UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geotechnical index properties of surficial sediments from central Buzzards Bay, Massachusetts

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INTRODUCTION

Buzzards Bay, which is located off southeastern Massachusetts, borders the western edge of the Cape Cod peninsula (Fig. 1). Hough (1940) and Moore (1963) have both described the bay and its recent sediments, and Robb and Oldale (1977) have mapped the geology of the bay. The investigation of geotechnical index properties was part of a larger project investigating the *in situ* pore pressures of central Buzzards Bay. This area of the bay was chosen because of its silty-clay sediments (Robb and Oldale, 1977).

METHODS

During August 1982, 14 gravity cores (1.5 m long, 10 cm inside diameter) were taken in the study area to establish the geotechnical index properties of the top meter of sediment. Figure 2 shows the location of cores taken in central Buzzards Bay. The cores were extruded in the laboratory and natural and remolded shear-strength measurements were made using a four-bladed, 12.7-mm-square laboratory vane. Samples were removed from both sides of the shear-strength measurement location to allow adequate material for performing index property tests. Liquid limit tests were performed using a fall-cone penetrometer following guidelines established by the British Standards Institute (BSI, 1377, 1975). Guidelines prescribed by the American Society of Testing Materials (ASTM D 424-59, 1977) were used to determine the plastic limit. Specific gravity was measured for each sample by means of an air-comparison pycnometer, Beckman Model 930. All data were corrected for salt content. The results of the analyses are presented in Table 1 and a summary of the geotechnical index properties is presented in Table 2.

REFERENCES CITED

American Society for Testing and Materials, 1977, Annual book of ASTM standards, part 19, natural building stones; soil and rock; peats, mosses, and humis: Philadelphia, Penn., American Society for Testing and Materials, 494 p.

British Standards Institute, 1975, Methods of test for soils for civil engineering purposes: London, British Standards Institute, 412 p.

Hough, J. L., 1940, Sediments of Buzzards Bay, Massachusetts: Journal of Sedimentary Petrology, v. 10, no. 1, p. 19-32.

Moore, J. R., 1963, Bottom sediment studies, Buzzards Bay, Massachusetts: Journal of Sedimentary Petrology, v. 33, no. 3, p. 511-558.

Robb, J. M., and Oldale, R. N., 1977, Preliminary geologic maps, Buzzards Bay, Massachusetts: U.S. Geological Survey Miscellaneous Field Study Map Series, MP-889, 2 sheets.

Table 1. Geotechnical index properties of central Buzzards Bay

Core number/ Latitude (N.)/ Longitude (W.)	Sample interval (m)	γ_t (g/cc)	w (%)	e	n (%)	w_L (%)	w_P (%)	I_L	I_P (%)	G_s	S_u (kPa)	S_t
11												
41°32.18′	.075-.125	1.42	123	3.21	76	82	38	1.93	44	2.61	1.37	
70°47.56′	.55-.60	1.51	93	2.44	71	74	35	1.49	39	2.62	5.49	
15A	.075-.125	1.43	121	3.17	76	72	35	2.32	37	2.63	**	
41°31.68′												
70°49.42′	.415-.465	1.52	91	2.38	70	68	34	1.68	34	2.62	7.20	4.21
16	0-.1	1.42	125	3.26	77	74	37	2.38	37	2.62	**	
41°31.91′	.475-.525	1.49	98	2.58	72	80	41	1.46	39	2.62	3.43	
70°48.65′												
16A	.075-.125	1.51	96	2.53	72	78	38	1.45	40	2.65	4.11	2.25
41°31.91′	.605-.655	1.51	95	2.49	71	76	35	1.46	41	2.63	4.11	2.57
70°48.68′												
17	.075-.125	1.47	106	2.76	73	80	38	1.62	42	2.61	2.28	2.52
41°31.68′	.555-.605	1.57	79	2.09	68	69	31	1.26	38	2.64	4.34	3.81
70°48.13′												
18	.075-.125	1.45	111	2.90	74	85	42	1.60	43	2.61	**	
41°32.04′												
70°47.25′												
19	0-.10	1.43	119	3.12	76	78	34	1.93	44	2.62	**	
41°31.72′	.475-.525	1.48	101	2.67	73	80	35	1.47	45	2.63	**	
70°46.85′												

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* Too weak to measure
** not measured

Table 1. Geotechnical index properties of central Buzzards Bay (cont.)

