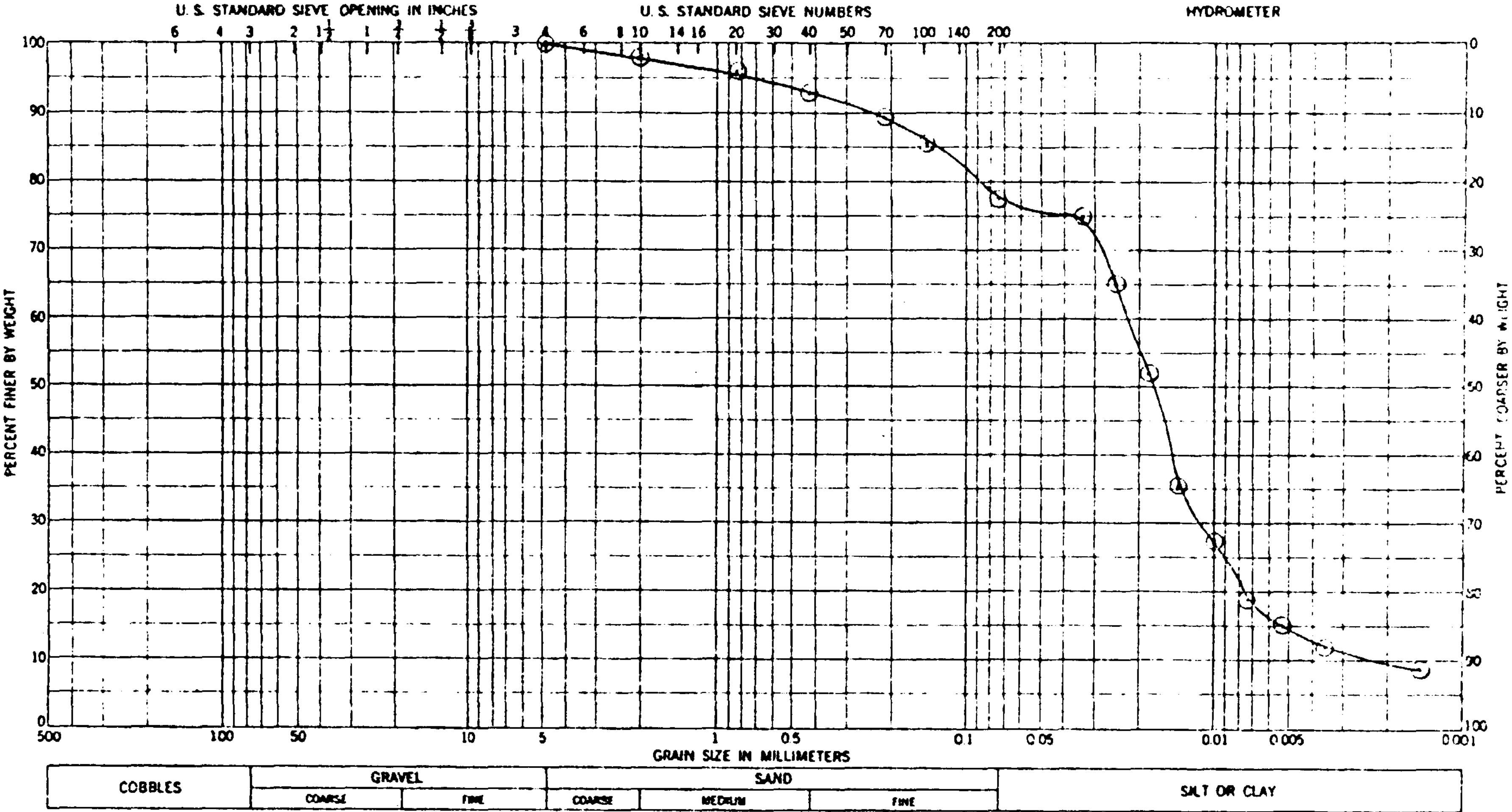
LB SER Boring No. 100-422-13

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-18



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9938C	0"-15"	Black-org. sandy clayey SILT (OH) w/mar odor Sp. Gr = 2.24		162	68	94

Project: NEW BEDFORD, MA

Area: 9938C

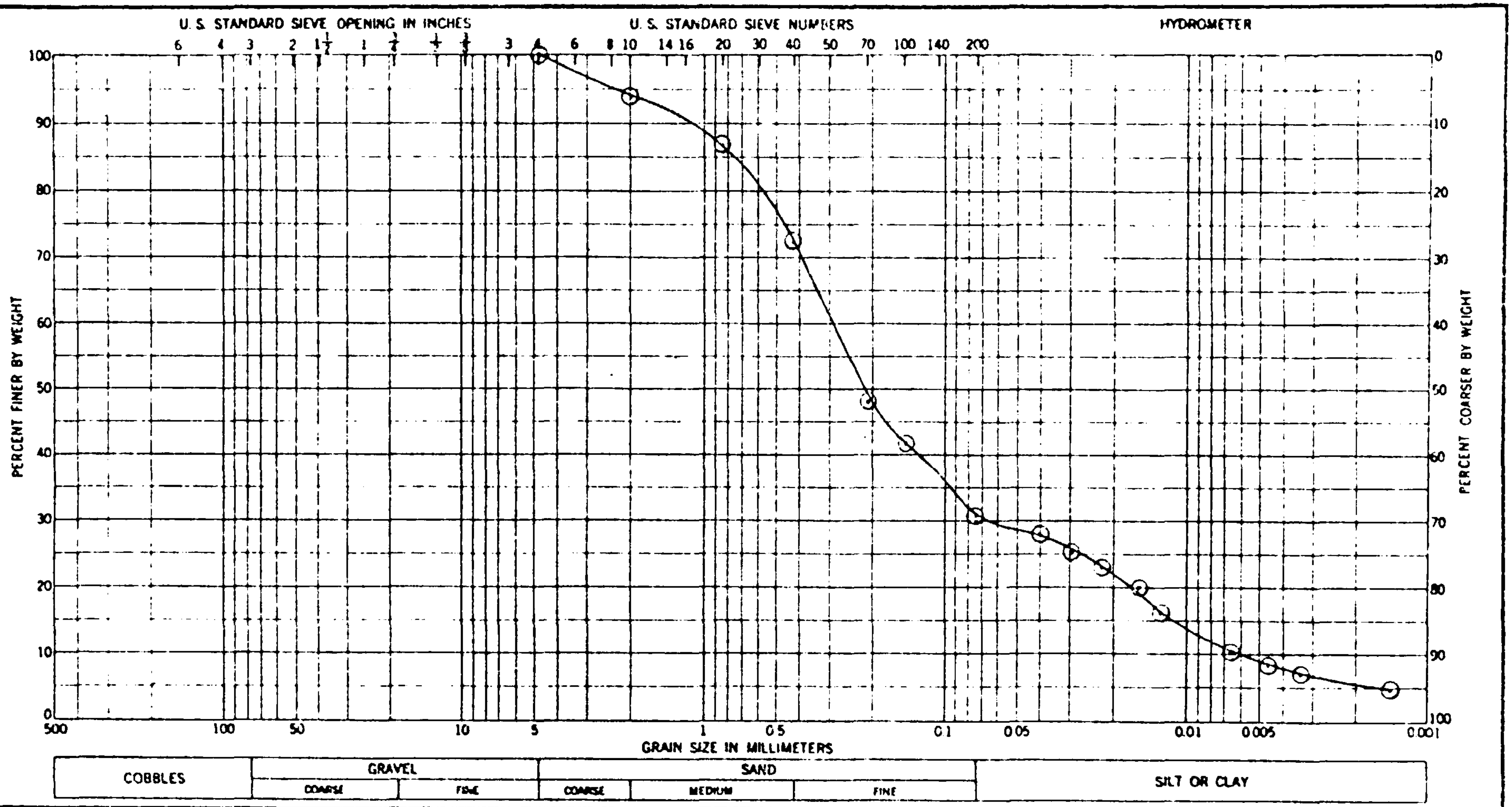
Boring No.: 00-422-11

Date: ?/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-19



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9941C-D	0"-20"	Dk olive green silty clayey f-m-c SAND (SM-SC) w/ mar odor Sp.Gr = 2.64		77	36	42

