UNITED STATES
DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

[Report - open file series]

AGE, GRAIN SIZE, MINERALOGY, AND CARBON/CARBONATE CONTENT OF MIOCENE AND PLIOCENE SAMPLES FROM DREDGE HAULS, DSDP HOLES 184B AND 185, AND THE SANDY RIVER WELL, SOUTHERN BERING SEA CONTINENTAL MARGIN AND ALASKA PENINSULA

M. B. Underwood, T. L. Vallier, J. V. Gardner,
and J. A. Barron

U. S. Geological Survey

OPEN FILE REPORT
79-450

This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature.

A jointly supported program between the Bureau of Land Management and the U. S. Geological Survey, Pacific-Arctic Branch of Marine Geology was undertaken in the Southern Bering Sea with funds managed by the Outer Continental Shelf Environmental Assessment Program (OCSEAP) Office. This report provides data from analyses that were performed on Miocene and Pliocene rocks and sediments taken from dredge hauls along the continental slope, DSDP holes (184B and 185) along the outer part of the continental slope and Umnak Plateau, and the Sandy River Well on the Alaska Peninsula (figs. 1 and 2). Vallier and others (1979) incorporated these data in a discussion of Neogene sedimentation in the southern Bering Sea.

Dredge haul samples are from a 1967 cruise of the R/V THOMAS A. THOMPSON (TT-3), described in more detail by Hopkins and others (1969), and a 1977 U. S. Geological Survey cruise of the R/V SEA SOUNDER, designated S6-77, DR-2 and DR-4 (figs. 3 and 4). Samples for comparative studies were selected from DSDP holes 184B (depths of 300 to 650 m below the sea floor) and 185 (depths of 170 to 630 m) of Leg 19 (Creager, Scholl, and others, 1973). Samples from the Sandy River Well were selected from cuttings taken between depths of 3,000 and 10,190 feet (900 and 3,100 m) in Miocene and Pliocene rocks, in part correlative to the Bear Lake Formation, a rock unit that is well exposed along the Alaska Peninsula (Burk, 1965).

Grain size data are presented in Table 1, which includes not only the relative percentages of sand, silt, and clay but also the sand to silt and clay ratios, and phi (ϕ) values of the median and mean grain sizes, sorting, skewness, and kurtosis. Replicate values are shown where data were checked for precision. Carbon (inorganic and organic) and carbonate values are given in Table 2. Mineralogies of the heavy fractions (specific gravity ≥ 2.85), light fractions (specific gravity < 2.85), and clay fractions (< 2 microns) are reported in

Tables 3, 4 and 5 respectively. Lithologic descriptions of thin sections and modal analyses are given in Tables 6 and 7. Species list and ages of diatoms and silicoflagellates are presented in Table 8.

Shipboard underway geophysics for Cruise S6-77 were presented by Gardner and Vallier (1978). Creager, Scholl and others (1973) reported data and conclusions for the DSDP holes (184B and 185). Data from the Sandy River Well were given by McLean (1977). Hopkins and others (1969) discussed the samples from dredge haul TT-3.

Subsamples of the dredge haul rocks were selected on board the R/V SEA SOUNDER for grain size, carbon-carbonate, and thin section analyses whereas samples from dredge haul TT-3 and from the Sandy River Well were chosen from collections stored at the U. S. Geological Survey marine facility in Menlo Park, California. Samples from DSDP holes 184B and 185 were selected at the Deep Sea Drilling Project repository at Scripps Institution of Oceanography, La Jolla, California. Samples chosen for grain size analyses also were used for analyses of heavy, light, and clay mineralogy.

Grain size was measured by first splitting samples into >63μ and <63μ size fractions. A 2-meter rapid sediment analyzer (Thiede and others, 1976) was used to analyze the >63μ fraction and the <63μ size fraction was analyzed with a hydrophotometer (Jordan and others, 1971). Calibration tests and replicate runs show that the rapid sediment analyzer has a precision of ±5% and an accuracy of ±5% whereas the hydrophotometer has a precision of ±10% and an accuracy of ±1%. Grain size parameters of Folk and Ward (1957) are given in Table 1.

Inorganic carbon, organic carbon, and carbonate values were determined with a LECO model WR-12 carbon analyzer. The LECO has a precision of ±2% and

an accuracy of ±1% based on studies of replicate analyses.

Bulk samples of sand and silty sand were sieved to retrieve the 63 to 88 micron size fraction, which was subsequently floated on diluted tetrabromoethane (specific gravity 2.85) to separate light and heavy components by the gravity method. Random mounted slides were prepared and more than 300 grains were counted using the line method (Galehouse, 1971).

The <2 micron size fraction was used for studies of clay mineralogy following the preparation procedures of Hein and others (1976) and the semi-quantitative weighted-peak X-ray diffraction technique of Biscaye (1965). A polar planimeter was used to measure the areas under the peaks on the diffractograms. Diffractograms were run from 3° to 14° 2 θ and measurements of peak areas were made on diffractograms of glycolated samples. Peaks corresponding to d-spacings of 7Å, 10Å, and 17Å were routinely measured for chlorite/kaolinite, illite, and mixed layer clays respectively. No internal standards were used in this study.

