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The Texture of Surficial Sediments in Western Long Island Sound off the Norwalk Islands, Connecticut

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Comments

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards (or with the North American Stratigraphic Code).

See also these related documents:

Map Showing the Distribution of Surficial Sediments in Fishers Island Sound, New York, Connecticut, and Rhode Island

Organic Carbon, Hydrogen, and Nitrogen Concentrations in Surficial Sediments from Western Long Island Sound, Connecticut and New York

Sidescan Sonar Image, Surficial Geological Interpretation, and Bathymetry of the Long Island Sea Floor off Milford, CT

Sidescan Sonar Image, Surficial Geologic Interpretation, and Bathymetry of the Long Island Sound Sea Floor off Hammonasset Beach State Park, Connecticut

The Texture of Surficial Sediments in Central Long Island Sound off Milford, Connecticut

U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

The texture of surficial sediments in western Long Island Sound off the Norwalk Islands, Connecticut

by

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ABSTRACT

Grain-size analyses were performed on 69 samples from western Long Island Sound. The relative grain-size frequency distributions and related statistics are reported herein. Descriptions of the benthic character from video tapes and still camera photographs of the bottom at these stations, and 33 others, are also presented.

The southern and eastern parts of the study area are dominated by poorly sorted clayey silts that have nearly symmetrical distributions. Gravelly sediments are prevalent in the shallow northwestern part of the study area, but are also present in central part of the study area. Bands of sand, silty sand, and sand-silt-clay occur on the flanks of the gravelly areas.

INTRODUCTION

The purpose of this study was to determine the grain-size distributions and associated statistical parameters of the surficial sediment samples from western Long Island Sound off the Norwalk Islands. These grain-size data, which help to ground-truth a pre-existent sidescan sonar survey (Poppe and others, 1995a; Twichell and others, in press), will eventually be used to describe the sedimentary processes active in this portion of western Long Island Sound, and to evaluate near-shore sand and gravel resources. Other potential uses for these textural data include benthic biologic studies that evaluate faunal distributions and relate them to habitats (Zajac and others, 1995), and geochemical studies involving the distribution, transport and deposition of pollutants (Moffett and others, 1994).

STUDY AREA

Long Island Sound is a large (about 182 km long by a maximum of 32 km wide) estuary located between the shorelines of southern Connecticut and northern Long Island. The Sound is underlain along the Connecticut coast north of the study area by Paleozoic granitic and gneissic rocks of the Appalachian orogen (Rodgers, 1985; Needell and others, 1987; Lewis and Needell, 1987). Coastal-plain strata of Late Cretaceous age unconformably overlie the bedrock at places beneath the Sound and along the north shore of Long Island, New York (Fuller, 1914; Grim and others, 1970).

Late Wisconsinan-age glaciation extended across the Sound to form the Ronkonkoma and Harbor Hill-Roanoke Point Moraines on Long Island (Donner, 1964; Mills and Wells, 1974; Sirkin, 1982). Less prominent recessional moraine segments have also been recognized along the coast of Connecticut and beneath northern Long Island Sound (Flint, 1971; Goldsmith, 1982; Stone and Borns, 1986; Poppe and others, 1995a,b). After the final retreat of the ice from the Long Island Sound basin, glacial Lake Connecticut formed in the depression behind the moraines on Long Island. Varved lake clays and, along the northern shore, deltaic complexes dominated sedimentation and together are responsible for the thick lacustrine section evident in seismic records (Lewis and Stone, 1991; Stone

and others, 1992; Stone and Schafer, in press). The lake level gradually lowered due to erosion at the spillway till the lake bed was subaerially exposed. Fluvial processes incised the exposed lake bed as streams ran down from high ground on either side of the Sound to join a central river which ran down the axis.

The Holocene eustatic rise flooded the basin creating Long Island Sound. Finer-grained hemipelagic sediments accumulated in the quieter, lower energy areas of the western Sound; tidal and storm currents dominate the patterns of erosion and transport in shallow areas and the eastern Sound.

A much more detailed discussion of the geological history of Long Island Sound has been published by Lewis and Stone (1991).

METHODS

Surficial sediment samples and bottom photographs were attempted at 103 locations during April-May and August, 1995 cruises aboard the RV John Dempsey using a Van Veen grab sampler (Figs. 1 and 2). This grab sampler was equipped with Osprey video and still camera systems; the video system was attached to an 8 mm video cassette recorder. These photographic systems were used to appraise intra-station bottom variability and to observe boulder fields and bedrock outcrop areas where sediment samples could not be collected (Appendix A). Turbid bottom conditions during the August cruise decreased visibility and degraded the quality of the bottom photography from this cruise. The turbid conditions are related primarily to biological activity throughout the water column, resuspension by tidal currents of organics that have settled to the bottom, and the presence of a thick (up to 1 m) benthic nepholoid layer. Because of these murky conditions, the still photographs and video from this cruise were only used to describe the benthic character at the textural station locations occupied solely during the August cruise (Stations NOR-92 through NOR-103).

The 0-2 cm interval in the surficial sediments was subsampled from the grab sampler; these samples were frozen and stored for later analysis. Navigation was performed using a differential Global Satellite Positioning system.