Project NEW BEDFORD, MA

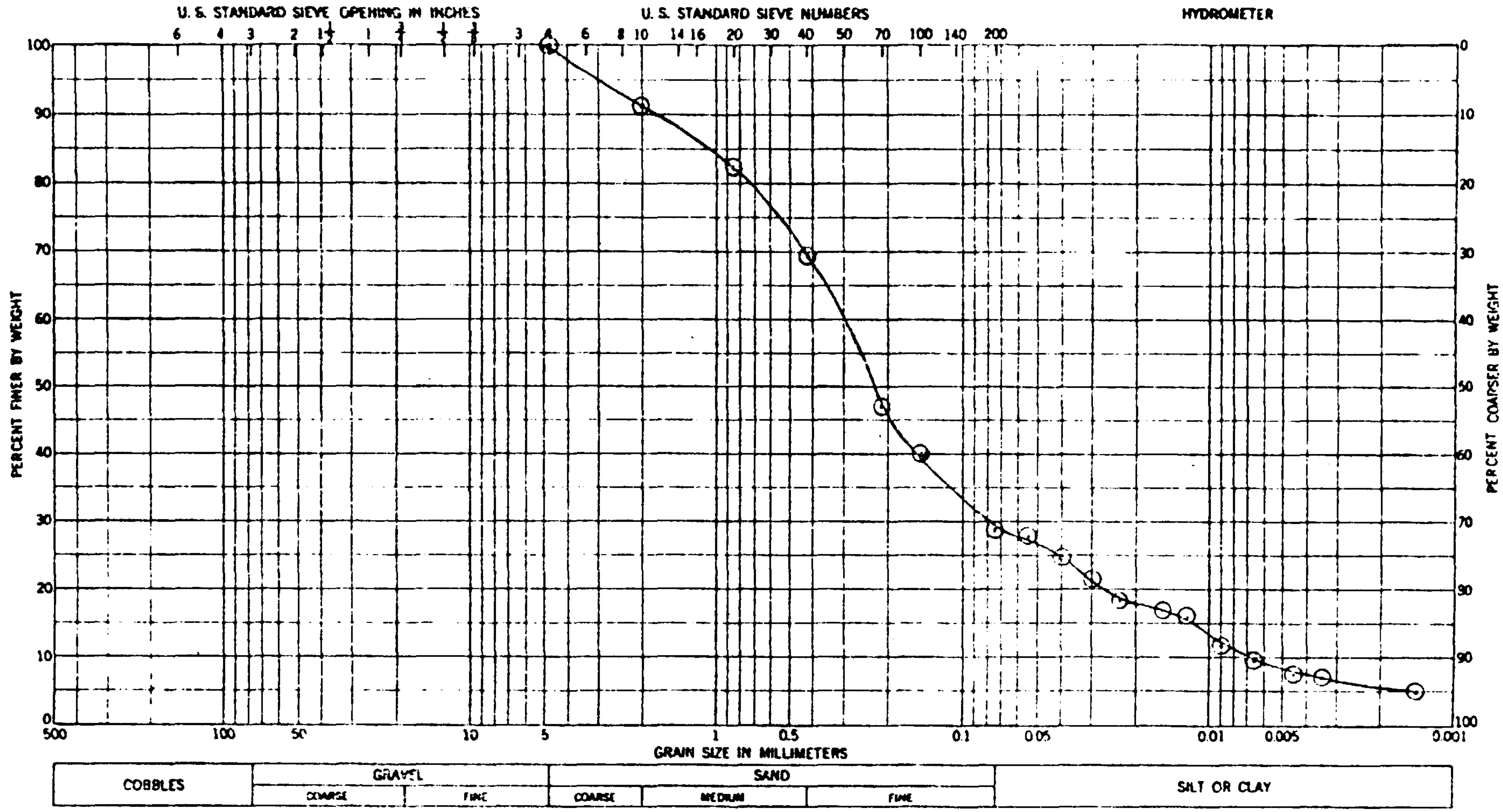
~~Area~~ 9941C+D

Job No. / Boring No. 100-422-20

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
9942 B	0"-16"	Olive green-silty m-f SAND (SM) water clear Sp Gr = 2.62		80	40	40

Project: NEW BEDFORD, MA

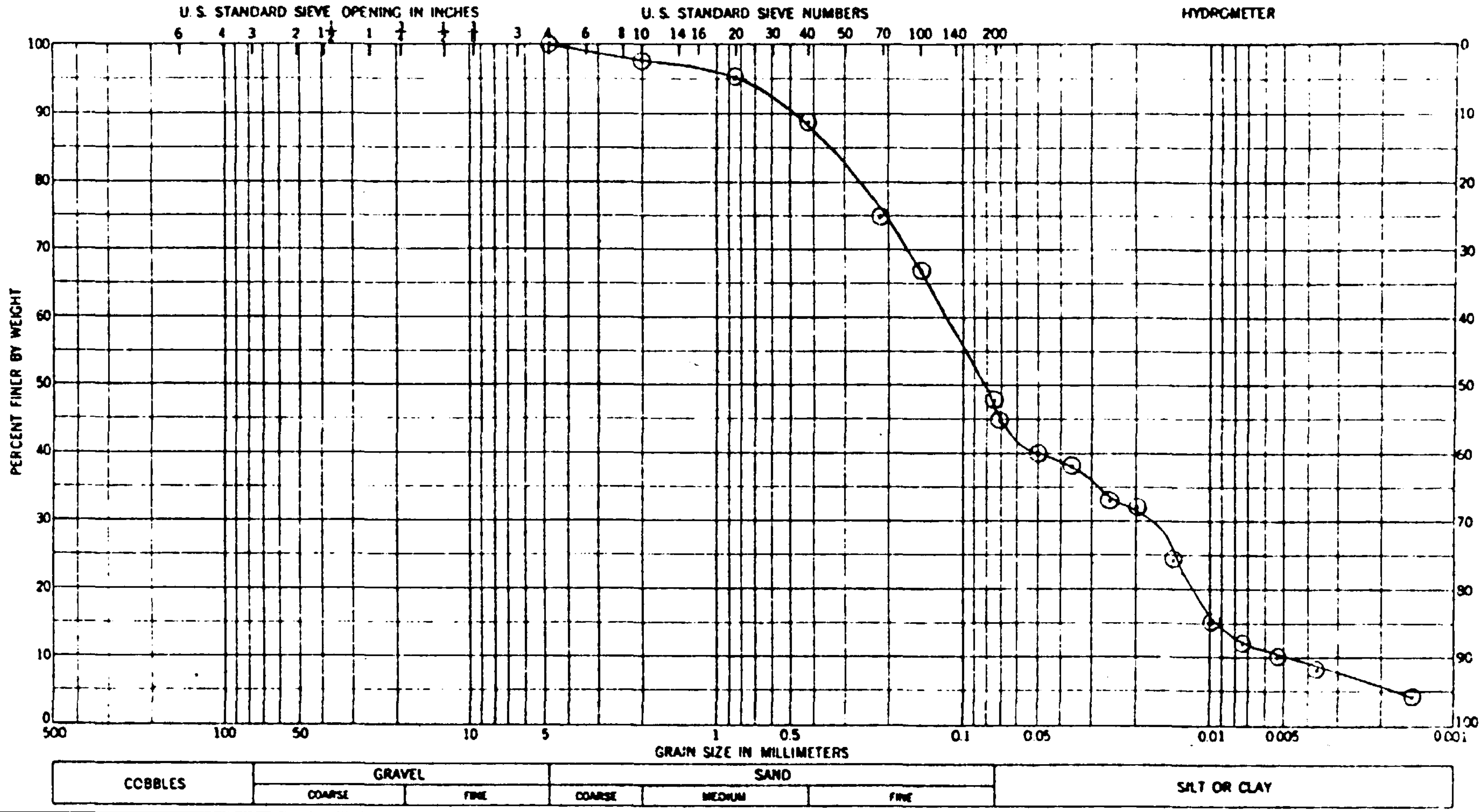
Area: 9942 B

Boring No: 100-422-21

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
7945C	0'-6"	Dk olive green-org. silty, clayey m-f SAND (SC) w/mar odor Sp. Gr = 2.46		109	42	67