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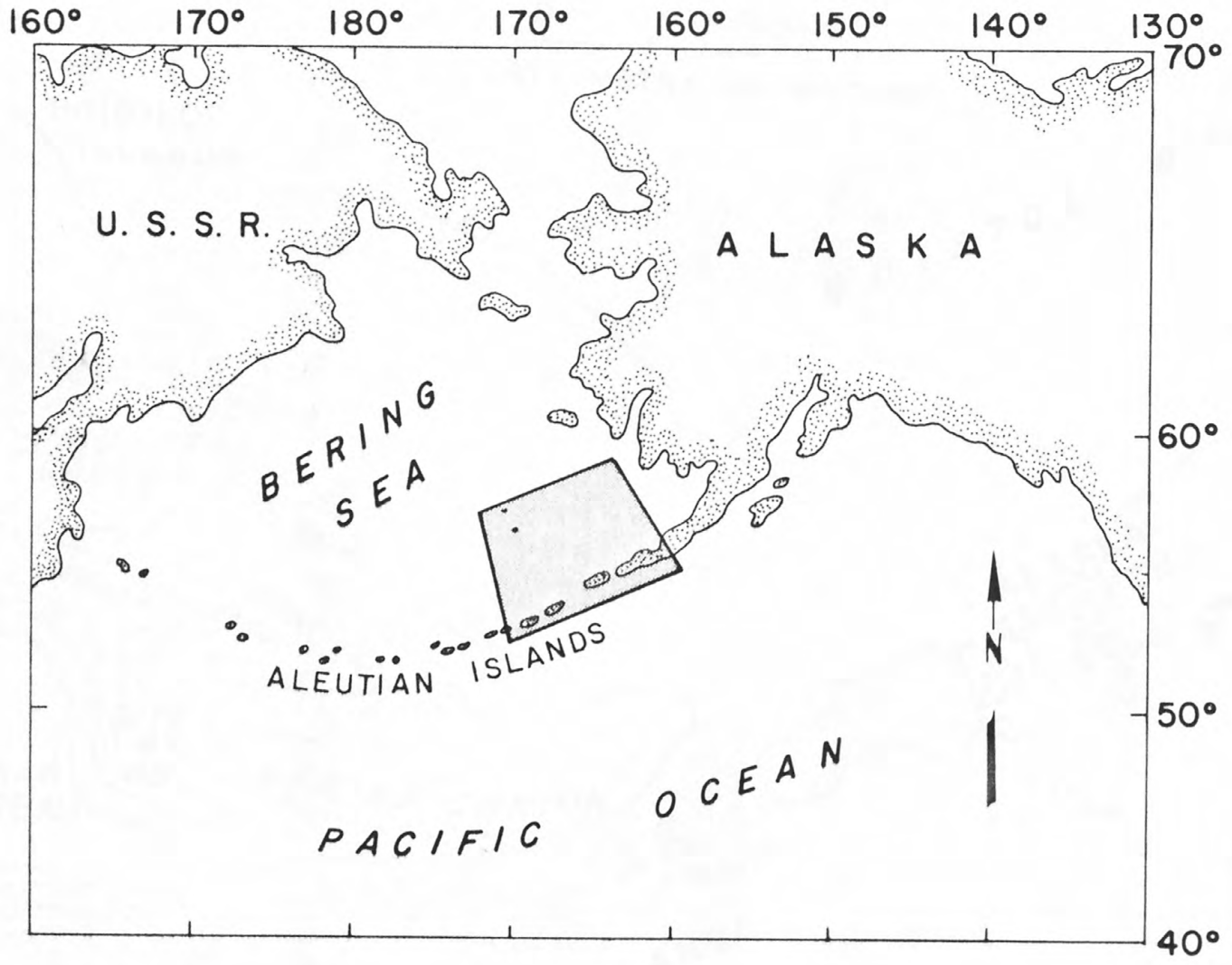
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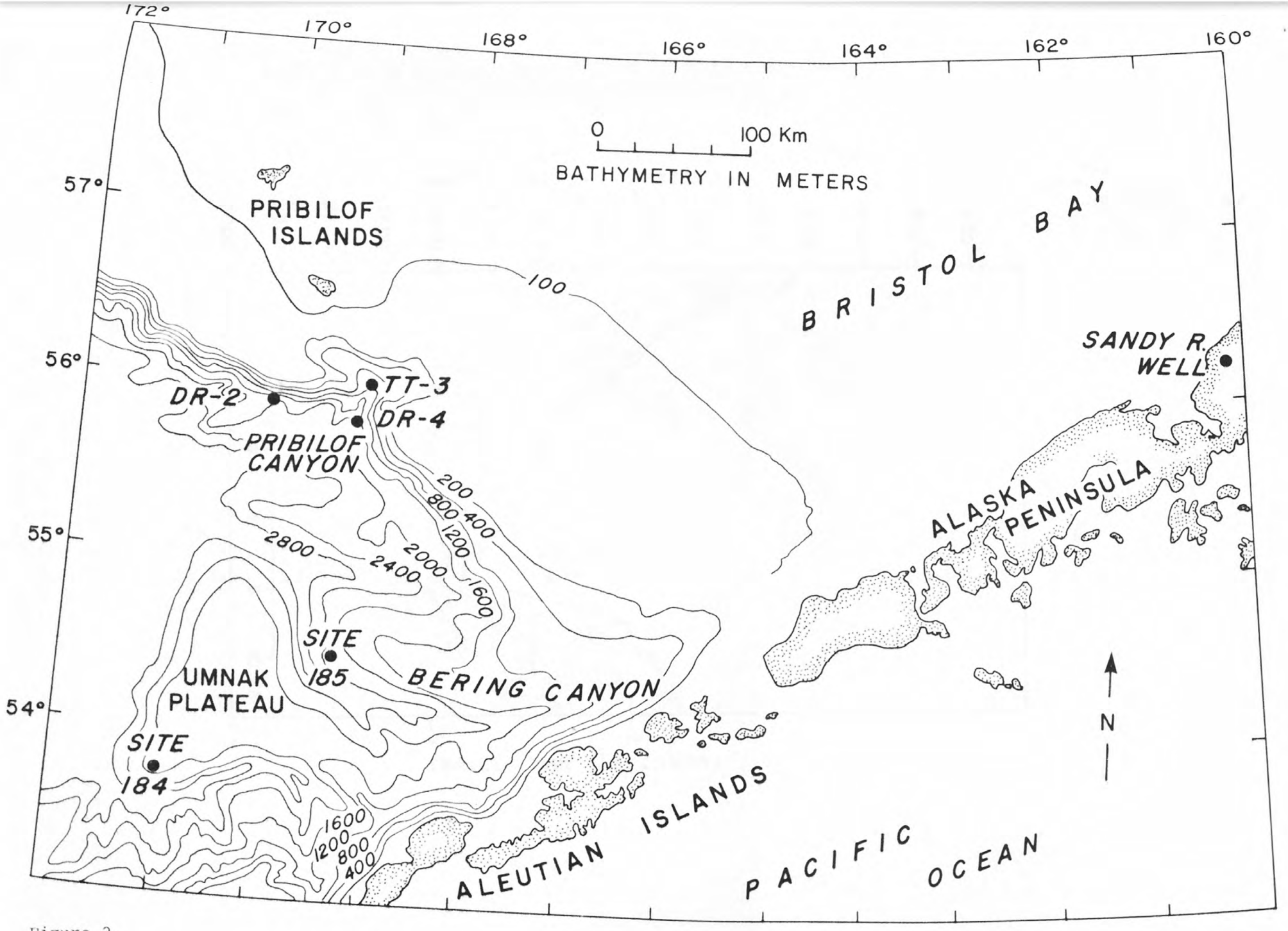
170°
180°
170°
160°
150°
140°
130°
70°
60°
50°
40°
U. S. S. R.
ALASKA
BERING SEA
ALEUTIAN ISLANDS
PACIFIC OCEAN
N

Figure 1.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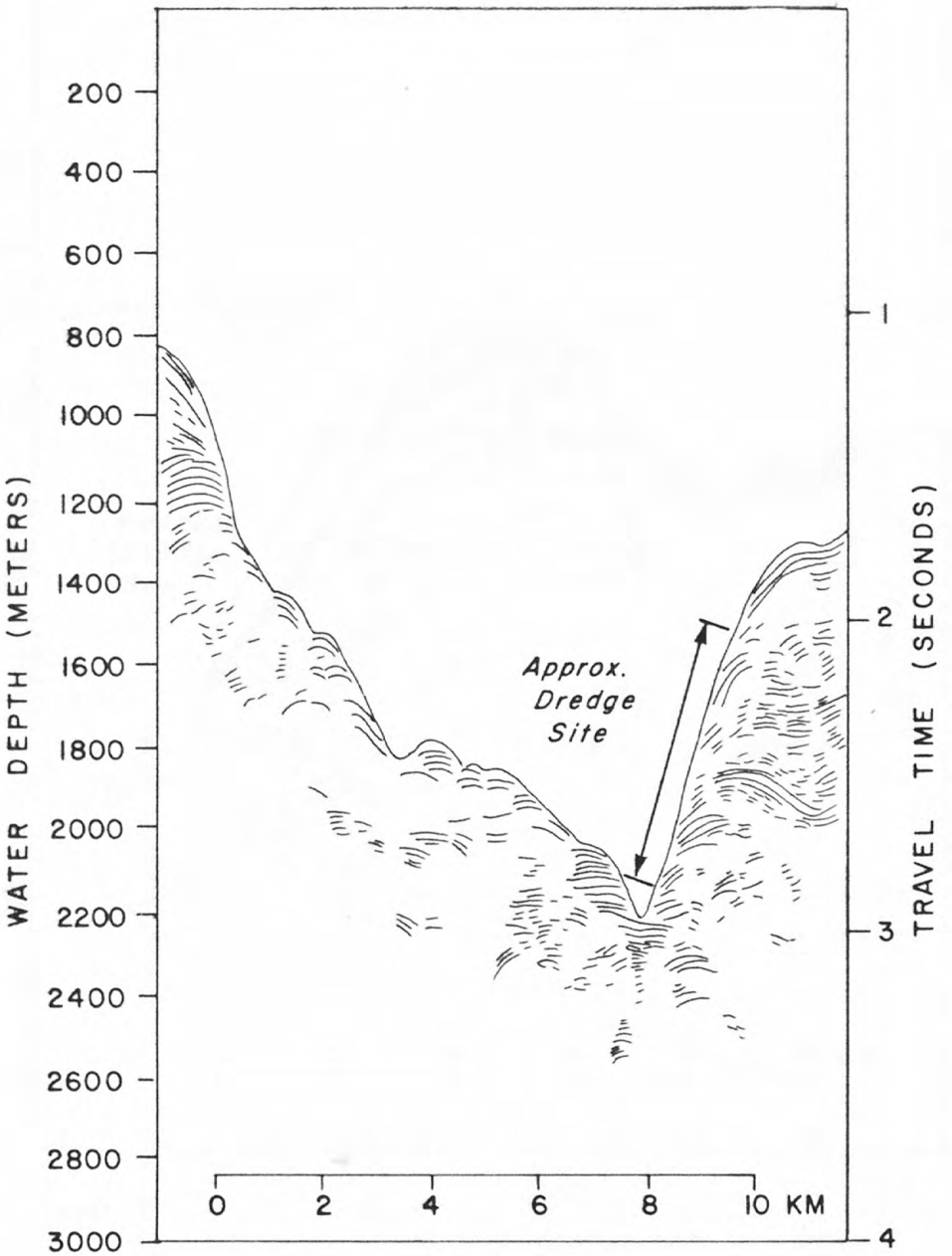
57°
56°
55°
54°
0
100 Km
BATHYMETRY IN METERS
PRIBILOF ISLANDS
BRISTOL BAY
100
SANDY R. WELL
TT-3
DR-2
DR-4
PRIBILOF CANYON
200
400
800
1200
1600
2000
2400
2800
ALASKA PENINSULA
SITE 185
BERING CANYON
UMNAK PLATEAU
SITE 184
N
ALEUTIAN ISLANDS
PACIFIC OCEAN