A total of 69 samples were collected for textural analysis. The samples were thawed and visually inspected in the laboratory. If the sample contained gravel, the entire sample was analyzed. If the sample was composed of only sand, silt, and clay, an approximately 50 gram, representative split was analyzed. The samples to be analyzed were placed in preweighed 100 ml beakers, weighed, and dried in a convection oven set at 75 °C. When dried, the samples were placed in a desiccator to cool and then weighed. The decrease in weight due to water loss was used to correct for salt; salinity was assumed to be 20 °/oo. The weight of the sample and beaker less the weight of the beaker and the salt correction gave the sample weight.

The samples were disaggregated and then wet sieved through a

Figure 1. Index map showing the location of the study area (hatched polygon). Map also shows the locations of other sidescan sonar and sampling surveys (open polygons) being completed as part of this series (Twichell and others, 1995; Poppe and others, 1995a; Poppe and others, 1995b; Twichell and others, in press) and the major morainal complexes.

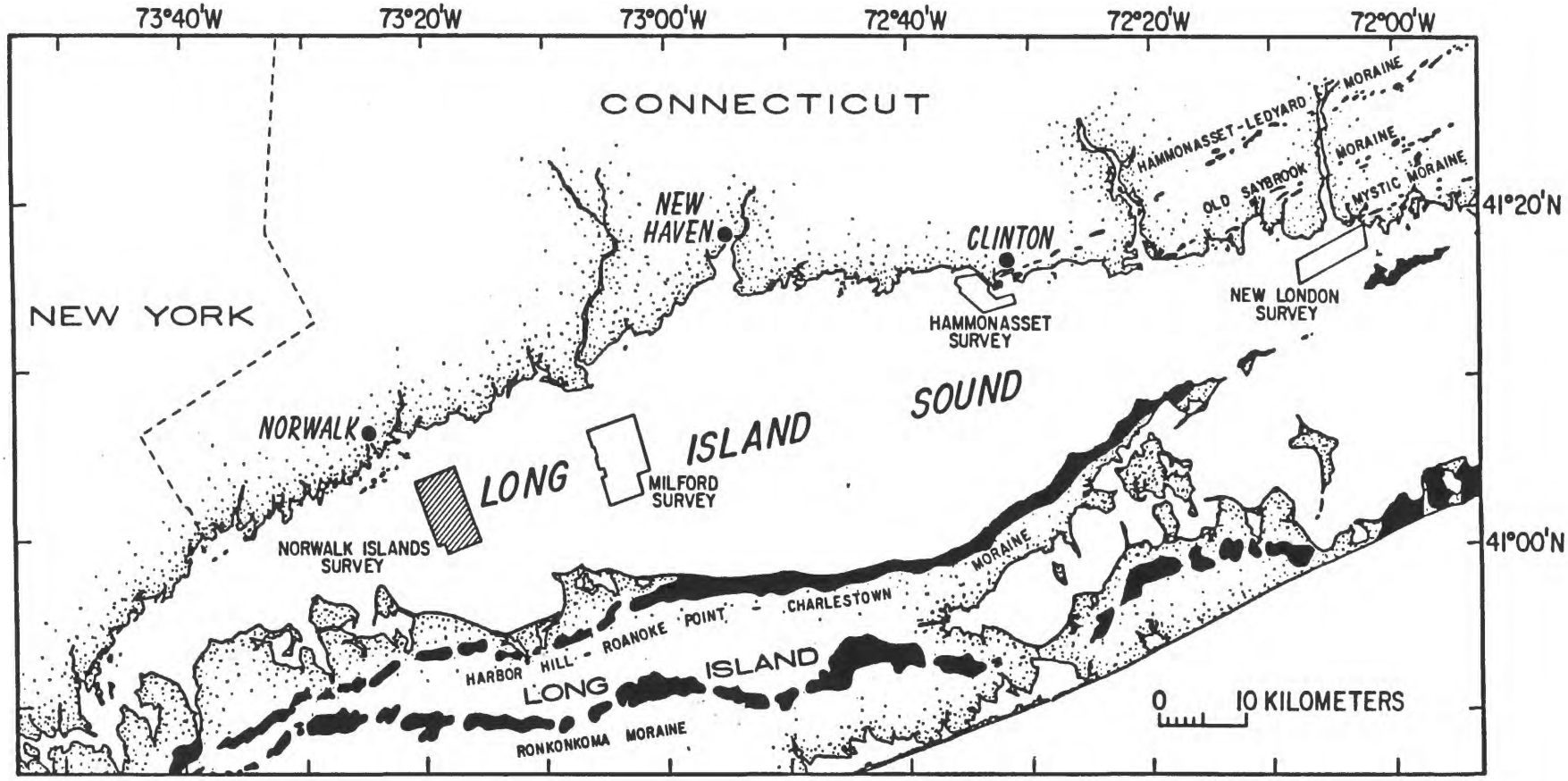
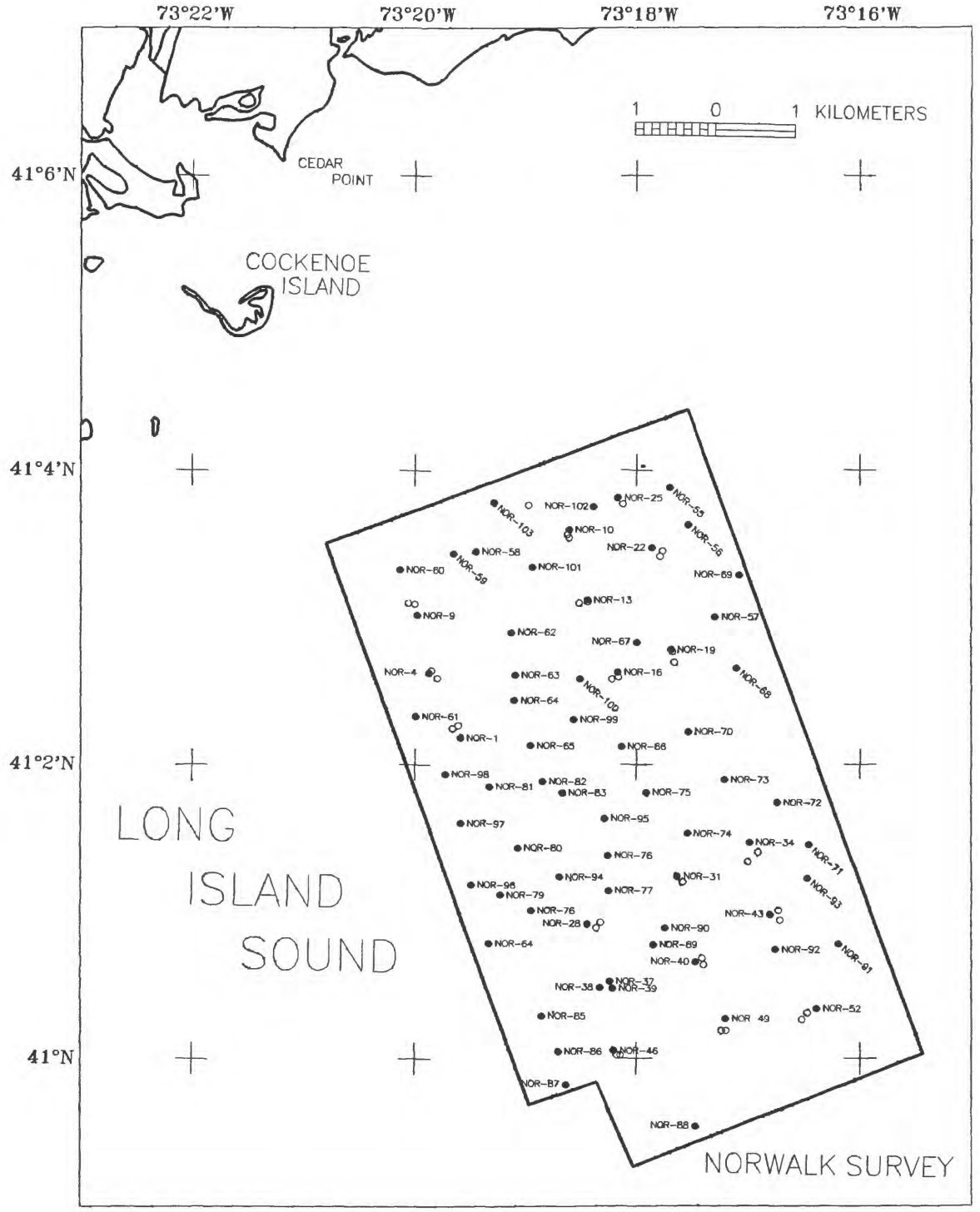