Project NEW BEDFORD, MA

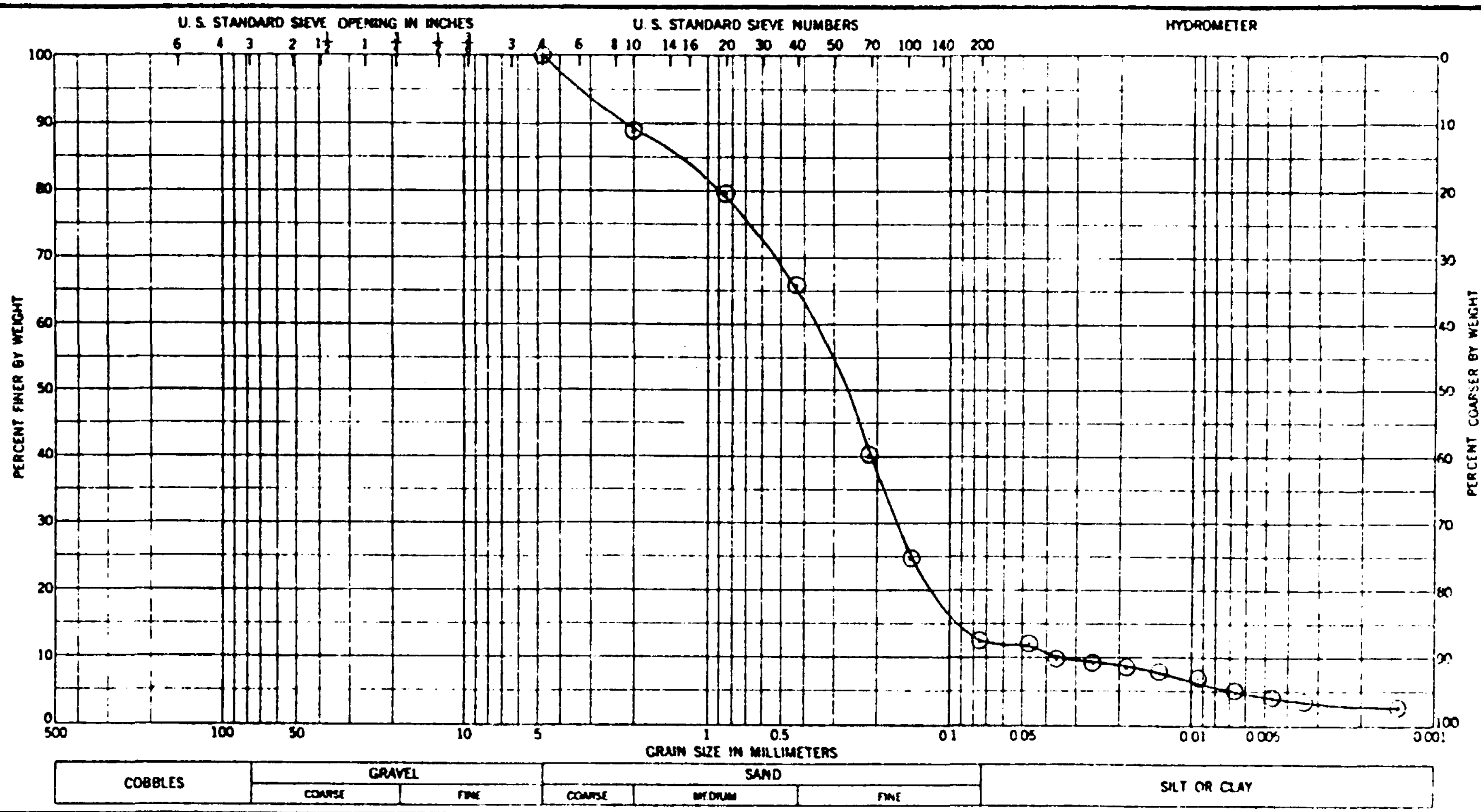
~~Area~~ LAB SER. 7945 C

~~Boring~~ No. 100-422-22

Date 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
9947 B	0"–16"	Olive green — silty c-f SAND (SM) w/mar odor		98	54	45
		Sp. Gr. = 2.65				

Project: NEW BEDFORD, MA

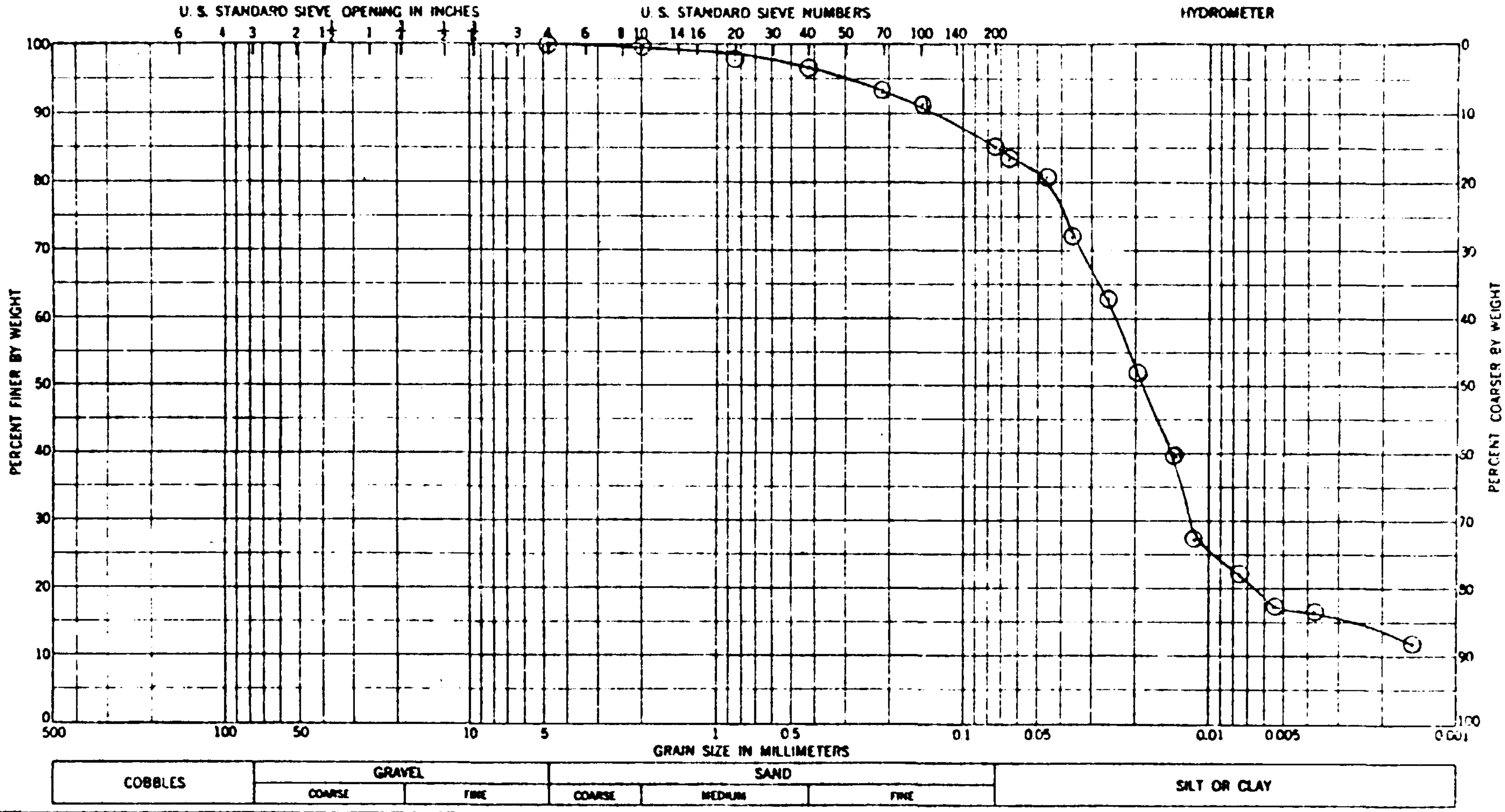
Area:

SS SER Boring No: 100-422-23

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9949D	0"-7"	Black-org. sandy SILT-CLAY (CH) w/ mar. odor Sp Gr = 2.26		173	64	109