Figure 2.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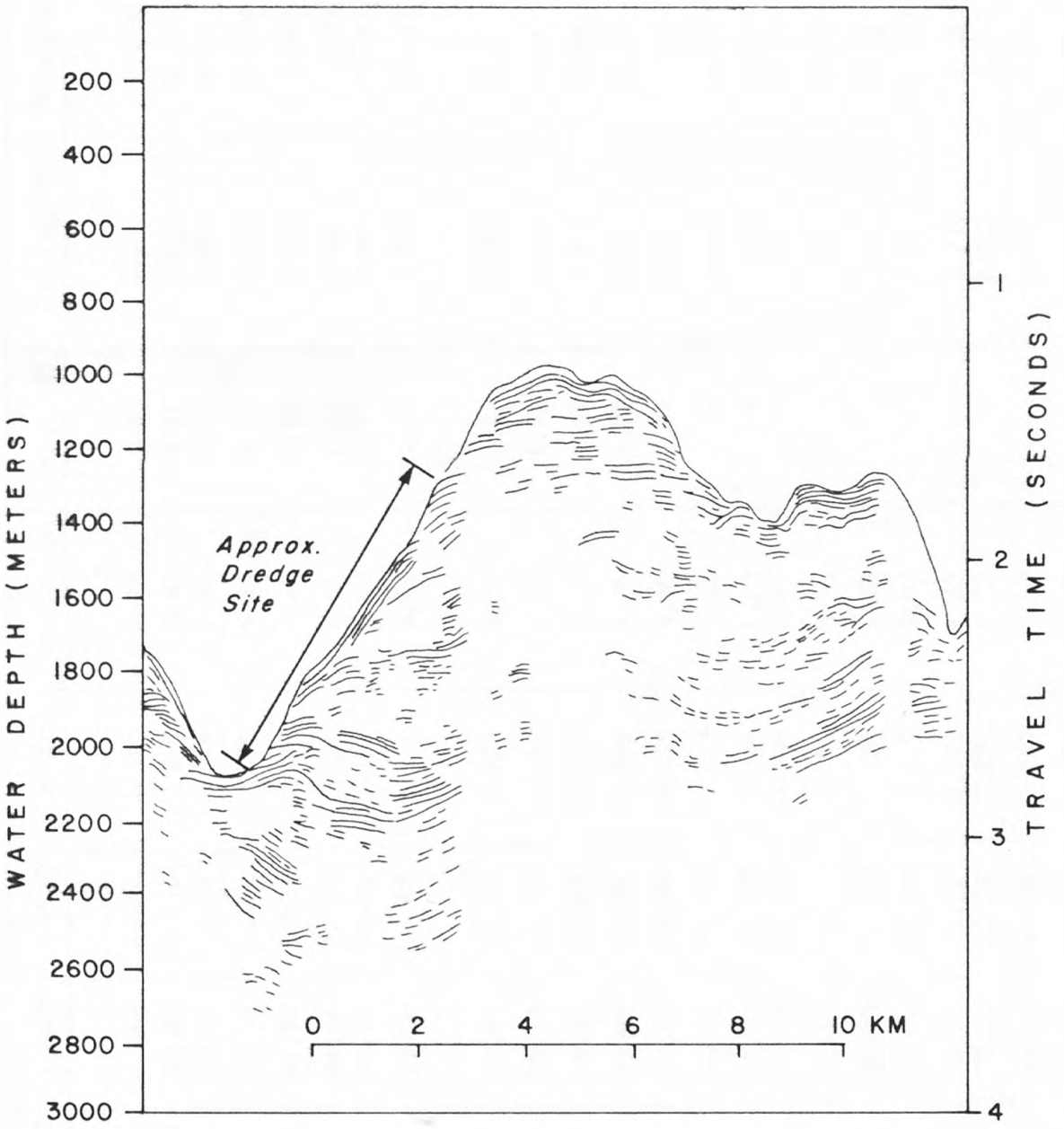
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
TRAVEL TIME (SECONDS)
1
2
3
4
Approx.
Dredge
Site
0
2
4
6
8
10 KM

Figure 3.


WATER DEPTH (METERS)
200
400
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1200
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1600
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2200
2400
2600
2800
3000
TRAVEL TIME (SECONDS)
1
2
3
4
Approx.
Dredge
Site
0
2
4
6
8
10 KM

Figure 4.

Table 1.--Grain size data.

SAMPLE NO.	% Sand	% Silt	% Clay	Sand/Mud	Median (Ø)	Mean (Ø)	Sorting (Ø)	Skewness	Kurtosis
S6-77									
DR2-1	60.25	27.23	12.51	1.516	3.69	4.78	2.28	0.766	1.087
DR2-2	61.77	32.48	5.74	1.616	3.43	4.11	1.92	0.515	1.239
	61.77	32.48	5.74	1.616	3.35	4.08	1.91	0.553	1.210
DR2-3	15.09	60.36	24.54	0.178	6.29	6.57	2.69	0.228	1.165
DR2-4	22.80	61.90	15.28	0.295	5.44	5.60	2.37	0.255	1.103
DR2-5	16.05	54.36	29.58	0.191	6.58	6.85	2.96	0.189	0.986
	16.05	56.36	27.58	0.191	6.63	6.77	2.86	0.147	1.046
DR2-6	60.25	34.26	5.48	1.516	3.44	4.15	1.65	0.681	1.156
S6-77									
DR4-6	24.09	61.40	14.50	0.317	5.26	5.49	2.36	0.281	1.184
DR4-8	12.80	64.42	22.77	0.147	6.20	6.59	2.53	0.287	1.244
DR4-12	10.60	64.22	25.17	0.119	6.55	6.80	2.67	0.201	1.292
DR4-13	15.68	65.85	18.46	0.186	5.78	6.07	2.40	0.285	1.142
DR4-14	23.35	60.34	13.88	0.315	5.30	5.37	2.67	0.091	1.382
DR4-15	25.78	65.44	8.77	0.347	5.23	5.26	2.08	0.125	1.145
DR4-16	9.01	70.20	20.77	0.099	6.27	6.53	2.48	0.196	1.498
	9.01	70.32	20.66	0.099	5.84	6.38	2.49	0.337	1.397
DR4-17	15.40	72.17	12.41	0.182	5.76	5.81	2.03	0.178	1.369
DR4-18	13.37	68.25	18.37	0.154	5.99	6.23	2.31	0.267	1.426
DR4-19	17.66	60.36	21.96	0.215	6.09	6.25	2.67	0.212	1.155
DR4-20	7.36	63.52	29.11	0.079	6.82	7.06	2.74	0.183	1.139
	7.36	70.25	22.38	0.079	6.33	6.66	2.42	0.267	1.339
DR4-21	23.48	61.06	15.45	0.307	5.57	5.63	2.50	0.152	1.240
DR4-22	23.62	62.29	14.07	0.309	5.62	5.51	2.61	0.024	1.410
	23.62	65.04	11.33	0.309	5.53	5.41	2.47	0.000	1.420

Table 1.--(continued)

SAMPLE NO.	% Sand	% Silt	% Clay	Sand/Mud	Median (Ø)	Mean (Ø)	Sorting (Ø)	Skewness	Kurtosis
S6-77									
DR4-23	9.55	58.24	32.20	0.106	6.74	7.13	2.93	0.220	1.037
DR4-24	12.79	54.98	32.21	0.147	6.29	7.05	3.02	0.367	0.912
	12.79	54.98	32.21	0.147	6.29	7.04	3.04	0.359	0.920
TT-3									
V-1	23.34	60.52	16.12	0.305	5.54	5.52	2.64	0.132	1.311
	23.34	60.52	16.12	0.305	5.54	5.59	2.56	0.170	1.249
V-2	4.23	68.47	27.28	0.044	6.67	7.07	2.43	0.332	1.176
V-3	29.91	56.41	13.66	0.427	5.19	5.23	2.59	0.159	1.057
	29.91	56.31	13.66	0.427	5.19	5.25	2.56	0.172	1.029
V-4	4.79	82.16	13.03	0.050	5.72	6.07	1.72	0.450	1.420
V-5	10.15	77.40	12.44	0.113	5.76	5.95	1.83	0.280	1.689
DSDP Hole 184B									
12-1 (90-92)	13.00	57.43	29.56	0.150	6.93	7.03	2.86	0.111	1.061
13-3 (25-27)	18.49	61.87	19.63	0.227	6.04	6.12	2.56	0.174	1.190
13-3 (100-102)	12.62	54.69	32.67	0.145	6.98	7.25	2.91	0.161	0.940
13-3 (108-109)	74.91	16.84	8.23	2.987	1.91	3.00	2.33	0.809	1.359
	74.91	16.84	8.23	2.987	1.80	2.96	2.33	0.843	1.338
14-1 (130-132)	12.45	64.32	23.22	0.142	6.44	6.63	2.58	0.187	1.326
14-4 (55-57)	12.53	63.63	23.82	0.143	6.54	6.66	2.60	0.168	1.270
14-4 (63-65)	36.25	49.98	13.76	0.569	5.47	5.20	2.66	0.053	0.852
15-1 (70-73)	13.65	62.79	23.55	0.158	6.16	6.52	2.64	0.264	1.309
15-2 (65-68)	10.25	71.69	18.05	0.114	6.35	6.39	2.23	0.147	1.654
16-1 (110-113)	12.96	62.15	24.88	0.149	6.72	6.76	2.66	0.123	1.209
16-1 (133-134)	15.81	67.73	16.45	0.188	5.83	5.97	2.25	0.242	1.114