Figure 2. Map of western Long Island Sound off the Norwalk Islands showing the station locations. Stations where surficial sediment samples and bottom photographs were collected are shown as solid circles. Stations where only bottom photographs or biological samples were taken are shown as open circles.



62 μm (4φ) sieve using distilled water to separate the coarse- and fine-fractions. The fine fraction was sealed in a Mason jar and reserved for analysis by Coulter Counter (Shideler, 1976). The coarse fraction was washed in tap water and reintroduced into the preweighed beaker. The coarse fraction was dried in the convection oven at about 75 °C and weighed. The weight of the coarse (greater than 62 μm) fraction is equal to the weight sand plus gravel. The weight of the fines (silt and clay) can also be calculated by subtracting the coarse weight from the sample weight. The coarse fraction was dry sieved through a 2.0 mm (-1φ) sieve to separate the sand and gravel. The size distribution within the gravel fraction was determined by sieving. Because biogenic carbonates commonly form in situ, they are not representative of the depositional environment from a textural standpoint. Therefore, bivalve shells and other biogenic debris greater than 1.0 mm (0φ) were manually removed from the samples and the weights corrected to mitigate this source of error.

If the sand fraction contained more than 16 grams of material (enough to run the analysis twice), a rapid sediment analyzer (Schlee, 1966) was used to determine the sand distribution. If less than 16 grams of sand were available, this fraction was dry sieved using a Ro-Tap shaker.