Project: NEW BEDFORD, MA

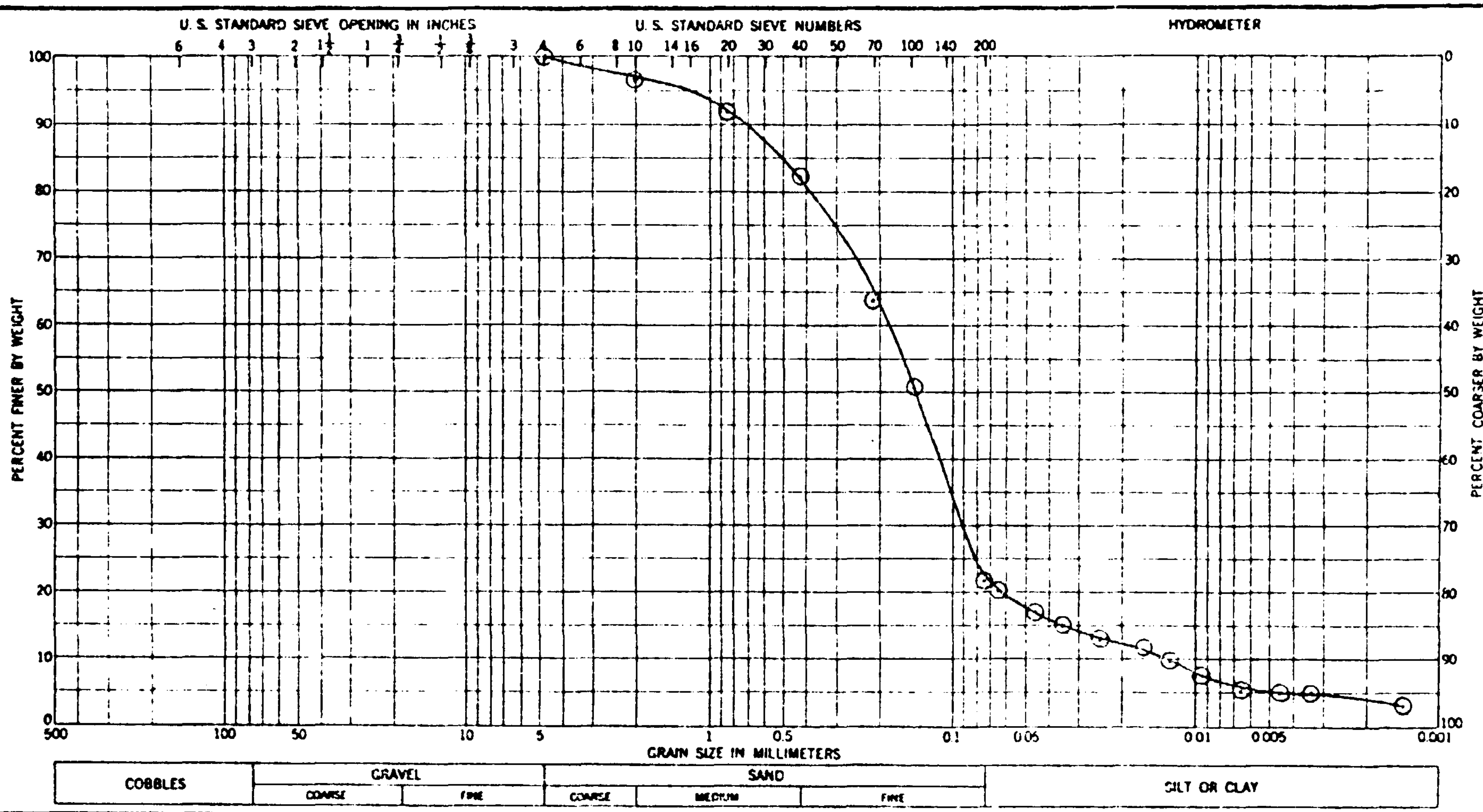
Area: 9949 D

LAB SER ~~Boring~~ No.: 100-422-24

Date: 10/31/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	Elev—or Depth	Classification	Nat w %	LL	PL	PI
9950C+D	0"-22"	Dk olive green – silty m-f SAND (SM) w/ mar odor Sp. Gr = 2.65		40	27	13

Project: NEW BEDFORD, MA

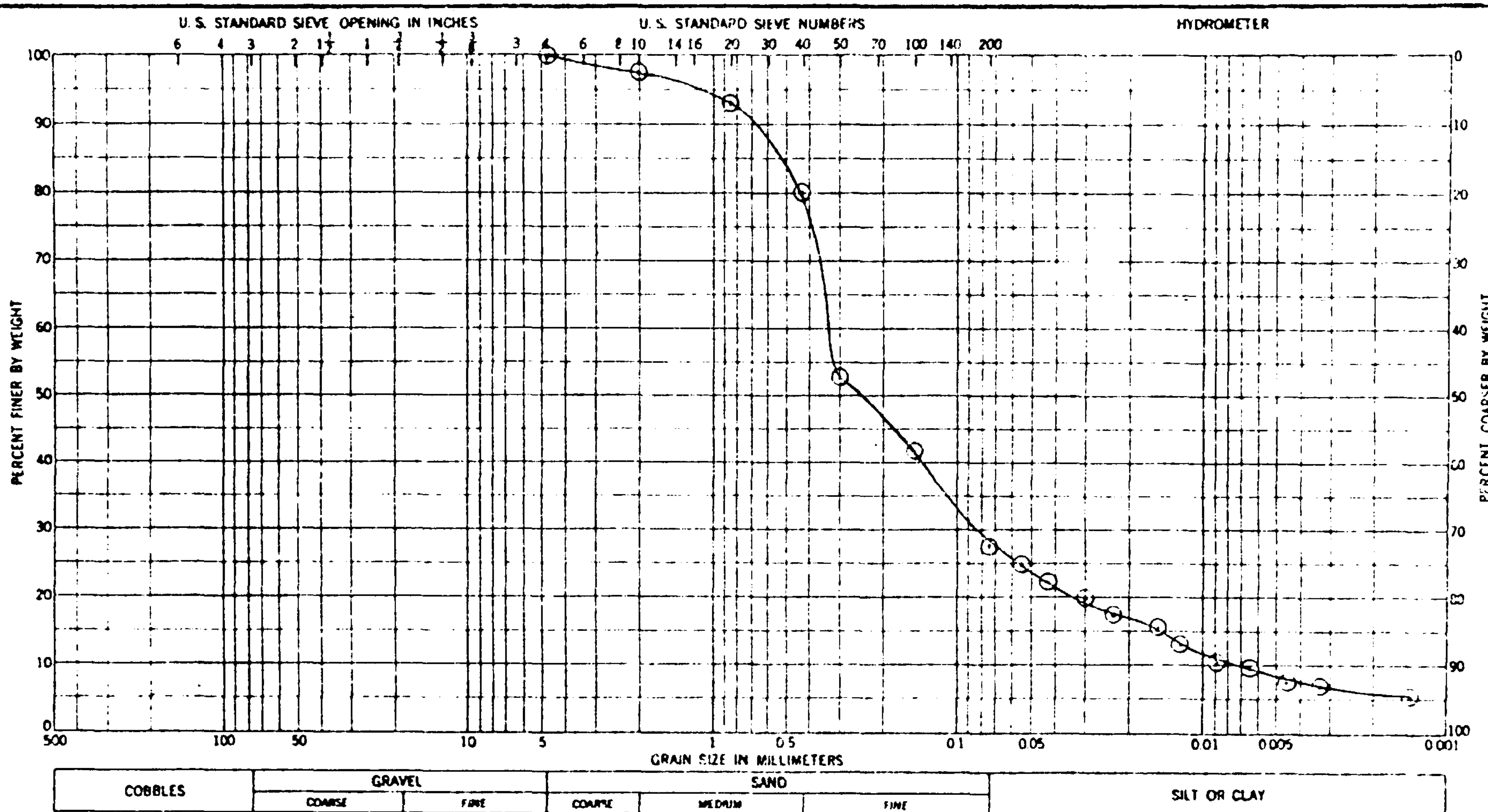
Area: 9950 C+D

Boring No: 100-422-25

Date: 11/1/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9953 D	8"-21"	Lt green - silty clayey m-f SAND (SC) w/ mar. odor Sp Gr = 2.66		51	27	24

Project NEW BEDFORD, MA

~~Area~~ 9953 D

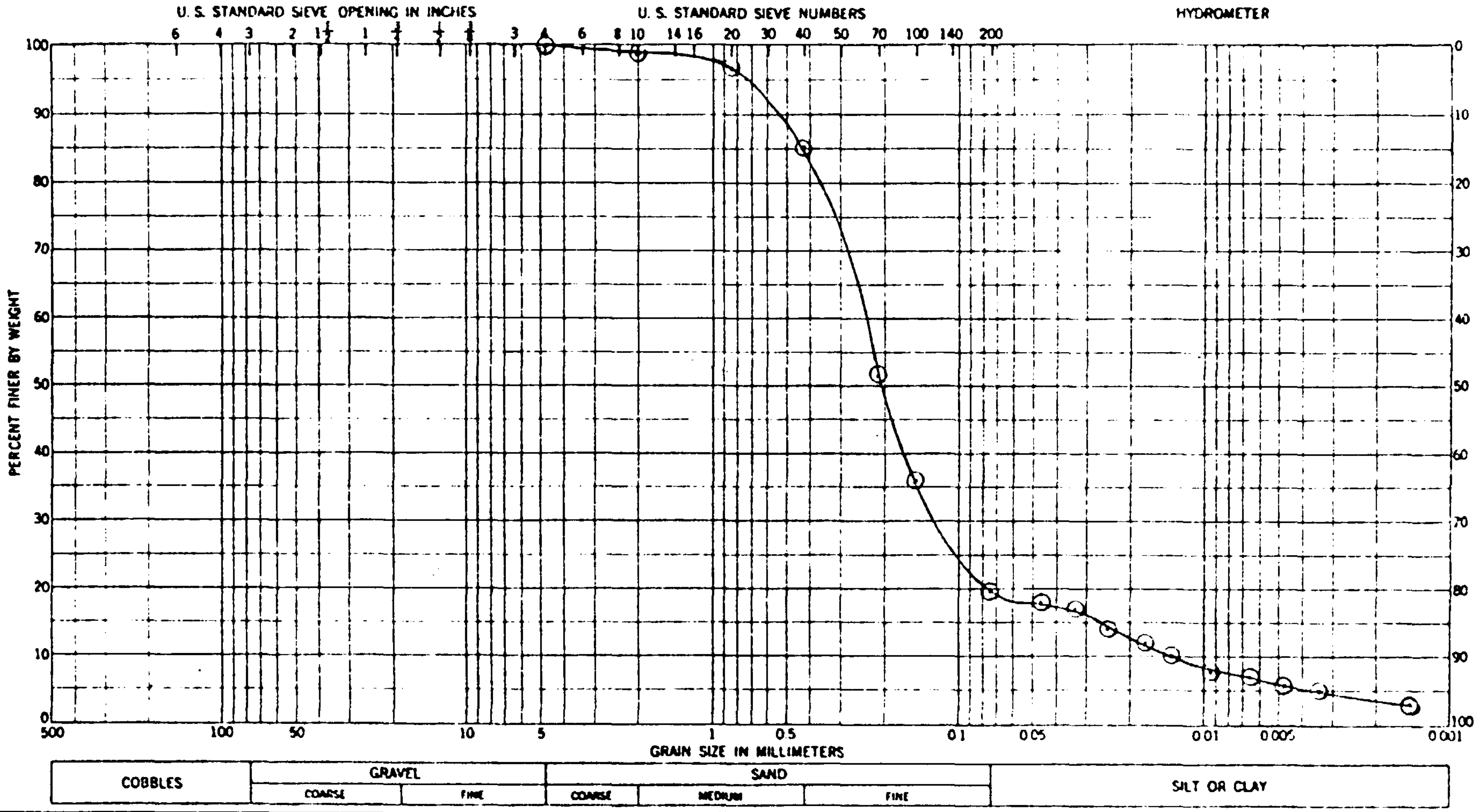
Boring No 100-4?? -??