Table 1.--(continued)

SAMPLE NO.	% Sand	% Silt	% Clay	Sand/Mud	Median (Ø)	Mean (Ø)	Sorting (Ø)	Skewness	Kurtosis
DSDP Hole 184 B									
17-2 (80-83)	14.44	67.22	18.32	0.169	6.15	6.23	2.40	0.148	1.501
18-2 (110-113)	7.67	69.09	23.24	0.083	6.24	6.66	2.44	0.325	1.336
18-2 (132-133)	50.00	30.32	13.96	1.129	2.45	3.82	3.43	0.532	0.954
19-2 (130-133)	11.25	57.89	30.85	0.127	6.86	7.13	2.85	0.167	1.062
20-4 (23-25)	5.89	83.33	10.77	0.063	5.54	5.89	1.58	0.469	1.617
20-5 (100-102)	16.08	67.77	16.13	0.192	5.88	5.96	2.26	0.198	1.294
	16.08	68.11	15.80	0.192	6.05	6.00	2.24	0.128	1.401
21-3 (100-103)	14.64	67.41	17.93	0.172	6.11	6.18	2.35	0.172	1.429
21-3 (144-145)	61.45	30.43	8.11	1.590	3.03	3.94	2.38	0.611	0.929
	61.45	31.24	7.30	1.590	3.03	3.85	2.26	0.591	0.988
22-2 (60-63)	17.76	66.32	15.90	0.216	5.95	5.89	2.40	0.090	1.474
22-6 (100-103)	9.99	70.42	19.57	0.111	6.21	6.43	2.33	0.233	1.609
DSDP Hole 185									
8-5 (40-43)	23.13	47.94	28.92	0.301	6.60	6.51	3.28	0.049	1.040
	23.13	47.94	28.92	0.301	6.60	6.51	3.27	0.052	0.976
8-5 (79-81)	52.33	37.79	9.33	1.110	3.63	4.01	2.75	0.312	0.830
8-5 (90-93)	5.46	54.76	39.77	0.058	7.49	7.58	2.96	0.116	0.837
9-1 (95-98)	6.90	66.63	26.46	0.074	6.80	6.98	2.58	0.180	1.429
10-1 (140-143)	13.85	58.79	27.35	0.161	6.72	6.88	2.81	0.136	1.105
10-3 (80-83)	16.19	58.61	25.18	0.193	6.50	6.69	2.87	0.159	1.163
10-3 (105-108)	3.42	82.22	13.83	0.036	6.02	6.35	1.62	0.447	1.626
10-3 (127-130)	59.10	35.79	5.10	1.445	3.59	3.99	1.72	0.434	1.173
	59.10	35.77	5.11	1.445	3.59	3.99	1.72	0.435	1.120
	59.10	35.77	5.11	1.445	3.55	4.00	1.70	0.477	1.152
	59.10	35.79	5.10	1.445	3.55	4.00	1.69	0.476	1.208

Table 1.--(continued)

SAMPLE NO.	% Sand	% Silt	% Clay	Sand/Mud	Median (Ø)	Mean (Ø)	Sorting (Ø)	Skewness	Kurtosis
DSDP Hole 185									
10-4 (10-13)	14.17	58.72	27.10	0.165	6.45	6.77	2.85	0.190	1.119
11-2 (110-113)	7.89	63.55	28.55	0.086	6.30	6.92	2.74	0.360	1.132
12-2 (110-113)	4.67	68.39	26.93	0.049	6.84	7.06	2.48	0.229	1.382
13-1 (111-115)	3.08	60.99	35.92	0.032	7.45	7.52	2.74	0.146	0.975
14-1 (90-93)	4.08	71.94	23.97	0.043	6.38	6.88	2.27	0.396	1.316
15-2 (75-78)	5.84	68.73	25.41	0.062	6.63	6.95	2.46	0.263	1.326
16-2 (60-63)	26.36	55.75	17.88	0.358	6.01	5.89	2.60	0.090	1.042
17-2 (21-23)	8.01	69.00	22.98	0.087	6.60	6.77	2.44	0.190	1.505
17-3 (25-28)	13.22	62.39	24.38	0.152	6.43	6.66	2.67	0.193	1.237

Table 2.--Carbon-carbonate data.

SAMPLE NUMBER	% TOTAL CARBON	% CARBONATE	% ORGANIC CARBON (Ave.)
TT-3			
V-1	0.4086, 0.3978	0.006	0.40
V-2	0.3940, 0.3619, 0.3798	-----	0.38
V-3	0.2944, 0.2789	0.008	0.28
V-4	0.3598, 0.3404	-----	0.35
V-5	0.4098, 0.4014, 0.4455	-----	0.42
S6-77			
DR2-1	0.7130, 0.7256	-----	0.71
DR2-2	0.1721	-----	0.16
DR2-3	0.4356	-----	0.43
DR2-4	0.6413	0.009	0.63
DR2-5	0.4900, 0.4841	-----	0.48
DR2-6	0.7890	0.008	0.78
S6-77			
DR4-6	0.4034, 0.3970	0.021	0.38
DR4-7	0.2558	-----	0.25
DR4-8	1.4256	-----	1.42
DR4-10	0.8098	-----	0.80
DR4-11	0.2486, 0.2533	-----	0.25
DR4-12	0.5318, 0.5485	-----	0.54
DR4-13	0.3063	-----	0.30
DR4-14	0.3516	0.009	0.34
DR4-15	0.6382	-----	0.63
DR4-16	0.4243	-----	0.42
DR4-17	1.1532, 1.1228	0.021	1.12
DR4-18	0.3472	-----	0.34
DR4-20	2.9916, 2.9409	2.417, 2.596	0.46
DR4-21	0.2785	-----	0.27
DR4-22	0.2731, 0.2701	0.014	0.26
DSDP Hole 184B			
12-1 (90-92)	0.6691, 0.6458	0.005	0.65
13-3 (25-27)	0.3293	-----	0.32
13-3 (100-103)	0.4102	-----	0.40
14-1 (130-132)	0.3486, 0.3498	0.009	0.34

Table 2.--(continued)

SAMPLE NUMBER	% TOTAL CARBON	% CARBONATE	% ORGANIC CARBON (Ave.)
DSDP Hole 184 B			
14-4 (55-57)	0.7162	-----	0.71
15-1 (70-73)	0.4774, 0.4506	-----	0.46
15-2 (65-68)	0.4851	-----	0.48
16-1 (110-113)	0.3688	-----	0.36
17-2 (80-83)	0.4822, 0.4628	0.010	0.46
18-2 (110-113)	0.6672	-----	0.66
19-2 (130-133)	0.5663, 0.5628	0.003	0.56
20-5 (100-103)	0.5856	0.004	0.58
21-3 (100-103)	0.5103	-----	0.50
22-2 (60-63)	0.4318	-----	0.42
22-6 (100-103)	0.5453	-----	0.54
DSDP Hole 185			
8-5 (40-43)	0.4176	-----	0.41
8-5 (90-93)	0.5165, 0.5163	0.007	0.51
9-1 (95-98)	0.4735	-----	0.47
10-1 (140-143)	0.5087	-----	0.50
10-3 (80-83)	0.4204	0.006	0.41
10-3 (105-108)	0.2227, 0.2394	-----	0.22
10-3 (127-130)	0.1862	-----	0.18
10-4 (10-13)	0.4386	-----	0.43
11-2 (110-113)	0.5976, 0.5756	-----	0.58
12-2 (110-113)	0.9735, 1.0027, 1.0007	0.004	0.99
13-1 (111-115)	0.7374	-----	0.73
14-1 (90-93)	0.7811, 0.7688, 0.7503	0.008	0.76
15-2 (75-78)	0.5173	-----	0.51
16-2 (60-63)	0.6344	-----	0.63
17-2 (21-23)	0.6493, 0.6480, 0.6706	0.010	0.65
17-3 (25-28)	0.6245	-----	0.62

Table 1.--Heavy mineral data.