The fine fraction was analyzed by Coulter Counter; storage in the Mason jars prior to analysis never exceeded five days. The gravel, sand, and fine fraction data were processed by computer to generate the distributions, statistics, and data base (Poppe and others, 1985). One limitation of using a Coulter Counter to perform fine fraction analyses is its ability to detect only those particles for which it has been calibrated. Calibration for this study allowed us to determine the distribution down to 0.72 μm or about two-thirds of the 11φ fraction. Because clay particles finer than this diameter and all of the colloidal fraction were not determined, a slight decrease in the 11φ fraction is present in the size distributions (Appendix B).

RESULTS AND COMMENTS

Sample locations, water depths, and brief comments on the bottom photography are presented in Appendix A. The relative frequency distributions of the grain-size analyses are presented in Appendix B and the related statistics and verbal equivalents are presented in Appendix C. Size classifications are based on the method proposed by Wentworth (1929); the statistics were calculated using the method of moments (Folk, 1974). The verbal equivalents were calculated using the inclusive graphics statistical method (Folk, 1974) and are based on the nomenclature proposed by Shepard (1954).

The southern and eastern portions of the study area are characterized by clayey silts. These fine-grained sediments are typically poorly to very poorly sorted (standard deviations are usually greater than 2.0), and have unimodal, coarsely-skewed to

nearly-symmetrical distributions. Although data on the total organic carbon content of the samples is unavailable, petrographic observation of smear slides suggests that as much as 25 percent on these samples may be biogenic in nature.

The fine-grained sediments are also extensively bioturbated; shrimp and lobster burrows, worm and amphipod tubes, mollusk shell hash, and tracks were commonly present at most of the stations. Most of the bedforms observed on the bottom video from this part of the study area appear to also have originated from the biological activity. For example, crustaceans mound the sediments while feeding and burrowing. These mounds, which extend above the surrounding sediments, are then modified into the rippled and undulating bottoms by tidal currents.

Gravelly sands are predominant in the northwestern and south-central portions of the study area. Bands of sand, silty sand and sand-silt-clay surround the gravelly areas, separating them from the lower energy environments dominated by clayey silt. These coarser sediments are also very poorly sorted, but are commonly finely skewed and have bimodal distributions. In the shallow northwestern part of the study area, scour and shadow effects, probably a result of the strong tidal currents, were observed around most of the isolated gravel-sized rocks. Oyster and razor clam shells litter the bottom, hydrozoans grow on the gravel and shell debris, and spider and rock crabs are common in this area. The gravelly sands in the south-central part of the study area are covered by a thin (less than 2 cm), possibly seasonal, veneer of muddy sediment.

Interested parties can obtain copies of the grain-size analysis data and an explanation of the variable headings in ASCII format and on 3.5" diskettes by contacting any of the authors. Videotapes showing the bottom character of the station locations can be viewed at the U.S. Geological Survey offices in Woods Hole, Massachusetts or at the Long Island Sound Resource Center at Avery Point, Groton, Connecticut.

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APPENDIX A

This table contains a list of the sample numbers, navigation (latitudes and longitudes) in degrees decimal minutes, water depths in meters, and comments on the bottom character. Stations designated by an asterisk were occupied during the August 1995 cruise.