Date ?/?/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-26



Sample No.	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9945C	0"-23"	Olive green - clayey, silty m-f SAND (SM), Sp. Gr = 2.63		77	38	40

Project: NEW BEDFORD, MA

Area: 9945 C

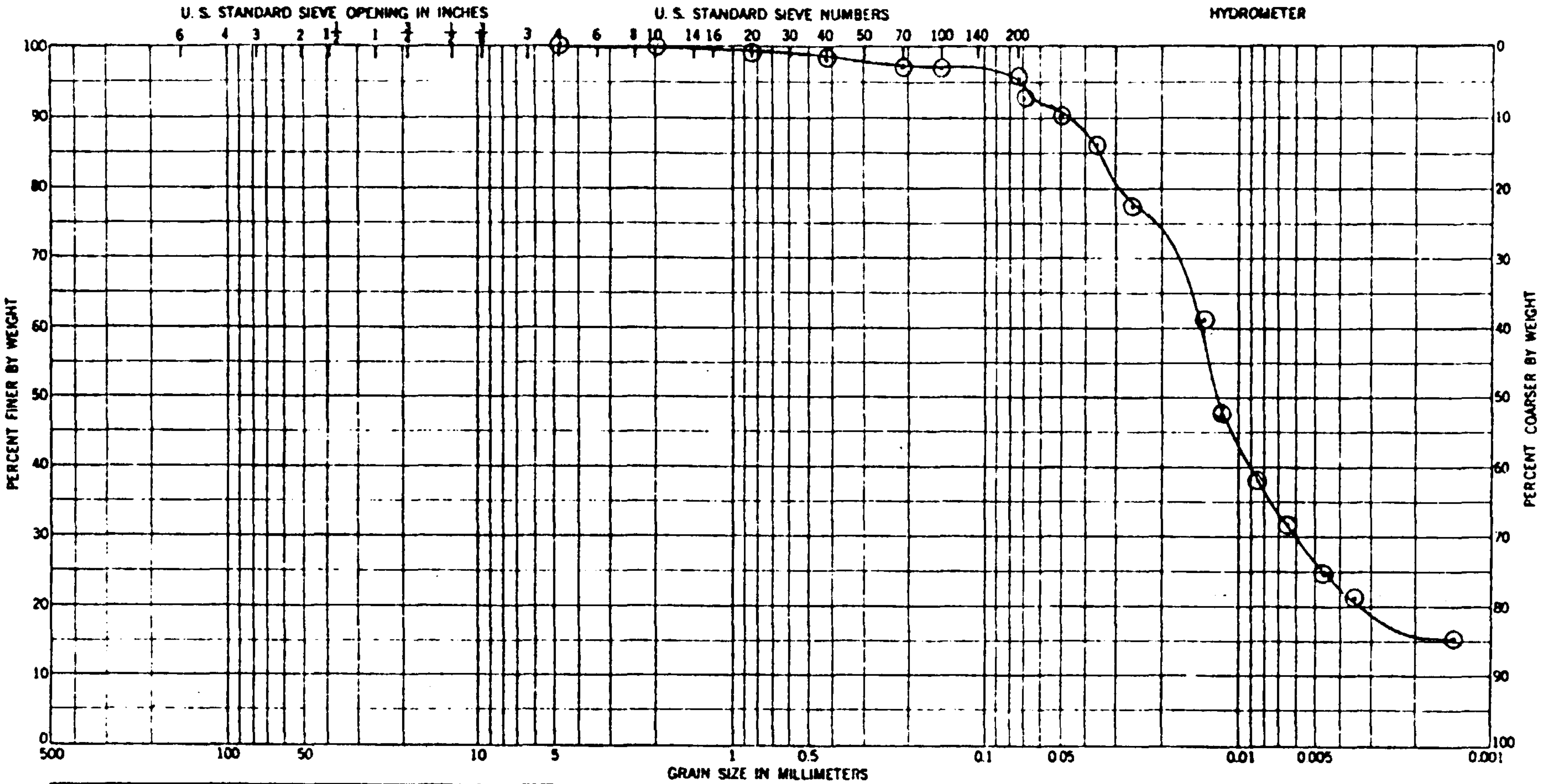
Boring No.: 100-482-27

Date: 11/1/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-27



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Sample No.	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
9956 E	11"-34"	Olive green - org. clayey SILT (OH) w/ shell frag + mar odor		104	46	58
		Sp. Gr = 2.55				