Sample No.	Clino-Pyroxene		Ortho-Pyroxene		Volcanic Rk. Frag.		Amphibole		Opaques		Epidote		Chlorite		Garnet		Meta-Volcanic		Altered Fine-Gr.		Other		Unknown		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
S6-77																									
DR2-2	19	5.8	22	6.7	76	23.2	105	32.1	16	4.9	20	6.1	3	0.9	6	1.8	13	4.0	27	8.2	8	2.4	12	3.7	327
DR2-3	5	1.5	8	2.4	118	35.3	118	35.3	5	1.5	15	4.5	8	2.4	4	1.2	19	5.7	27	8.1	7	2.1	0	0	334
DR2-4	18	5.3	3	0.9	126	37.5	107	31.8	22	6.5	10	3.0	15	4.5	1	0.3	13	3.9	12	3.6	3	0.9	6	1.8	336
S6-77																									
DR4-6	8	9.6	0	0	176	53.3	81	24.5	10	3.0	10	3.0	16	4.8	1	0.3	13	3.9	5	1.5	2	0.6	8	2.4	330
DR4-8	11	3.5	0	0	204	65.5	42	13.5	7	2.2	7	2.2	15	4.8	0	0	10	3.2	6	1.9	1	0.3	8	2.5	311
DR4-14	30	9.6	2	0.6	130	41.6	83	26.6	14	4.5	7	2.2	7	2.2	1	0.3	8	2.6	19	6.1	6	1.9	5	1.6	312
DR4-15	20	6.2	2	0.6	168	52.6	63	19.7	26	8.1	6	1.9	13	4.0	0	0	2	0.6	11	3.4	2	0.6	6	1.9	319
DR4-18	15	4.9	7	2.3	135	43.9	88	28.7	8	2.6	5	1.6	21	6.8	1	0.3	8	2.6	11	3.6	2	0.6	6	1.9	307
DR4-22	12	3.8	4	1.2	144	45.3	92	28.9	9	2.8	5	1.6	18	5.7	1	0.3	6	1.9	19	6.0	4	1.2	4	1.2	318
DR4-24	21	6.9	7	2.3	141	46.1	73	23.8	17	5.6	3	0.9	28	9.1	1	0.3	1	0.3	7	2.3	3	0.9	4	1.2	306
TT-3																									
V-3	30	8.9	7	2.1	96	28.6	112	33.3	16	4.7	15	4.5	17	5.0	3	0.9	10	3.0	19	5.6	3	0.9	8	2.4	336
V-5	13	3.9	1	0.3	249	74.8	20	6.0	6	1.8	4	1.2	23	6.9	0	0	5	1.5	4	1.2	1	0.3	7	2.1	333
DSDP Hole 184																									
13-3 (108-109)	25	7.7	17	5.2	232	71.4	19	5.8	21	6.5	2	0.6	0	0	0	0	1	0.3	3	0.9	0	0	5	1.5	325
14-4 (63-65)	26	7.9	9	2.7	234	70.9	18	5.4	32	9.7	0	0	0	0	0	0	0	0	3	0.9	2	0.6	6	1.8	330
16-1 (133-134)	18	5.8	9	2.9	246	79.3	6	1.9	21	6.8	0	0	0	0	0	0	0	0	3	0.9	0	0	7	2.2	310
18-2 (132-133)	39	11.6	9	2.7	244	72.6	18	5.3	16	4.7	0	0	2	0.6	0	0	0	0	3	0.9	0	0	5	1.5	336
21-3 (144-145)	3	0.9	16	4.8	12	3.6	219	66.4	78	23.6	0	0	0	0	0	0	0	0	0	0	0	0	2	0.6	330
DSDP Hole 185																									
8-5 (40-43)	60	17.0	8	2.3	223	63.3	15	4.3	32	9.1	0	0	2	0.6	0	0	0	0	7	2.0	0	0	5	1.4	352
10-3 (127-130)	41	12.4	18	5.4	238	72.1	5	1.5	19	5.7	0	0	0	0	0	0	0	0	6	1.8	0	0	3	0.9	330
16-2 (60-63)	42	13.0	18	5.6	79	24.4	144	44.6	13	4.0	8	2.5	6	1.8	1	0.3	3	0.9	3	0.9	2	0.6	4	1.2	323
Sandy River Well																									
3000-3030 feet	75	21.4	38	10.8	106	30.3	60	17.1	51	14.6	1	0.3	4	1.2	1	0.3	0	0	4	1.2	3	0.9	7	2.0	350
4590-4620 feet	48	14.0	32	9.3	91	26.6	64	18.7	55	16.1	3	0.9	17	5.0	3	0.9	0	0	8	2.3	12	3.5	9	2.6	342
6700-6730 feet	39	12.3	47	14.8	99	31.1	66	20.7	27	8.5	8	2.5	6	1.9	4	1.2	2	0.6	9	2.8	4	1.2	7	2.2	318
9075-9090 feet	51	13.8	37	10.1	100	27.2	62	16.8	42	11.4	9	2.4	43	11.7	2	0.6	1	0.3	8	2.2	1	0.3	12	3.3	368

Table 4.--Light mineral data.

Sample No.	Quartz		Feldspar		Volcanic Glass		Volcanic Rk. Frag.		Non-Vol. Rk. Frag.		Opaques		Altered Fine-Gr.		Unknown		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
S6-77																	
DR2-2	35	11.1	94	29.9	24	7.6	16	5.1	91	29.0	8	2.5	31	9.9	15	4.8	314
DR2-3	33	10.6	132	42.6	16	5.2	7	2.3	62	20.0	6	1.9	41	13.2	13	4.2	310
DR2-4	35	11.6	100	33.1	34	11.2	9	3.0	61	20.2	10	3.3	33	10.9	20	6.6	302
DR2-5	24	7.8	95	31.0	63	20.6	12	3.9	48	15.7	8	2.6	50	16.3	6	1.9	306
DR2-6	36	11.4	103	32.6	31	9.8	18	5.7	88	27.8	10	3.2	19	6.0	11	3.5	316
S6-77																	
DR4-6	14	4.5	92	29.9	29	9.4	19	6.2	61	19.8	6	1.9	78	25.3	9	2.9	308
DR4-8	28	8.9	85	27.1	31	9.9	24	7.7	59	18.8	2	0.6	68	21.7	16	5.1	313
DR4-14	30	10.0	103	34.2	42	13.9	19	6.3	63	20.9	3	1.0	33	11.0	8	2.6	301
DR4-15	22	7.2	85	27.8	75	24.5	16	5.2	56	18.3	3	1.0	39	12.7	10	3.2	306
DR4-18	30	9.7	94	30.4	35	11.3	18	5.8	77	24.9	10	3.2	33	10.7	12	3.9	309
DR4-19	41	12.4	132	40.0	62	18.8	14	4.2	52	15.7	9	2.7	16	4.8	4	1.2	330
DR4-22	21	6.7	95	30.4	38	12.2	18	5.8	66	21.2	10	3.2	47	15.1	17	5.4	312
DR4-23	42	13.2	116	36.4	68	21.3	20	6.3	43	13.5	11	3.4	10	3.1	9	2.8	319
DR4-24	39	12.7	101	32.8	79	25.6	13	4.2	21	6.8	10	3.2	38	12.3	7	2.3	308
TT-3																	
V-2	28	9.2	102	33.4	48	15.7	10	3.3	54	17.7	10	3.3	39	12.8	14	4.6	305
V-3	22	6.7	76	23.3	54	16.6	15	4.6	60	18.4	7	2.1	84	25.8	8	2.5	326
V-4	10	3.2	48	15.5	110	35.6	17	5.5	28	9.1	10	3.2	73	23.6	13	4.2	309
DSDP Hole 184B																	
13-3 (108-109)	10	3.0	61	18.4	135	40.8	49	14.8	29	8.8	25	7.5	12	3.6	10	3.0	331
14-1 (130-135)	2	0.6	40	12.9	154	49.8	46	14.9	34	11.0	20	6.5	10	3.2	3	1.0	309
15-1 (70-73)	9	3.0	49	16.2	139	46.0	52	17.2	22	7.3	19	6.3	6	2.0	6	2.0	302
16-1 (133-134)	3	1.0	24	7.8	147	47.7	76	24.7	28	9.1	19	6.2	7	2.3	4	1.3	308
21-3 (144-145)	5	1.6	139	44.5	124	39.7	16	5.1	19	6.1	2	0.6	6	2.0	1	0.3	312

Table 4.--(continued)

Sample No.	Quartz		Feldspar		Volcanic Glass		Volcanic Rk. Frag.		Non-Vol. Rk. Frag.		Opaques		Altered Fine-Gr.		Unknown		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
DSDP Hole 185																	
8-5 (40-43)	1	0.3	41	13.5	122	40.3	57	18.8	42	13.9	22	7.3	14	4.6	4	1.3	303
8-5 (90-93)	22	6.9	71	22.2	88	27.5	44	13.7	72	22.5	7	2.2	8	2.5	8	2.5	320
10-1 (140-143)	15	4.6	71	21.7	96	29.3	41	12.5	53	16.2	22	6.7	19	5.8	10	3.0	327
10-3 (80-83)	18	5.6	76	23.6	114	35.5	30	9.3	50	15.6	11	3.4	10	3.1	12	3.7	321
10-3 (127-130)	0	0	24	7.2	206	61.9	44	13.2	3	0.9	43	12.9	6	1.8	7	2.1	333
10-4 (10-13)	10	3.1	49	15.3	146	45.7	52	16.3	42	13.2	10	3.1	5	1.6	5	1.6	319
16-2 (60-63)	14	4.6	68	22.5	66	21.8	37	12.2	63	20.9	7	2.3	38	12.6	9	3.0	302
Sandy River Well																	
3000-3030 feet	10	3.3	84	27.8	102	33.8	23	7.6	21	6.9	14	4.6	39	12.9	9	3.0	302
4590-4620 feet	22	6.8	91	28.2	36	11.1	11	3.4	42	13.0	12	3.7	105	32.5	4	1.2	323
6700-6730 feet	30	10.0	103	34.2	37	12.3	9	3.0	46	15.3	21	7.0	50	16.6	5	1.7	301
9075-9090 feet	23	7.6	95	31.6	47	15.6	11	3.6	49	16.3	20	6.6	41	13.6	15	5.0	301

Table 5.--Clay mineral data.