SAMPLE	LATITUDE	LONGITUDE	DEPTH (M)	COMMENTS
NOR-1*	41d02.185'	-73d19.586'	18.2	GRAVEL, FAINT RIPPLES, HYDROZOANS, WORM TUBES, CRABS, BURROWS, SHELLS AND SHELL DEBRIS
NOR-2	41d02.2687'	-73d19.6058'	18.0	FAINT RIPPLES, HYDROZOANS, WORM TUBES, SHELLS AND SHELL DEBRIS
NOR-3	41d02.2473'	-73d19.6574'	18.0	FAINT RIPPLES, HYDROZOANS, WORM TUBES, GRAVELLY AND SHELLY PATCHES
NOR-4	41d02.628'	-73d19.872'	16.1	FAINT RIPPLES, SHELLS (RAZOR, OYSTER, AND CLAM), CRABS, FISH, SNAILS, HYDROZOANS
NOR-5	41d02.592'	-73d19.798'	16.9	BIOTURBATED, WORM TUBES, SHELLS AND SHELL DEBRIS, CRABS, WELK, HYDROZOANS, EEL, FISH
NOR-6	41d02.645'	-73d19.851'	16.3	GRAVEL, SHELLS (OYSTER, RAZOR) AND SHELL DEBRIS, HYDROZOANS
NOR-7	41d03.101'	-73d20.060'	13.6	GRAVEL, SPIDER CRABS, SHELLS (OYSTER AND RAZOR) AND SHELL DEBRIS, HYDROZOANS ON SHELLS
NOR-8	41d03.094'	-73d20.002'	14.0	CURRENT EFFECTS AROUND GRAVEL, SHELLS AND SHELL DEBRIS, CRABS, HYDROZOANS
NOR-9	41d03.020'	-73d19.980'	14.4	SCOUR AROUND GRAVEL, SHELLS (OYSTER, RAZOR, AND CLAM) AND SHELL DEBRIS, HYDROZOANS, SNAILS
NOR-10	41d03.5953'	-73d18.6061'	17.8	LUMPY BIOTURBATED BOTTOM, WORM TUBES, SHRIMP BURROWS, TRACES OF SHELL DEBRIS
NOR-11	41d03.5403'	-73d18.6072'	18.2	FAINT BEDFORMS, WORM TUBES, LOBSTER AND SHRIMP BURROWS, TRACES OF SHELL DEBRIS, TRACKS
NOR-12	41d03.5656'	-73d18.6222'	18.0	LUMPY BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM AND AMPHIPOD TUBES, SCATTERED TRACES OF SHELL DEBRIS
NOR-13	41d03.120'	-73d18.442'	20.1	BIOTURBATED, WORM TUBES, COLLAPSED LOBSTER BURROWS, TRACES OF SHELL DEBRIS, FLOUNDER, TRACKS
NOR-14	41d03.101'	-73d18.517'	20.1	UNDULATING BIOTURBATED BOTTOM, LOBSTERS AND BURROWS, WORM TUBES, TRACKS
NOR-15	41d03.110'	-73d18.439'	20.1	UNDULATING BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS, TRACKS, FLOUNDER
NOR-16	41d02.6311'	-73d18.1674'	20.9	LUMPY BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, TRACKS
NOR-17	41d02.5848'	-73d18.2203'	20.9	FAINTLY RIPPLED, SHRIMP BURROWS, WORM TUBES, SCATTERED TRACES OF SHELL DEBRIS
NOR-18	41d02.5973'	-73d18.1639'	20.9	UNDULATING BIOTURBATED BOTTOM, NONDESCRIPT BURROWS, WORM TUBES, SCATTERED TRACES OF SHELL DEBRIS
NOR-19	41d02.7840'	-73d17.6918'	20.7	FAINT BEDFORMS, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED AND PATCHY SHELL DEBRIS
NOR-20	41d02.770'	-73d17.680'	20.7	FAINTLY RIPPLED, SHRIMP BURROWS, WORM TUBES, SCATTERED AND PATCHY SHELL DEBRIS, TRACKS
NOR-21	41d02.6967'	-73d17.6656'	20.7	UNDULATING BIOTURBATED BOTTOM, FAINT BEDFORMS, LOBSTER AND SHRIMP BURROWS, WORM TUBES, TRACE OF SHELL DEBRIS
NOR-22	41d03.470'	-73d17.865'	19.4	FAINT RIPPLES, SHRIMP BURROWS, WORM TUBES, TRACES OF SHELL DEBRIS, CRABS, FLOUNDER
NOR-23	41d03.4493'	-73d17.7712'	19.7	FAINT BEDFORMS, COLLAPSED LOBSTER BURROWS, WORM TUBES, SHRIMP BURROWS, TRACES OF SHELL DEBRIS,
NOR-24	41d03.412'	-73d17.794'	19.8	UNDULATING BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS
NOR-25	41d03.8102'	-73d18.1663'	17.6	RIPPLES, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED TRACES OF SHELL DEBRIS, TRACKS
NOR-26	41d03.7684'	-73d18.1209'	17.8	FAINT CURRENT RIPPLES, LOBSTER AND SHRIMP BURROWS, AMPHIPOD AND WORM TUBES, SCATTERED SHELL DEBRIS
NOR-27	41d03.7633'	-73d18.9743'	18.2	FAINT RIPPLES, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS
NOR-28	41d00.9202'	-73d18.4396'	36.1	BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS, CRABS, TRACKS