Project NEW BEDFORD, MA

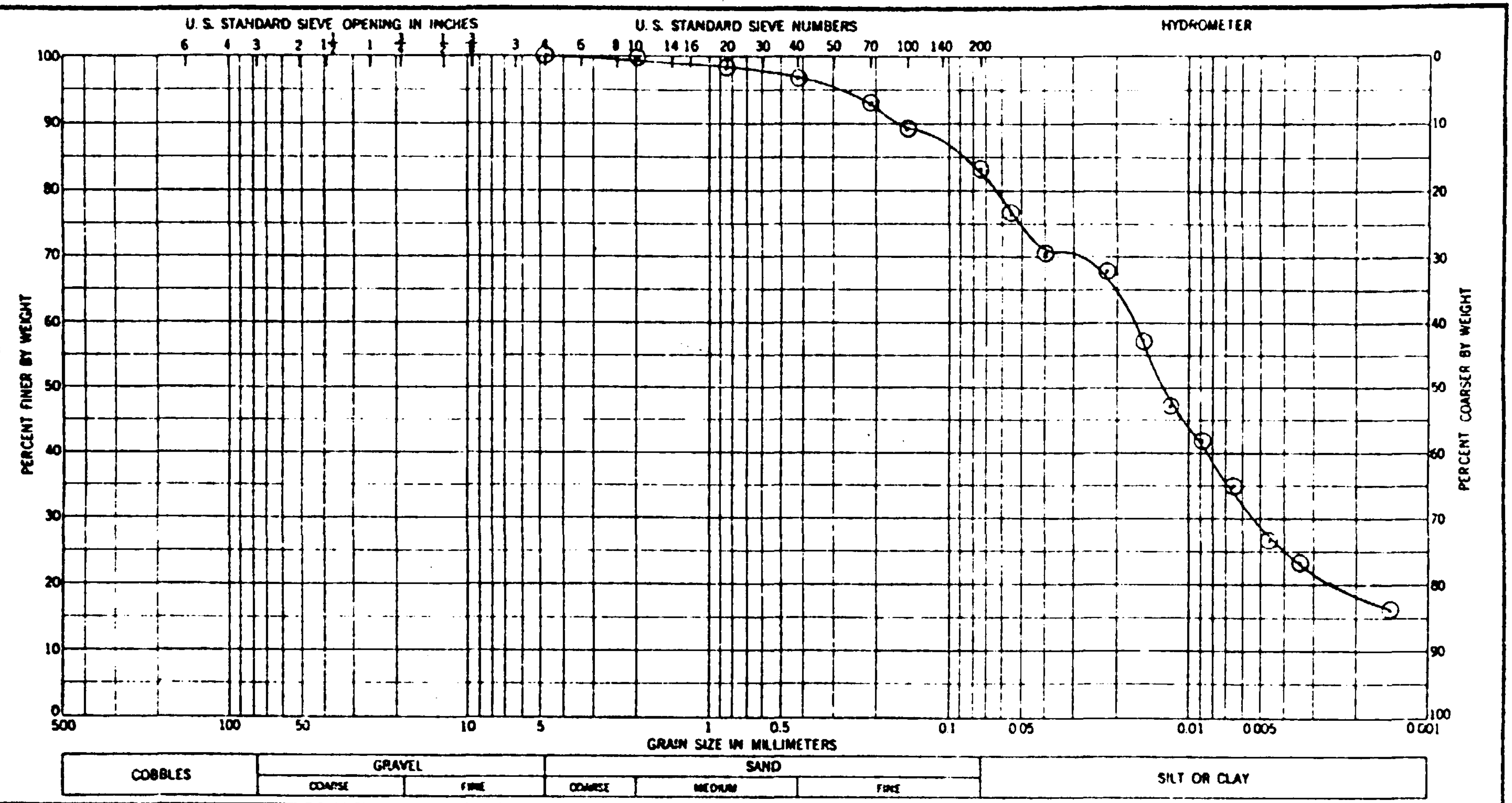
Area 9956 E

LAB SER Boring No. 100-422-28

Date 11/1/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
9962E	6"-34"	Olive green - org. sandy silty CLAY (OH) w/mar odor Sp. Gr. = 2.54		114	38	76

Project: NEW BEDFORD, MA

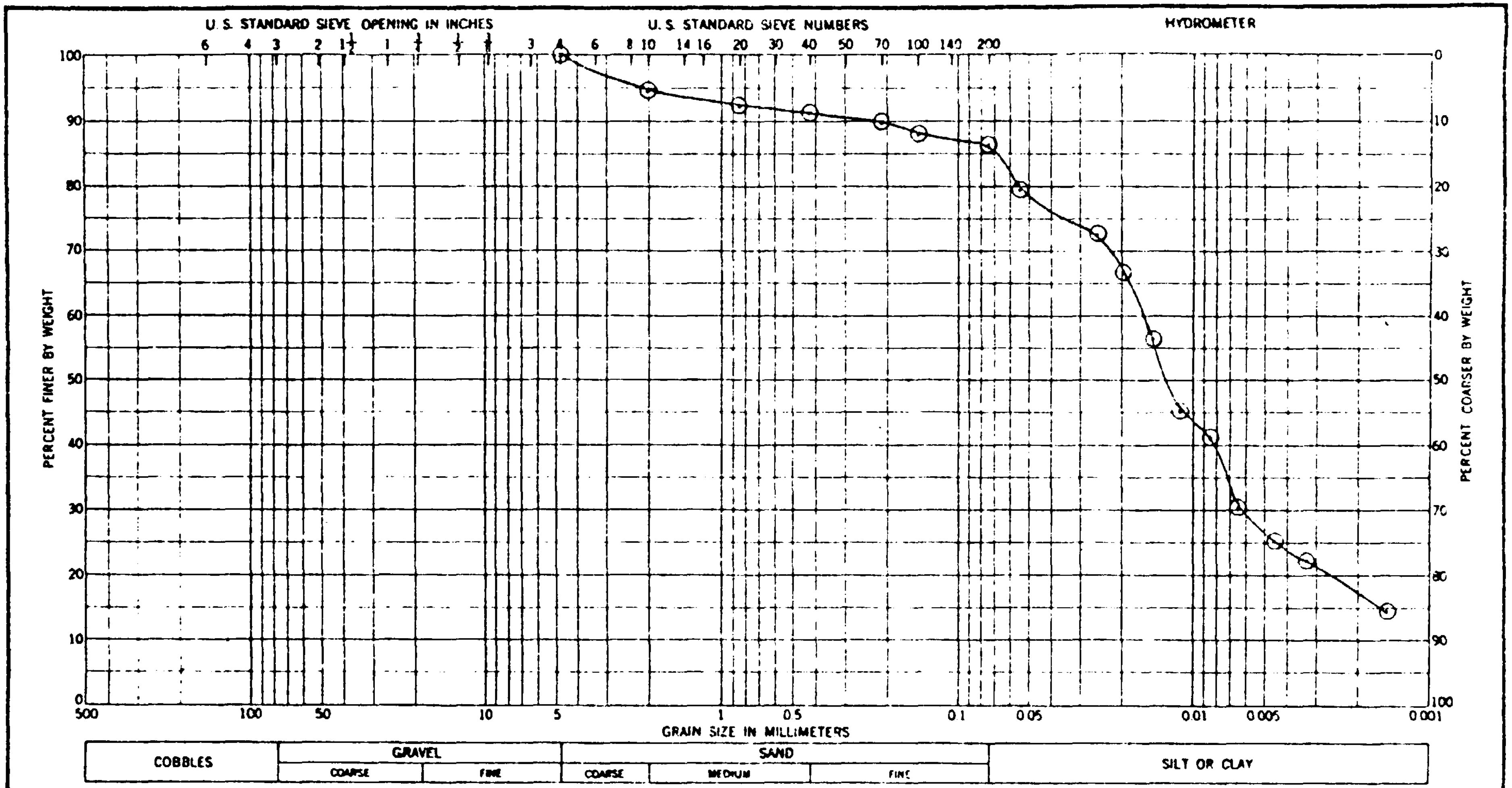
Area: 9962 E

Boring No.: 100-422-39

Date: 11/1/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
9965D	24"-31"	Dk olive green-gray sandy SILT-CLAY (OH) w/shell frag + mar odor Sp. Gr = 2.59		108	44	64

Project: NEW BEDFORD, MA

Area: 9965 D

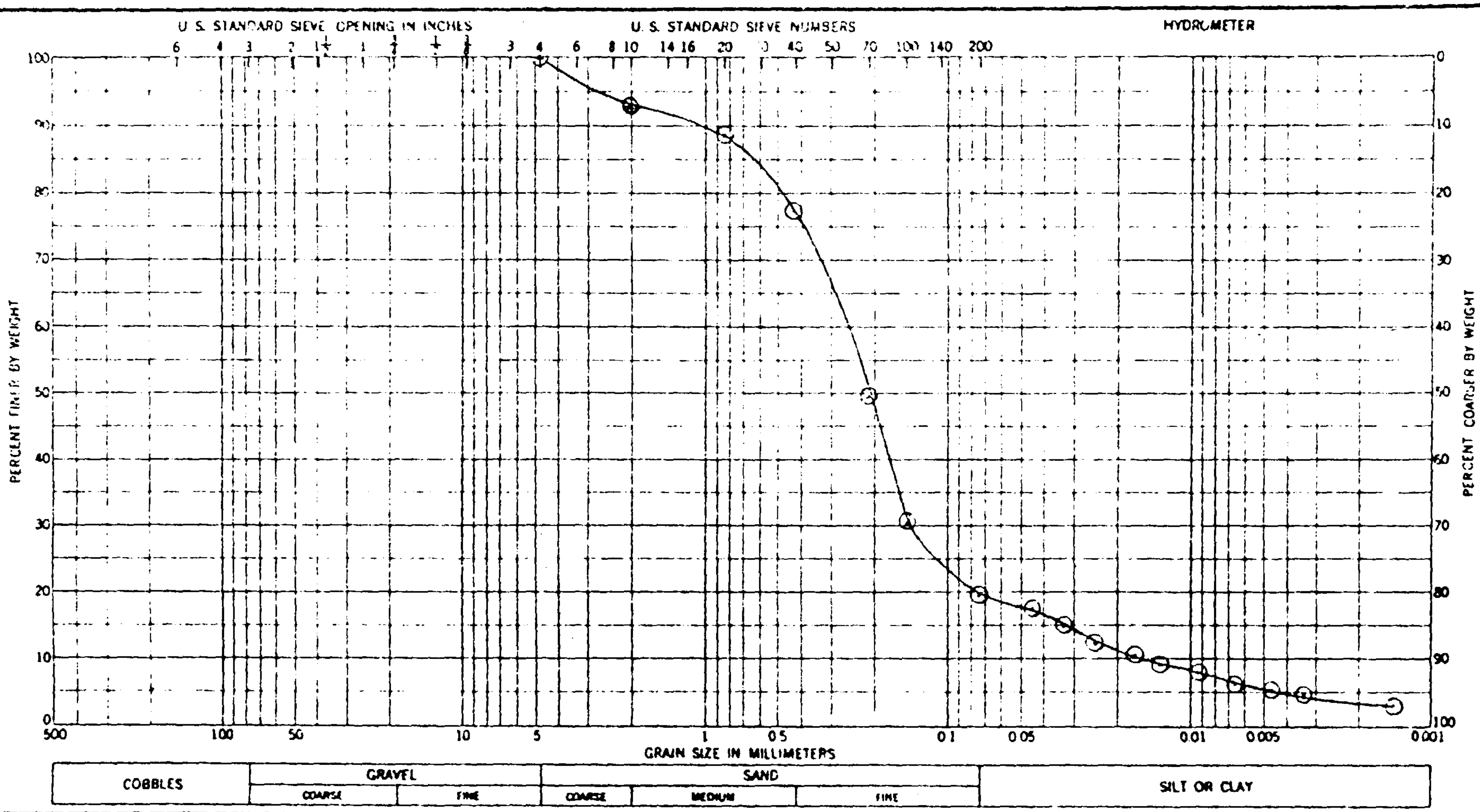
Boring No.: 100-422-30

Date: 11/1/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-30



Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
9967 D	16"-26"	Olive green - silty med SAND (SM)		70	40	30
		Sp. Gr = 2.66				