Core number/ Latitude (N.)/ Longitude (W.)	Sample interval (m)	γ_t (g/cc)	w (%)	e	n (%)	w_L (%)	w_P (%)	I_L	I_P (%)	G_s	Su (kPa)	S_t
19A	.075-.125	1.45	110	2.88	74	79	36	1.72	43	2.61	2.97	3.26
41°31.73′	.605-.655	1.53	88	2.33	70	71	32	1.44	39	2.64	2.51	
70°46.86′												
20	.075-.125	1.44	115	2.99	75	90	44	1.54	46	2.60	2.28	2.21
41°31.71′	.61-.66	1.48	103	2.69	73	80	36	1.52	44	2.62	1.49	
70°46.05′												
21	0-.10	1.41	129	3.35	77	85	42	2.02	43	2.61	6.97	2.78
41°31.87′	.475-.525	1.44	116	3.01	75	96	39	1.35	57	2.60	**	
70°45.21′	.68-.73	1.47	105	2.77	73	91	39	1.27	52	2.63	6.86	2.14
21A	.075-.125	1.38	141	3.70	79	90	39	2.00	51	2.62	**	
41°31.88′												
70°45.23′	.435-.485	1.46	106	2.77	73	81	39	1.60	42	2.60	4.68	
25	.075-.125	1.56	82	2.15	68	57	31	1.96	26	2.63	1.94	
41°31.26′	.44-.49	1.60	73	1.93	66	61	30	1.39	31	2.64	5.71	1.66
70°47.60′												
32	.075-.125	1.55	83	2.18	69	77	31	1.13	46	2.62	3.20	2.81
41°30.61′	.475-.525	1.48	103	2.68	73	71	36	1.91	35	2.61	4.34	2.71
70°47.27′	.75-.91	**	59	**	**	48	25	1.48	23	**	**	
32A	.075-.125	1.52	91	2.39	71	65	31	1.76	34	2.63	4.11	1.64
41°30.63′	.575-.625	1.60	74	1.96	66	56	30	1.69	26	2.65	7.31	
70°47.29′												

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* Too weak to measure

** Not measured

Table 2. Summary of geotechnical index properties, Project Athena (central Buzzards Bay) 1982

	γ_t (g/cc)	w (%)	e	n (%)	w_L (%)	WP (%)	I_L	I_P (%)	G_s	S_u (kPa)	S_t
Maximum	1.60	141	3.70	79	96	44	2.38	57	2.65	7.31	4.21
Minimum	1.38	59	1.93	66	48	25	1.13	23	2.60	1.37	1.64
Mean	1.48	101	2.69	73	76	36	1.65	40	2.62	4.13	2.66