SAMPLE	LATITUDE	LONGITUDE	DEPTH (M)	COMMENTS
NOR-29	41d00.9325'	-73d18.3194'	35.5	BIOTURBATED BOTTOM, SOME SHELL DEBRIS, LOBSTER BURROWS, WORM TUBES, CRABS, TRACKS
NOR-30	41d00.8952'	-73d18.3580'	35.5	BIOTURBATED BOTTOM, SOME SHELL DEBRIS, LOBSTER AND SHRIMP BURROWS, WORM TUBES, CRABS, TRACKS
NOR-31	41d01.2418'	-73d17.6396'	39.6	UNDULATING BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, FEW SHELL FRAGMENTS, CRABS, TRACKS
NOR-32	41d01.2058'	-73d17.5880'	39.2	BIOTURBATED BOTTOM, WORM TUBES, SHRIMP BURROWS, FEW SHELL FRAGMENTS, TRACKS
NOR-33	41d01.2034'	-73d17.5926'	39.2	BIOTURBATED BOTTOM, TRACKS, NONDESCRIPT TUBES AND BURROWS
NOR-34	41d01.4712'	-73d16.9847'	35.0	FAINTLY UNDULATING BOTTOM, SCATTERED SHELL DEBRIS, CRABS, LOBSTERS AND BURROWS, TRACKS, WORM TUBES, SHRIMP BURROWS
NOR-35	41d01.4042'	-73d16.9091'	37.5	FAINTLY UNDULATING BOTTOm, SOME SHELL DEBRIS, WORM TUBES, SHRIMP BURROWS
NOR-36	41d01.3405'	-73d17.0038'	38.4	LUMPY BIOTURBATED BOTTOM, SOME SHELL DEBRIS, WORM TUBES, SHRIMP BURROWS, TRACKS
NOR-37	41d00.5275'	-73d18.2365'	28.2	FAINTLY UNDULATING BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, TRACKS
NOR-38	41d00.4869'	-73d18.3262'	28.0	BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS
NOR-39	41d00.4809'	-73d18.2125'	27.1	FAINTLY UNDULATING BOTTOM, SCATTERED SHELL DEBRIS, SHRIMP BURROWS, WORM TUBES, TRACKS
NOR-40	41d00.657'	-73d17.472'	29.6	BIOTURBATED BOTTOM, WORM TUBES, SCATTERED SHELL DEBRIS, TRACKS
NOR-41	41d00.642'	-73d17.400'	29.4	BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, SCATTERED TRACES OF SHELL DEBRIS, TRACKS
NOR-42	41d00.6837'	-73d17.4135'	29.8	NO BOTTOM PHOTOGRAPHY
NOR-43	41d00.9821'	-73d16.8031'	36.3	BIOTURBATED BOTTOM, LOBSTERS AND BURROWS, WORM AND AMPHIPOD TUBES, TRACKS, FECAL CASTS
NOR-44	41d01.0118'	-73d16.7280'	36.9	BIOTURBATED BOTTOM, WORM TUBES, SHRIMP BURROWS, SCATTERED AND PATCHY SHELLS AND SHELL FRAGMENTS, SNAILS, TRACKS
NOR-45	41d00.946'	-73d16.717'	36.3	BIOTURBATED BOTTOM, LOBSTERS AND BURROWS, WORM TUBES, CRABS, SCATTERED SHELLS AND SHELL DEBRIS
NOR-46	41d00.0528'	-73d18.2039'	23.8	BIOTURBATED BOTTOM, LOBSTER BURROWS, WORM TUBES, PATCHY SHELL DEBRIS, TRACKS
NOR-47	41d00.022'	-73d18.177'	23.4	BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS, TRACKS, FLOUNDER
NOR-48	41d00.0231'	-73d18.1439'	23.2	BIOTURBATED BOTTOM, FAINT BEDFORMS, LOBSTER AND SHRIMP BURROWS, WORM TUBES, FLOUNDER, TRACKS, SCATTERED SHELL DEBRIS
NOR-49	41d00.2700'	-73d17.2042'	26.3	FAINT RIPPLES, LOBSTER AND SHRIMP BURROWS, AMPHIPOD AND WORM TUBES, SOME SHELL DEBRIS
NOR-50	41d00.1895'	-73d17.2410'	25.9	AMPHIPOD/WORM TUBES, FEW SHELL FRAGMENTS, NONDESCRIPT BURROWS, TRACKS
NOR-51	41d00.1884'	-73d17.2022'	26.1	SPARSE NONDESCRIPT BURROWS, SCATTERED SHELL FRAGMENTS, SNAILS, TRACKS
NOR-52	41d00.3410'	-73d16.3905'	27.6	FAINT RIPPLES, SHRIMP BURROWS, WORM TUBES, FEW SCATTERED SHELL FRAGMENTS, TRACKS
NOR-53	41d00.3091'	-73d16.4743'	27.5	FAINT RIPPLES, LOBSTER AND SHRIMP BURROWS, FISH, FEW SCATTERED SHELL DEBRIS
NOR-54	41d00.2651'	-73d16.5227'	27.1	LOBSTER BURROWS, WORM TUBES, FEW SCATTERED SHELL FRAGMENTS, FISH, TRACKS
NOR-55	41d03.8823'	-73d17.7058'	18.2	LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED TRACES OF SHELL DEBRIS, TRACKS, FLOUNDER
NOR-56	41d03.625'	-73d17.540'	19.4	UNDULATING BIOTURBATED BOTTOM, AMPHIPOD AND WORM TUBES, SHRIMP BURROWS, TRACES OF SHELL DEBRIS
NOR-57	41d03.0042'	-73d17.2983'	20.3	FAINTLY RIPPLED, SHRIMP BURROWS, WORM TUBES, TRACKS, SCATTERED TRACES OF SHELL DEBRIS
NOR-58	41d034467'	-73d19.4473'	15.0	CURRENT EFFECTS AROUND GRAVEL, SHELLS AND SHELL DEBRIS, CRABS
NOR-59	41d03.436'	-73d19.654'	14.2	FAINT CURRENT EFFECTS AROUND GRAVEL, SHELLS AND SHELL DEBRIS, CRABS, HYDROZOANS
NOR-60	41d03.327'	-73d20.132'	12.5	GRAVELLY, CRABS (SPIDER AND CANCER), SHELLS (OYSTER AND RAZOR) AND SHELL DEBRIS, HYDROZOANS