Project NEW BEDFORD, MA

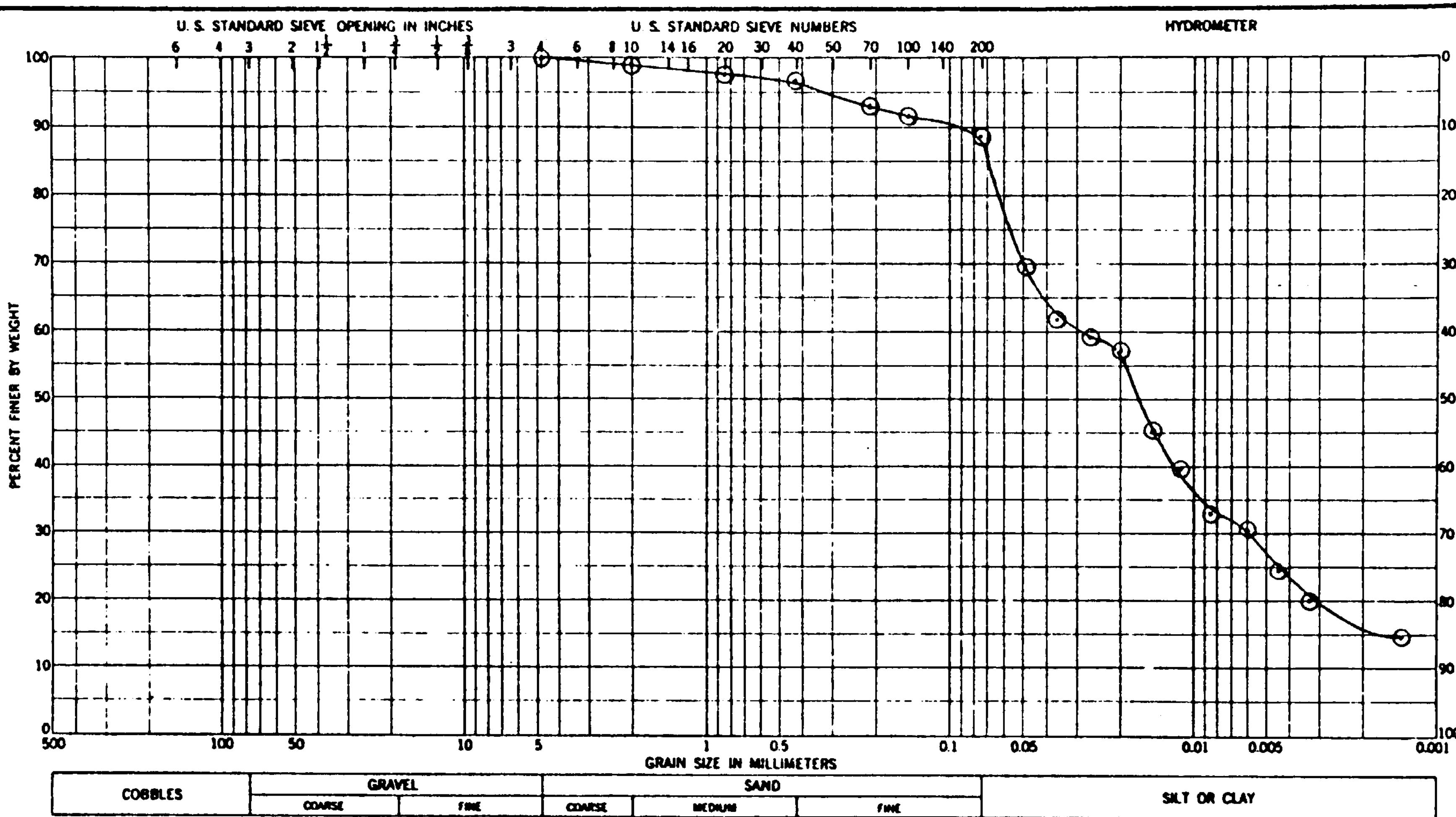
Area 9967 D

Boring No. 100-422-31

Date 11/1/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
I-11-1	13"-16"	Gray - Organic silt (OH)		104	45	59
		Sp. Gr. = 2.64				

Project: NEW BEDFORD, MA

Area: I

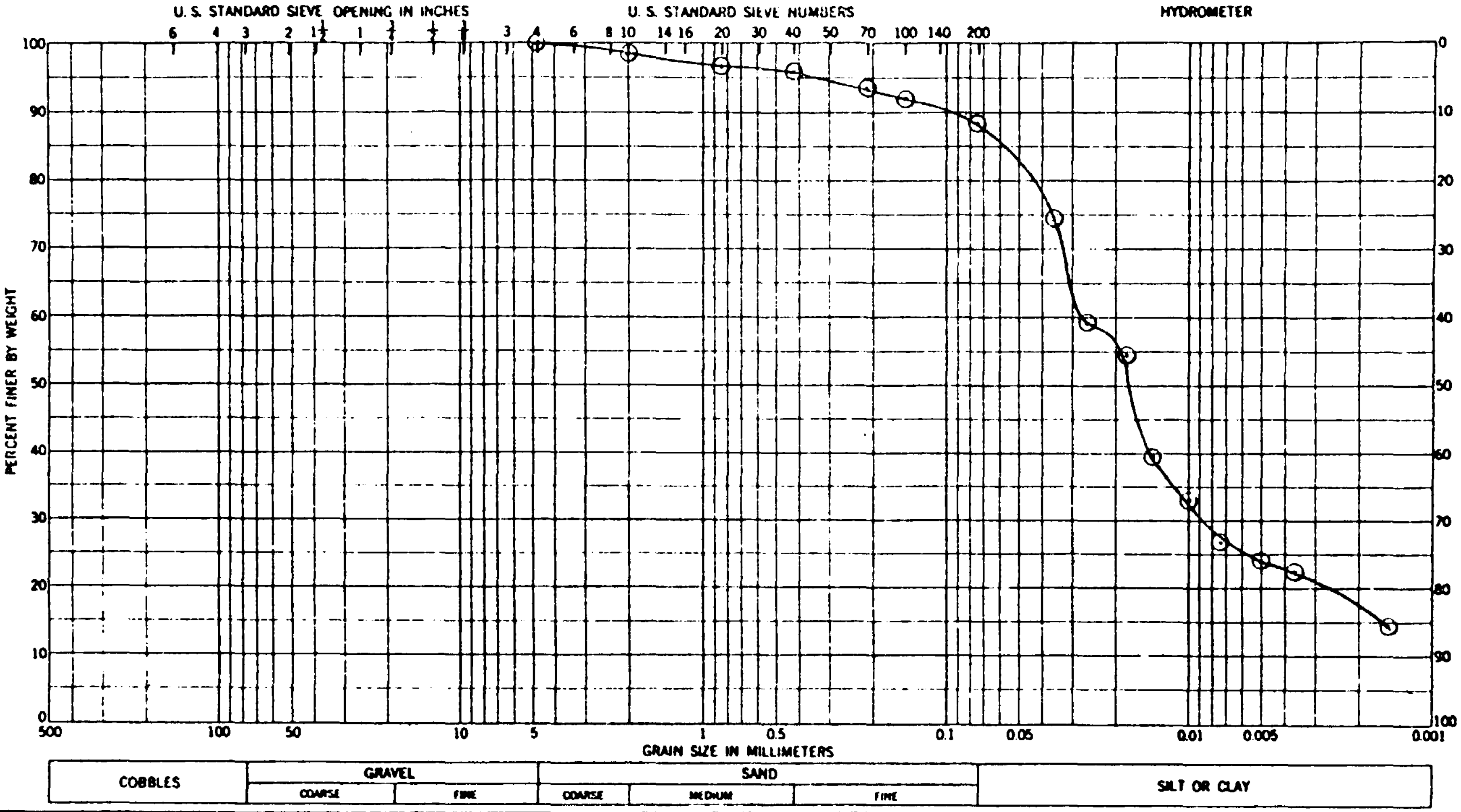
LAB SER Boring No.: 100-426-1

Date: 12/9/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087

H-31



H-32

Sample No	Elev or Depth	Classification	Nat w %	LL	PL	PI
L-10-1	0"-11"	Black - Organic silt (OH)		182	81	101
		Sp. Gr. = 2.41				