Sample No.	Kaol.+Chlor.	Kaolinite	Chlorite	Illite	Smectite	% Illite In Mixed Layer
S6-77						
DR2-2	18	5	13	13	69	25
DR4-6	28	10	18	19	53	37
DR4-9	31	9	22	26	43	34
DR4-12	12	4	8	6	82	8
DR4-14	17	4	13	13	70	19
DR4-15	34	10	24	32	34	44
DR4-16	38	8	30	25	37	25
DR4-20	35	6	29	27	38	35
TT-3						
V-3	25	3	22	22	53	24
V-5	25	8	17	18	57	29
DSDP Hole 184B						
13-3 (100-102)	30	7	23	14	56	33
15-1 (70-73)	25	3	22	18	57	31
18-2 (110-113)	22	6	16	26	52	40
20-4 (23-25)	18	5	13	17	65	37
DSDP Hole 185						
8-5 (40-43)	38	11	27	24	38	30
10-1 (140-143)	31	4	27	23	46	35
10-4 (10-13)	28	6	22	25	47	31
15-2 (75-78)	30	6	24	20	50	29

Table 6.--General descriptions of thin sections. Compositions are given in Table 7.

Sample	Lithology	Structure	TEXTURE			Matrix	Remarks
			Sorting	Shape	Grain Size		
TT-3 V-2	Mudstone	Bedded	Poor	Angular	Fine	Clay minerals, fine silt, rare carbon	Silicic volcanic glass occurs in volcanic rock component.
TT-3 V-3	Sandy mudstone	Bedded	Poor	Angular	Max. 1.0 mm Avg. 0.05-0.10 mm	Clay minerals, fine silt, rare carbon	Glauconite/chlorite components are detrital and partly oxidized.
TT-3 V-5	Mudstone	Bedded	Poor	Angular	Fine	Clay minerals, fine silt, rare carbon	Not counted; very similar to TT-3, V-2.
TT-3 V-6	Keratophyre tuff	Massive	Poor	Angular	Medium to coarse sand size	Recrystallized quartz and feldspar	Clast. Composition includes volcanic rx., feldspar, and quartz.
S6-77 DR2-1	Sandy mudstone	Bedded	Poor	Angular	Max. 0.2mm Avg. 0.05-0.07 mm	Clay minerals, fine silt, rare carbon	About half the volcanic rock fragments (Table 7) are volcanic glass.
S6-77 DR2-2	Sandy mudstone	Bedded	Poor	Angular	Slightly coarser than DR2-2	Clay minerals, fine silt, rare carbon	Not counted; contains greater relative percent silicic volcanic glass.
S6-77 DR2-3	Sandy mudstone	Bedded	Poor	Angular	Max. 0.2 mm Avg. 0.05-0.07 mm	Clay minerals, fine silt, rare carbon	Not counted; composition similar to DR-2, sample 1.
S6-77 DR2-4	Mudstone	Bedded	Poor	Angular	Max. 0.3 mm Avg. 0.05 mm	Clay minerals, fine silt, rare carbon	Glauconite/chlorite grains are spherical and ovoid pellets.
S6-77 DR2-5	Sandy mudstone	Bedded	Poor	Angular	Max 0.2 mm Avg. 0.05-0.08 mm	Clay minerals, fine silt, rare carbon	Some volcanic glass apparently replaced by zeolites.

Table 6.--(continued)

Sample	Lithology	Structure	TEXTURE			Matrix	Remarks
			Sorting	Shape	Grain Size		
S6-77 DR4-1	Calcareous sandstone	Massive	Poor	Angular	Max. 0.5 mm	Calcite and clay	Metamorphic rocks are gneisses; strained quartz abundant. Exotic clast.
S6-77 DR4-2	Volcanic breccia	Massive	Poor	Angular			Recrystallized, metamorphosed to prehnite-pumpellyite grade. Exotic clast.
S6-77 DR4-3	Sandstone	Bedded	Poor	Angular to sub-rounded	Max. 5.0 mm Avg. 0.5 mm	Clay minerals, silt, and rare carbon	Sandstone clast in dredge haul rocks.
S6-77 DR4-4	Quartzite or quartz vein	Mylonitic					Metamorphic clast in dredge haul rocks. Not counted.
S6-77 DR4-5	Sandstone	Bedded	Poor	Angular	Max. 0.8 mm Avg. 0.1 to 0.2 mm	Fine-grained quartz, feldspar, and epidote; clay minerals	Arkosic with abundant potash feldspar. Prehnite in veins. Exotic clast.
S6-77 DR4-6	Mudstone	Bedded	Poor	Angular	Max. 0.6 mm Avg. 0.05-0.10 mm	Clay minerals, fine silt, some carbon	Glauconite/chlorite detrital grains.
S6-77 DR4-7	Mudstone	Bedded	Poor	Angular		Clay minerals, fine silt, some carbon	Very similar to DR4-6. Not counted.
SR6-77 DR4-8	Mudstone	Bedded	Poor	Angular	Max. 0.3 mm Avg. 0.05-0.10 mm	Clay minerals, fine silt, some carbon	Volcanic rocks are andesitic; chlorite is detrital.
S6-77 DR4-13	Mudstone	Bedded	Poor	Angular	Max. 1.6 mm Avg. 0.05-0.10 mm	Clay minerals, fine silt, opaques, rare carbon	Contains clast of metaquartz diorite (62% feldspar, 7% qtz, 11% opaques, 20% chlorite and epidote).

Table 6.--(continued)

Sample	Lithology	Structure	TEXTURE			Matrix	Remarks
			Sorting	Shape	Grain Size		
S6-77 DR4-14	Sandy mudstone	Bedded	Poor	Angular	Max. 0.2 mm Avg. 0.05 mm	Clay minerals, fine silt, opaques, rare carbon	Similar to DR4-13.
S6-77 DR4-19	Mudstone	Bedded	Poor	Angular	Max. 0.6 mm Avg. 0.07-0.09 mm	Clay minerals, fine silt, rare carbon	Similar to other mudstone samples.
S6-77 DR4-21	Sandy mudstone	Bedded	Poor	Angular	Max. 2.0 mm Avg. 0.1-0.2 mm	Clay minerals, fine silt, rare carbon	Glauconite may be replaced fecal pellets. Sedimentary rock fragments are intraformational.

Table 7.--Major components (%) in thin sections from dredge hauls TT-3, DR-2, and DR-4. Descriptions are given in Table 6.

Sample	Points Counted	Feld	Qtz_m [1]	Qtz_p [2]	Chrt	Opaq	Pyrx	Hbde	Glau [3]	Chlo	Epdt	Musc	Calc	V. Gls	V. Rx	G. Rx	S. Rx	M. Rx	Preh	Matr	Diat
TT-3, V-2	370	10	3	-	-	1	-	T	-	-	T	-	-	-	4	-	-	-	-	82	-
TT-3, V-3	459	10	5	2	-	-	-	2	← 5 →		1	T	-	1	2	1	-	T	-	70	1
S6-77, DR2-1	396	12	4	1	-	1	-	1	← 2 →		T	T	-	2	2	-	-	-	-	69	6
S6-77, DR2-4	403	10	5	T	-	1	-	1	← 1 →		T	1	-	-	4	T	-	-	-	71	5
S6-77, DR2-5	346	26	9	T	3	-	-	2	-	3	T	T	-	3	4	-	-	-	-	44	6
S6-77, DR4-1	425	12	11	2	T	1	T	1	-	T	T	-	T	2	7	-	-	2	-	61 [4]	-
S6-77, DR4-3	358	4	7	1	T	-	-	-	15	2	-	-	-	-	2	2	6	-	7	53	1
S6-77, DR4-5	417	57	20	1	-	1	T	2	-	2	5	T	1	- [5]	4	-	1	-	T	6	-
S6-77, DR4-6	402	7	4	1	-	3	T	T	← 2 →		T	-	-	-	3	1	-	-	-	76	2
S6-77, DR4-8	453	8	6	1	-	4	-	1	-	2	1	1	-	-	3	-	-	-	-	69	4
S6-77, DR4-13	384	11	3	1	-	T	-	1	2	1	-	1	-	-	3	4	-	-	-	70	3
S6-77, DR4-14	454	5	3	1	-	2	-	1	2	1	T	T	-	-	3	-	-	-	-	82	-
S6-77, DR4-19	424	11	6	1	-	1	1	1	-	T	T	T	-	-	5	-	-	-	-	71	2
S6-77, DR4-21	418	6	5	1	-	2	-	T	4	-	T	T	-	-	5	-	1	-	-	74	2

1) Qtz_m is monocrystalline quartz.