SAMPLE	LATITUDE	LONGITUDE	DEPTH (M)	COMMENTS
NOR-61	41d02.333'	-73d19.992'	17.1	CURRENT EFFECTS AROUND GRAVEL, SHELLS AND SHELL DEBRIS, CRABS, FLOUNDER, HYDROZOANS
NOR-62	41d02.905'	-73d19.125'	17.6	BIOTURBATED, WORM TUBES, SCATTERED SHELLS AND SHELL DEBRIS, SPARSE HYDROZOANS
NOR-63	41d02.613'	-73d19.095'	19.4	BIOTURBATED, WORM TUBES, SCATTERED TRACES OF SHELL DEBRIS, CRABS, HORSESHOE CRABS, TRACKS
NOR-64	41d02.442'	-73d19.098'	19.6	BIOTURBATED, WORM TUBES, SCATTERED SHELL AND SHELL DEBRIS, SPARSE HYDROZOANS, TRACKS
NOR-65	41d02.1316'	-73d18.9559'	20.9	FAINTLY UNDULATING BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SKATE, SCATTERED SHELL DEBRIS, TRACKS
NOR-66	41d02.1241'	-73d18.1366'	21.9	UNDULATING BIOTURBATED BOTTOM, NONDESCRIPT BURROWS, SCATTERED SHELL DEBRIS, TRACKS
NOR-67	41d02.8339'	-73d17.9947'	20.0	UNDULATING BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, FLOUNDER, TRACKS, TRACE OF SHELL DEBRIS
NOR-68	41d02.6582'	-73d17.1056'	21.9	UNDULATING BIOTURBATED BOTTOM, SHRIMP BURROWS COMMON, SCATTERED TRACES OF SHELL DEBRIS
NOR-69	41d03.284'	-73d17.083'	20.0	UNDULATING BIOTURBATED BOTTOM, NONDESCRIPT BURROWS, WORM TUBES, TRACKS, SCATTERED TRACES OF SHELL DEBRIS
NOR-70	41d02.2259'	-73d17.5356'	22.3	NO PHOTOGRAPHY
NOR-71	41d01.4545'	-73d16.4605'	35.5	FAINTLY UNDULATING BOTTOM, SOME SHELL DEBRIS, WORM TUBES, SHRIMP BURROWS, TRACKS
NOR-72	41d01.7373'	-73d16.7427'	28.8	FAINT BEDFORMS, SHRIMP AND LOBSTER BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS, CRABS, TRACKS
NOR-73	41d01.8947'	-73d17.2119'	26.7	BIOTURBATED BOTTOM, WORM AND AMPHIPOD TUBES, SCATTERED SHELL DEBRIS, FLOUNDER, TRACKS
NOR-74	41d01.5322'	-73d17.5465'	31.3	BIOTURBATED BOTTOM, SOME SHELL DEBRIS, SHRIMP BURROWS, WORM TUBES
NOR-75	41d01.808'	-73d17.913'	26.3	BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, PATCHY AND SCATTERED SHELL DEBRIS
NOR-76	41d01.384'	-73d18.254'	30.9	BIOTURBATED, FAINT BEDFORMS, WORM TUBES, SHRIMP AND LOBSTER BURROWS, TRACKS
NOR-77	41d01.1483'	-73d18.2534'	44.9	BIOTURBATED BOTTOM, LOBSTER, SHRIMP AND LOBSTER BURROWS, WORM TUBES, TRACKS
NOR-78	41d01.0133'	-73d18.9503'	45.0	SCATTERED SHELL DEBRIS, LOBSTER AND SHRIMP BURROWS, WORM TUBES
NOR-79	41d01.120'	-73d19.228'	39.6	BIOTURBATED BOTTOM, MANY TRACKED, HORSESHOE CRABS, SOME SHELL DEBRIS, LOBSTER BURROWS, WORM TUBES
NOR-80	41d01.4373'	-73d19.0683'	25.9	HYDROZOANS, NONDESCRIPT BURROWS, WORM TUBES, SCATTERED SHELLS AND SHELL DEBRIS
NOR-81	41d01.8494'	-73d19.3202'	20.1	FAINTLY UNDULATING BOTTOM, HYDROZOANS, NONDESCRIPT BURROWS, SHELLS AND SHELL FRAGMENTS
NOR-82	41d01.8844'	-73d18.8452'	21.3	BIOTURBATED BOTTOM, WORM TUBES, NONDESCRIPT BURROWS, FLOUNDER, CRABS, SCATTERED SHELL DEBRIS
NOR-83	41d01.8069'	-73d18.6665'	25.7	UNDULATING BIOTURBATED BOTTOM, SHRIMP BURROWS, SCATTERED TRACES OF SHELL DEBRIS
NOR-84	41d00.7891'	-73d19.3262'	34.8	SCATTERED SHELL DEBRIS, NONDESCRIPT BURROWS, FISH, TRACKS
NOR-85	41d00.2937'	-73d18.8538'	25.5	BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, SCATTERED SHELL DEBRIS, WORM TUBES, TRACKS
NOR-86	41d00.0488'	-73d18.7064'	24.2	BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL FRAGMENTS, CRABS
NOR-87	40d59.8239'	-73d18.6358'	23.0	BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS, SNAILS, TRACKS
NOR-88	40d59.544'	-73d17.473'	21.5	BIOTURBATED BOTTOM, SHRIMP BURROWS, WORM TUBES, SCATTERED TRACES OF SHELL DEBRIS, FLOUNDER
NOR-89	41d00.7766'	-73d17.8501'	31.5	PATCHES OF HARDER BOTTOM AND SHELL DEBRIS, LOBSTERS AND BURROWS, CRABS, TRACKS
NOR-90	41d00.8937'	-73d17.7442'	32.1	FINER-GRAINED SEDIMENTS OVERLIE GRAVEL, SHRIMP BURROWS, WORM TUBES, CRABS, FISH, EEL, TRACKS
NOR-91	41d00.7825'	-73d16.1928'	34.6	FAINT RIPPLES, SHRIMP BURROWS, AMPHIPOD AND WORM TUBES, SCATTERED TRACES OF SHELLS AND SHELL DEBRIS
NOR-92*	41d00.7466'	-73d16.7543'	31.7	TURBID, BIOTURBATED, FAINT BEDFORMS, SHRIMP AND BURROWS, CRABS, SCATTERED SHELLS AND SHELL DEBRIS