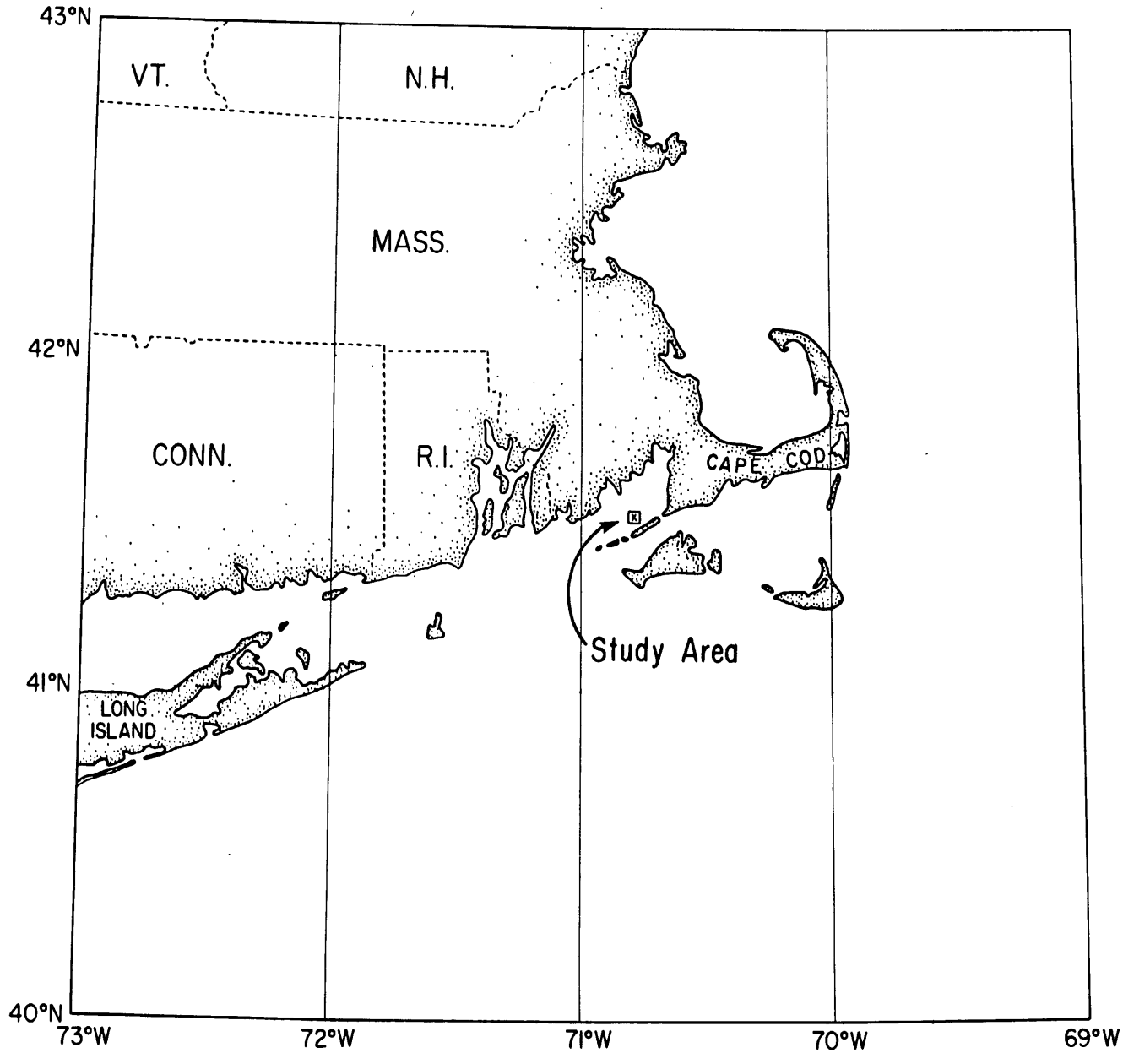

Figure 1. Buzzards Bay showing study area.

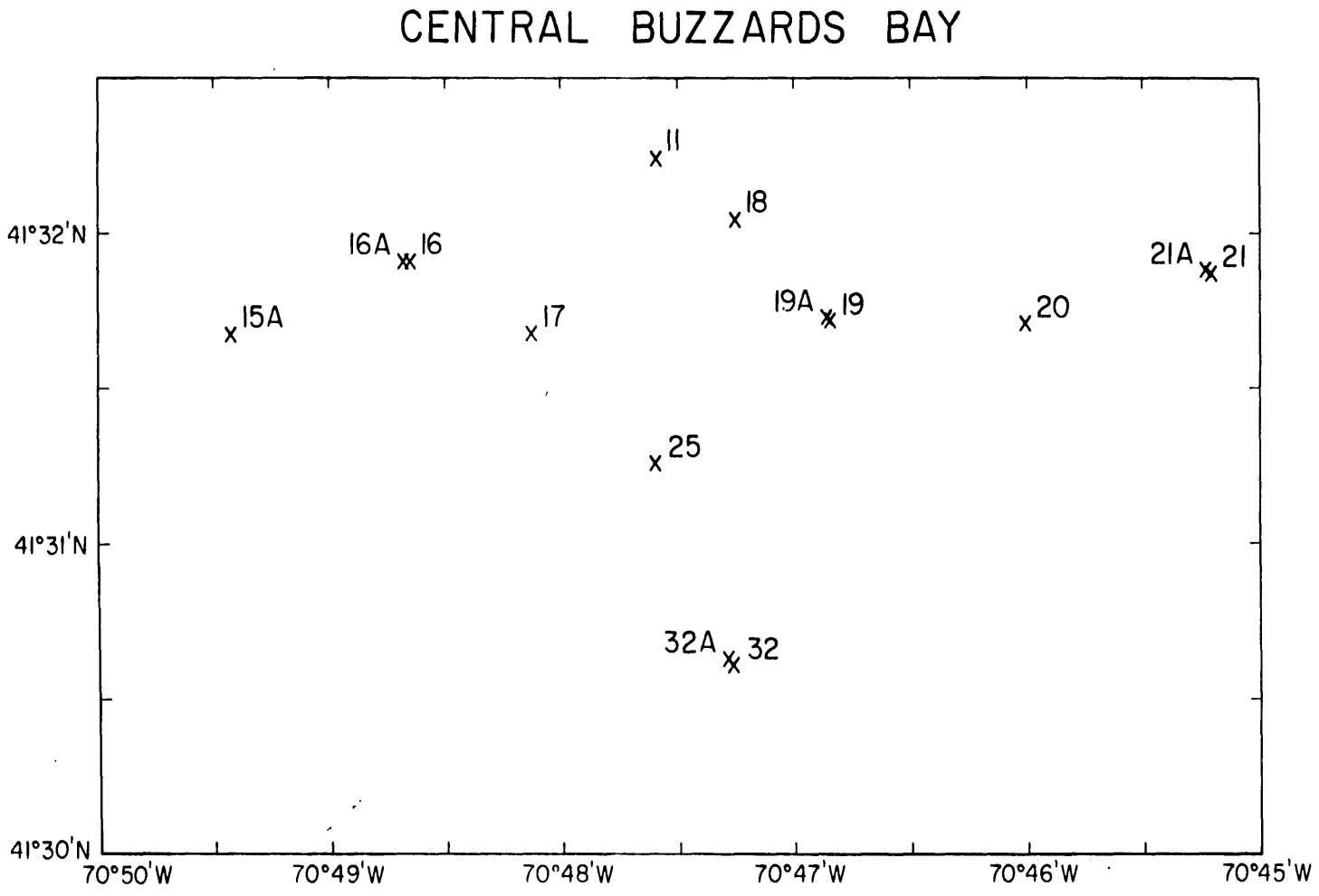

Figure 2. Central Buzzards Bay with location of gravity cores.