2) Qtz_p is polycrystalline quartz.

3) Glauconite and chlorite are not distinguished in some thin sections.

4) Abundant calcite in matrix.

5) May be partly replaced by zeolites.

Table 8.--Diatom and silicoflagellate age data, DR-2, TT-3, DR-4, DSDP Holes 184B and 185, and Gulf Sandy River Well.

S6-77, Dredge 2--Dredge haul collected from side of Pribilof Canyon at a depth of 2,000 to 1,500 meters. Latitude 55°55'N; Longitude 169°57'W.

4 Samples (Mf 4896 - 4899)

DR2-2
Diatoms include:
ACTINOCYCLUS INGENS Rattray
DENTICULA HUSTEDTII Simonsen & Kanaya
D. PRAEDIMORPHA of Akiba
COSCINODISCUS YABEI Kanaya
GONIOTHECIUM TENUE Brun
MEDIARIA SPLENDIDA Sheshukova-Poretzkaya
NITZSCHIA HETEROPOLICA Schrader
RHIZOSOLENIA MIOCENICA Schrader

Age: Late middle Miocene. Correlates with subzone b of Koizumi's (1975) DENTICULA HUSTEDTII-D. LAUTA Zone. Also with Schrader's (1973) North Pacific Diatom Zonal Interval 17-18.

DR2-3
Diatoms include:
ACTINOCYCLUS INGENS Rattray
DENTICULA HUSTEDTII Simonsen & Kanaya
D. LAUTA Bailey
D. PRAEDIMORPHA of Akiba
GONIOTHECIUM TENUE Brun
NITZSCHIA HETEROPOLICA Schrader

Age: Late middle Miocene. Probably equivalent to sample DR2-2.

DR2-4
Diatoms include:
ACTINOCYCLUS INGENS Rattray
DENTICULA HUSTEDTII Simonsen & Kanaya
D. LAUTA Bailey
D. PRAEDIMORPHA of Akiba
NITZSCHIA HETEROPOLICA Schrader
STEPHANOPYXIS SCHENCKII Kanaya

Table 8.--(continued)

Age: Late middle Miocene. Probably equivalent to samples DR2-2 and DR2-3.

DR2-5
Diatoms include:
ACTINOCYCLUS INGENS Rattray
COSCINODISCUS PLICATUS Grunow (group)
C. YABEI Kanaya
DENTICULA HUSTEDTII Simonsen & Kanaya
D. LAUTA Bailey
D. PRAEDIMORPHA of Akiba
D. sp.
GONIOTHECIUM TENUE Brun
NITZSCHIA HETERPOLICA Schrader
ROUXIA PERAGALLI Brun & Heriband
THALASSIOSIRA sp. cf. sp. 1 of Barron (1976)

Age: Late middle Miocene. Probably equivalent to samples DR2-2, DR2-3, and DR2-4.

TT-3--Dredge haul collected from side of Pribilof Canyon at an approximate depth of 1,450 meters. Latutude 56°05'N; Longitude 169°09'W.

5 Samples (Mf 4910 - 4914)

TT-3, V-1
Diatoms include:
ACTINOCYCLUS INGENS var. Rattray
COSCINODISCUS MARGINATUS Schmidt
C. TEMPEREI Brun (large form of Koizumi)
ROUXIA CALIFORNICA Peragallo
THALASSIONEMA HIROSAKIENSIS (Kanaya) Schrader
SYNEDRA JOUSEANA var. Sheshukova-Poretzkaya
STEPHANOPYXIS SCHENCKII Kanaya
RHIZOSOLENIA BARBOI Brun

Silicoflagellate:
DISTEPHANUS PSEUDOFIBULA (schulz) Bukry

Age: Early late Miocene. Correlates with Koizumi's DENTICULA HUSTEDTII Zone.

Table 8.--(continued)

TT-3, V-2
Diatoms include:
ACTINOCYCLUS cf. A. DIVISUS (Grun.) Hust.
COSCINODISCUS MARGINATUS
RHIZOSOLENIA BARBOI Brun
THALASSIONEMA HIROSAKIENSIS (Kanaya) Schrader
COSMIODISCUS INSIGNIS Jouse

Age: Early late Miocene. Correlates with subzone b of Koizumi's DENTICULA HUSTEDTII Zone.

TT-3, V-3
Diatoms include:
ACTINOCYCLUS INGENS RATTRAY
COSCINODISCUS MARGINATUS Schmidt
C. TEMPEREI Brun (large form of Koizumi)
C. cf. PLICATUS Grunow
ROUXIA CALIFORNICA Peragallo
STEPHANOPYXIS SCHENCKII Kanaya
SYNEDRA JOUSEANA var. Sheshukova-Poretzkaya
THALASSIONEMA HIROSAKIENSIS (kanaya) Schrader
RHIZOSOLENIA BARBOI Brun

Age: Early late Miocene. Correlates with Koizumi's DENTICULA HUSTEDTII Zone.

TT-3, V-4
Diatoms include:
COSCINODISCUS TEMPEREI Brun (large form of Koizumi)
C. MARGINATUS Schmidt
ROUXIA CALIFORNICA Peragallo
SYNEDRA JOUSEANA var. Sheshukova-Poretzkaya
THALASSIONEMA HIROSAKIENSIS (Kanaya) Schrader

Silicoflagellate:
DISTEPHANUS PSEUDOFIBULA (Schulz) Bukry

Age: Early late Miocene. Correlates with Koizumi's DENTICULA HUSTEDTII Zone.

Table 8.--(continued)

TT-3, V-5
Diatoms include:
ACTINOCYCLUS INGENS Rattray
A. sp.
ACTINOPTYCHUS MINUTUS Greville
COSCINODISCUS MARGINATUS Schmidt
C. TEMPEREI (large form of Koizumi)
GONIOTHECIUM TENUE Brun
ROUXIA CALIFORNICA Peragallo
SYNEDRA JOUSEANA var. Sheshukova-Poretzkaya
THALASSIONEMA HIROSAKIENSIS (Kanaya) Schrader
RHIZOSOLENIA BARBOI Brun

Age: Early late Miocene. Correlates with Koizumi's DENTICULA HUSTEDTII Zone.

S6-77, Dredge 4--Dredge haul collected from side of Pribilof Canyon at a depth of approximately 2,000 to 1,200 meters. Latitude 55°50'N; Longitude 169°09'W.

14 Samples (Mf 5023)

Fourteen samples were examined from Dredge 4. All samples are placed in the upper Miocene. Either the lower half of the DENTICULA KAMTSCHATICA Zone or the upper half of the DENTICULA HUSTEDTII Zone.

DR4-7
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS SYMBOLOPHORUS Grunow
C. TEMPEREI Brun
GONIOTHECIUM TENUE Brun
HEMIAULUS POLYMORPHUS Grunow
RHIZOSOLENIA BARBOI Brun
ROUXIA CALIFORNICA Peragallo
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA NATIVA (of Koizumi, 1975)
T. ANTIQUA (Grunow) Cleve-Euler

Correlates with subzone b of the DENTICULA HUSTEDTII Zone.

DR4-8
Diatoms include:
COSCINODISCUS SYMBOLOPHORUS Grunow
C. TEMPEREI Brun
ROUXIA CALIFORNICA Peragallo
NITZSCHIA PLIOCENA (Brun) Kanaya and Koizumi

Table 8.--(continued)

RHIZOSOLENIA BARBOI Brun
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA NATIVA (of Koizumi 1975)

Subzone b of the DENTICULA HUSTEDTII Zone.

DR4-9
Diatoms include:
COSCINODISCUS TEMPEREI Brun
COSMIODISCUS INSIGNIS Jouse
DENTICULA cf. D. KAMTSCHATICA Sabelina (primitive form)
GONIOTHECIUM TENUE Brun
NITZSCHIA sp.
ROUXIA CALIFORNICA Peragallo
THALASSIONEMA HIROSAKIENSIS Kanaya (v. rare)
THALASSIOSIRA NATIVA (of Koizumi 1975)

Subzone b of the DENTICULA HUSTEDTII Zone.