Project: NEW BEDFORD, MA

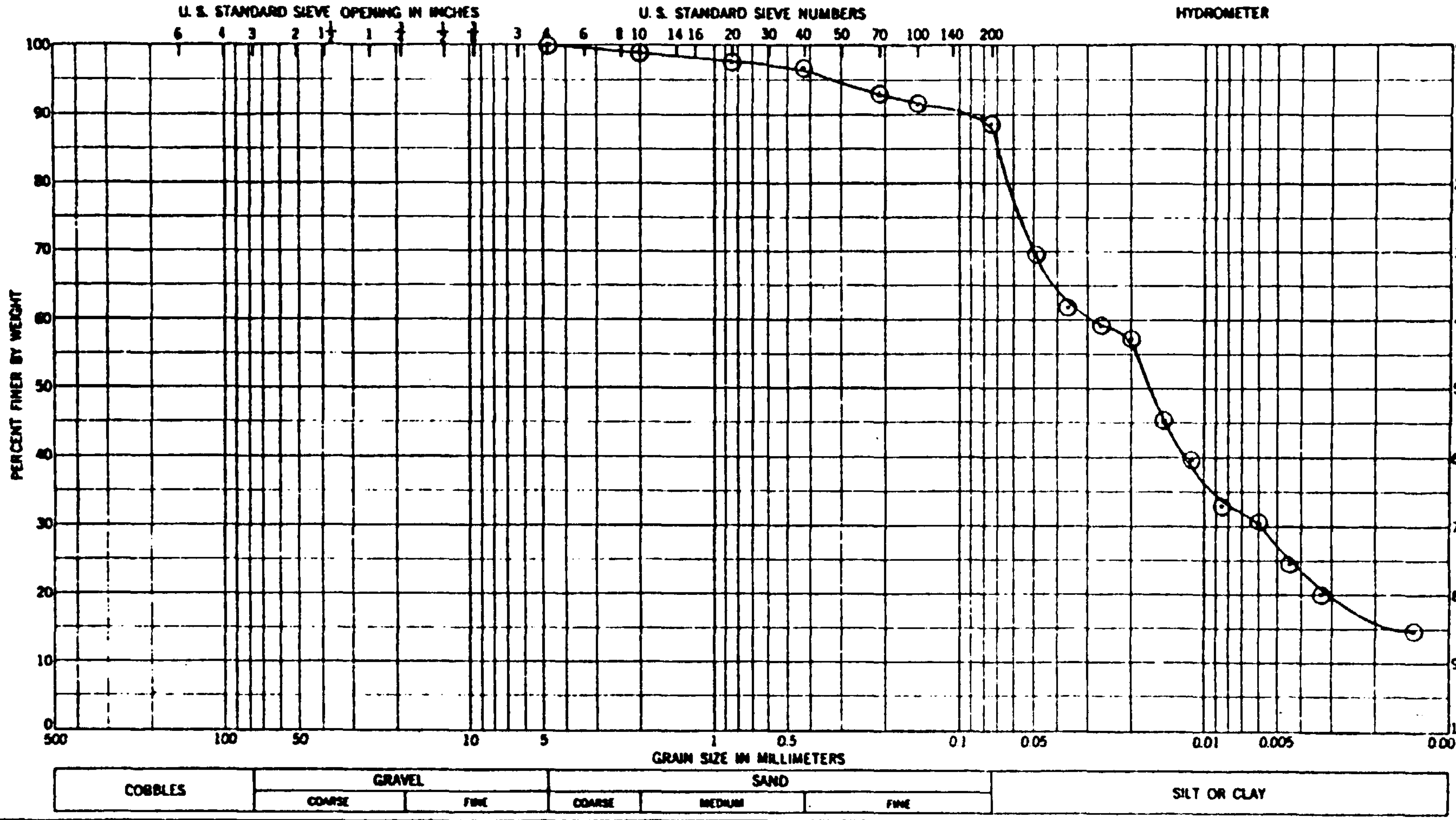
Area: L

LAB SER No.: 100-426-3

Date: 12/9/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No	~~Elev or~~ Depth	Classification	Nat w %	LL	PL	PI
I-11-1	13"-16"	Gray - Organic silt (OH)		104	45	59
		Sp. Gr. = 2.64				

Project: NEW BEDFORD, MA

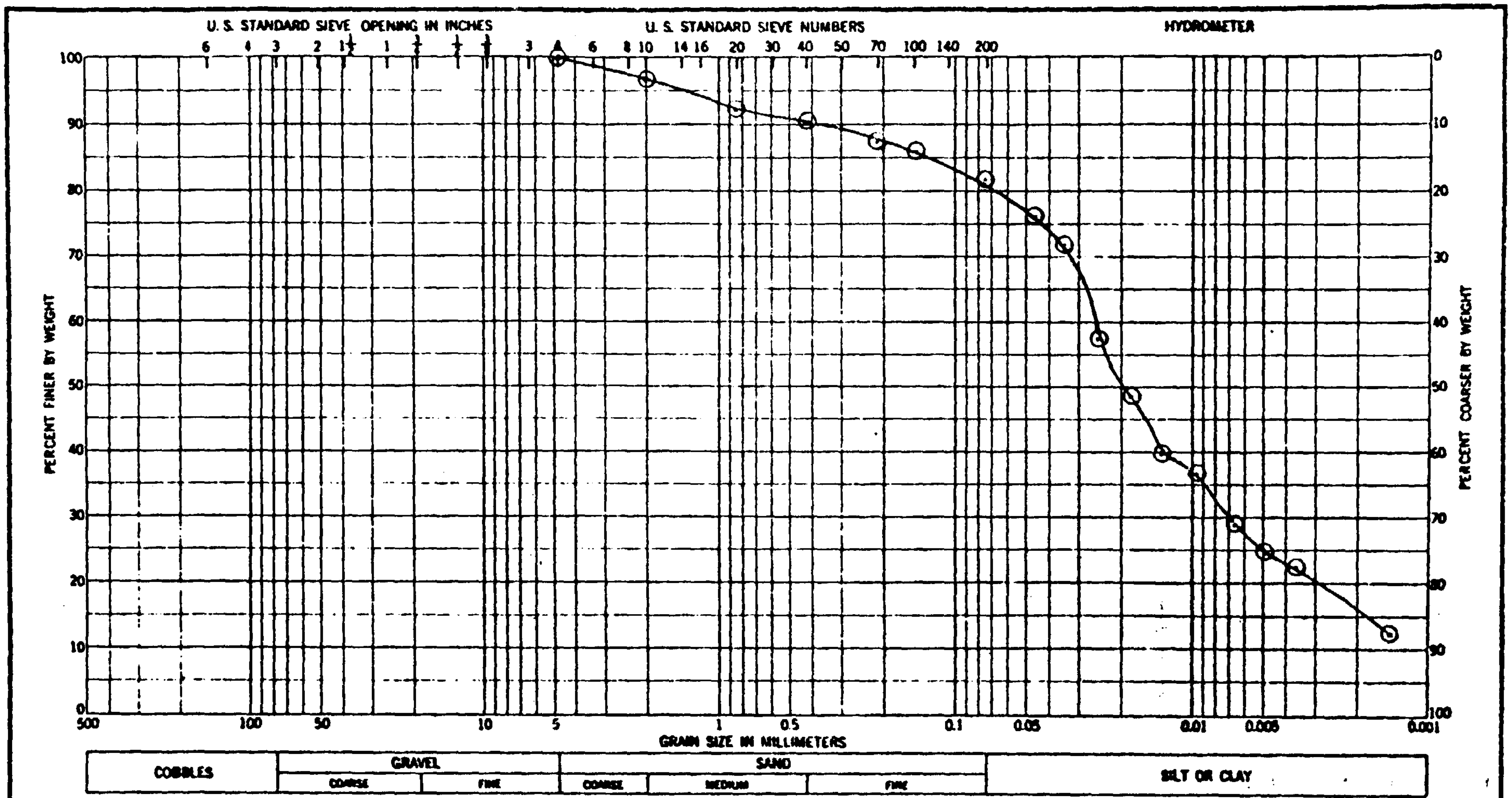
Area: I

48 SER ~~Boring~~ No.: 100-426-1

Date: 12/9/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087



Sample No.	Elev or Depth	Classification	Nat w %	LL	PL	PI
J-8-2	24"-32"	Gray - Organic silt with Sand (OH) w/shell frag Sp. Gr. = 2.52		134	55	79

Project	NEW BEDFORD MA
Area	J
LAB SER Boring No.	100-426-2
Date	12/9/85

GRADATION CURVES

ENG FORM 1 MAY 63 2087