DR4-10
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS SYMBOLOPHORUS Grunow
C. TEMPEREI Brun
SYNEDRA JOUSEANA Shesukova-Poretzkaya
THALASSIOSIRA NATIVA (of Koizumi 1975)
T. cf. T. ZABELINAE Jouse
THALASSIONEMA HIROSAKIENSIS Kanaya

Subzone b of the DENTICULA HUSTEDTII Zone.

DR4-11
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS TEMPEREI Brun
DENTICULA cf. D. KAMTSCHATICA Sabelina (primitive form)
D. SEMINAE var. FOSSILIS Schrader (one specimen equals contaminant)
GONIOTHECIUM TENUE Brun
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA PUNCTATA Jouse
ROUXIA CALIFORNICA Peragallo

Subzone b of the DENTICULA HUSTEDTII Zone.

Table 8.--(continued)

DR4-12
Diatoms include:
ACTINOCYCLUS INGENS Rattray
ACTINOPTYCHUS MINUTUS Greville
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS SYMBOLOPHORUS Grunow
C. TEMPEREI Brun
DENTICULA HUSTEDTII Simonsen & Kanaya
ROUXIA CALIFORNICA Peragallo
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA NATIVA (of Koizumi 1975)
T. PUNCTATA Jouse
TRICERATIUM CONDECORUM Brightwell

Silicoflagellate:
DISTEPHANUS PSEUDOFIBULA (schulz) Bukry

Subzone b of DENTICULA HUSTEDTII Zone.

DR4-13
Diatoms include:
COSCINODISCUS SYMBOLOPHORUS GRUNOW
C. TEMPEREI Brun
DENTICULA cf. D. KAMTSCHATICA Sabelina (primitive)
ROUXIA CALIFORNICA Peragallo
THALASSIOSIRA NATIVA (of Koizumi 1975)
T. GRAVIDA var. FOSSILIS Jouse
T. PUNCTATA Jouse
THALASSIONEMA HIROSAKIENSIS Kanaya

Poor preservation. Subzone b of DENTICULA HUSTEDII Zone.

DR4-14
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS TEMPEREI Brun
DENTICULA cf. D. KAMTSCHATICA Sabelina
ROUXIA CALIFORNICA Peragallo
THALASSIOSIRA ANTIQUA (Grunow) Cleve-Euler
T. GRAVIDA Cleve
T. PUNCTATA Jouse
T. cf. T. ZABELINAE Jouse
T. NATIVA (of Koizumi 1975)
SYNEDRA JOUSEANA Shesukova-Poretzkaya

Subzone b of the DENTICULA HUSTEDTII Zone.

Table 8.--(continued)

DR4-15
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS TEMPEREI Brun
DENTICULA cf. D. KAMTSCHATICA Sabelina
ROUXIA CALIFORNICA Peragallo
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA NATIVA (of Koizumi 1975)
T. cf. T. ZABELINAE Jouse

Subzone b of the DENTICULA HUSTEDTII Zone.

DR4-17
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
DENTICULA cf. D. KAMTSCHATICA Sabelina
GONIOTHECIUM TENUE Brun
NITZSCHIA FOSSILIS (Frenguelli) Kanaya
N. PLIOCENA (Brun) Kanaya and Koizumi
SYNEDRA JOUSEANA Sheshukova-Poretzkaya
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA NATIVA (of Barron 1976)
T. NATIVA (of Koizumi 1975)

Subzone b of the DENTICULA HUSTEDTII Zone.

DR4-18
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS TEMPEREI Brun
DENTICULA cf. D. KAMTSCHATICA Sabelina (primitive form)
NITZSCHIA cf. N. PORTERI
SYNEDRA JOUSEANA Sheshukova-Poretzkaya
ROUXIA CALIFORNICA Peragallo
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA NATIVA (of Koizumi 1975)
T. ANTIQUA (Grunow) Cleve-Euler

Subzone b of the DENTICULA HUSTEDTII Zone.

DR4-20
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
COSCINODISCUS TEMPEREI Brun
DENTICULA KAMTSCHATICA Sabelina
THALASSIOSIRA ANTIQUA (Grunow) Cleve-Euler
D. cf. D. KAMTSCHATICA Sabelina

Table 8.--(continued)

T. NATIVA (of Koizumi 1975)
T. GRAVIDA Cleve
T. GRAVIDA var. FOSSILIS Jouse
T. ZABELINAE Jouse
T. PUNCTATA Jouse

Silicoflagellate:
DISTEPHANUS BOLIVIENSIS FRUGALIS

Lower half of D. KAMTSCHATICA Zone. (Probably subzone a)

DR4-21
Diatoms include:
COSCINODISCUS SYMBOLOPHORUS Grunow
C. TEMPEREI Brun
DENTICULA KAMTSCHATICA Sabelina (v. rare)
D. cf. D. KAMTSCHATICA Sabelina (primitive)
GONIOTHECIUM TENUE Brun
ROUXIA CALIFORNICA Peragallo
THALASSIOSIRA ANTIQUA (Grunow) Cleve-Euler
T. NATIVA (of Koizumi 1975)
T. CONVEXA var. ASPINOSA Schrader
ROUXIA CALIFORNICA Peragallo

Subzone a of the DENTICULA KAMTSCHATICA Zone.

DR4-22
Diatoms include:
COSMIODISCUS INSIGNIS Jouse
ROUXIA CALIFORNICA Peragallo
THALASSIONEMA HIROSAKIENSIS Kanaya
THALASSIOSIRA cf. T. ZABELINAE Jouse

Poor preservation

Subzone b of the DENTICULA HUSTEDTII Zone.

Samples from Deep Sea Drilling Project Holes 184B and 185

DSDP Hole 184B (Mf 4968). Latitude 53°42.64'N; longitude 170°55.39'W.
Water depth 1910 m.

Sample 1-2 (145-148 cm)
Sample 1-4 (137-140 cm)

Both are barren of diatoms

Table 8.--(continued)

DSDP Hole 185 (Mf 4967). Latitude 54°25.73'N; Longitude 169°14.59'W. Water depth 2110 m.

Sample 18-1 (70-73 cm)

Diatoms include:
DENTICULA KAMTSCHATICA Sabelina
THALASSIOSIA NATIVA (of Koizumi, 1975)
T. LINEATA Jouse
T. GRAVIDA Cleve
T. sp.

Age: Probably early Pliocene. Upper part of DENTICULA KAMTSCHATICA Zone.

Sample 20-5 (100-103 cm)

Barren of diatoms

Sample 20-6 (66-69 cm)

Barren of diatoms

Gulf Sandy River FED-1 (GSR) Test Hole Bear Lake Formation, sandy silt and silty sand. T. 46 S., R. 70 W., Sec. 10.

Mf 3673

8 Samples (MF 3673)

3,000 - 3,030 feet	6,700 - 6,730 feet
3,510 - 3,540 feet	8,120 - 8,139 feet
3,930 - 3,960 feet	9,075 - 9,090 feet
4,590 - 4,620 feet	10,170 - 10,195 feet

All assemblages poor to barren

3,000 - 3,030 feet

Diatoms include:
THALASSIOSIRA ANTIQUA (Grunow) Cleve-Euler
T. HYALINA (Grunow) Grunow
T. GRAVIDA Cleve
T. NIDULUS (Tempere & Brun) Jouse
T. OESTRUPII(Ostenfeld) Proshkina-Lavrenko

Age: Pliocene (probably upper Pliocene)

Table 8.--(continued)

3,510 - 3,540 feet

Diatoms include:
COSCINODISCUS PUSTULATUS Hanna
DENTICULA KAMTSCHATICA? Sabelina
THALASSIOSIRA ZABELINAE Jouse

Age: Probably middle Pliocene or a little above top of D. KAMTSCHATICA Zone.

3,930 - 3,960 feet

Diatoms include:
COSMIODISCUS INSIGNIS Jouse
THALASSIOSIRA ZABELINAE Jouse

Age: Early Pliocene or late late Miocene. Absence of Miocene species suggests early Pliocene. Equivalent to D. KAMTSCHATICA Zone.

6,700 - 6,730 feet

Diatoms include:
DENTICULA KAMTSCHATICA Sabelina
THALASSIOSIRA OESTRUPII? (Ostenfeld) Proshkina-Lavrenko
T. NATIVA (of Koizumi 1975)
SYNEDRA JOUSEANA Sheshukova-Poretzkaya

Age: Early Pliocene or latest Miocene. DENTICULA KAMTSCHATICA Zone.

8,120 - 8,139 feet

Barren of diatoms

9,075 - 9,090 feet

Barren of any diagnostic diatom species. Presence of ACTINOCYCLUS INGENS Rattray means that it must be late early Miocene or younger.

10,170 - 10,195 feet

Barren of any age diagnostic diatoms.