SAMPLE	LATITUDE	LONGITUDE	DEPTH (M)	COMMENTS
NOR-93*	41d01.2295'	-73d16.4741'	35.7	TURBID, BIOTURBATED, LOBSTER IN LOBSTER POT, LOBSTER BURROW, WORM TUBES, CRABS, SOME SHELL DEBRIS
NOR-94*	41d01.2427'	-73d18.6948'	28.4	TURBID, BIOTURBATED, SOME GRAVEL, SHRIMP AND BURROWS, WORM TUBES, CRABS, HYDROZOANS, TRACKS, SOME SHELL DEBRIS
NOR-95*	41d01.6310'	-73d18.2846'	26.7	TURBID, VERY DENSE NEPHOLOID LAYER
NOR-96*	41d01.1875'	-73d19.4876'	35.0	TURBID, UNDULATING BIOTURBATED BOTTOM, LOBSTER AND SHRIMP BURROWS, WORM TUBES, SOME SHELL DEBRIS
NOR-97*	41d01.6031'	-73d19.5809'	27.1	TURBID, BIOTURBATED, SHRIMP BURROWS, WORM TUBES, SHELLS AND SHELL DEBRIS, CRABS (CANCER), FLOUNDER
NOR-98*	41d01.9361'	-73d19.7181'	18.2	TURBID, GRAVELLY PATCHES, SPIDER CRABS, SHELLS AND SHELL DEBRIS
NOR-99*	41d02.3106'	-73d18.5615'	21.1	TURBID, UNDULATING BIOTURBATED BOTTOM, SHRIMP AND BURROWS, WORM TUBES, CRABS, TRACKS
NOR-100*	41d02.5892'	-73d18.5055'	20.1	TURBID, BIOTURBATED, SHRIMP AND BURROWS, WORM TUBES, CRABS, SCATTERED SHELL DEBRIS
NOR-101*	41d03.3448'	-73d18.9397'	16.5	TURBID, BIOTURBATED, SHRIMP AND BURROWS, WORM TUBES, SCATTERED SHELL DEBRIS, TRACKS
NOR-102*	41d03.7525'	-73d18.3847'	16.9	TURBID, SHRIMP AND BURROWS, CRABS, SCATTERED SHELL DEBRIS
NOR-103*	41d03.7803'	-73d19.2819'	14.0	TURBID, GRAVELLY PATCHES, WORM TUBES, CRABS (HERMIT AND CANCER), SCATTERED SHELLS AND SHELL DEBRIS

APPENDIX B

This table contains the relative grain-size frequency distributions by weight in whole phi units for each sample. The -5 ϕ fraction contains all sediment coarser than 32 mm; the 11 ϕ fraction contains sediment with diameters between .001 and .00072 mm.

	CLAY					SILT				SAND				GRAVEL			
SAMPLE NUMBER	11ϕ	10ϕ	9ϕ	8ϕ	7ϕ	6ϕ	5ϕ	4ϕ	3ϕ	2ϕ	1ϕ	0ϕ	-1ϕ	-2ϕ	-3ϕ	-4ϕ	-5ϕ
NOR-1	2.34	1.98	3.47	4.60	4.41	2.43	0.91	1.06	9.29	30.34	16.70	7.83	6.37	7.80	2.34	0.0	0.0
NOR-4	0.19	0.66	1.31	1.96	2.07	1.33	0.41	0.66	13.91	49.52	17.59	6.69	1.70	0.28	1.72	0.0	0.0
NOR-9	0.14	0.49	0.99	1.47	1.62	1.33	1.20	0.87	12.41	38.25	14.89	6.82	4.41	7.09	8.01	0.0	0.0
NOR-10	0.76	2.61	5.29	8.43	11.86	17.38	15.41	2.81	8.14	8.55	4.52	2.94	4.14	7.16	0.0	0.0	0.0
NOR-13	2.09	8.65	14.39	17.88	19.76	18.77	7.96	1.27	2.57	3.75	1.94	0.83	0.13	0.0	0.0	0.0	0.0
NOR-16	10.26	10.39	15.50	17.95	17.65	14.49	5.31	1.72	4.32	1.47	0.36	0.44	0.15	0.0	0.0	0.0	0.0
NOR-19	2.60	8.31	13.95	18.36	21.12	15.33	6.74	1.57	6.82	4.28	0.61	0.32	0.0	0.0	0.0	0.0	0.0
NOR-22	2.55	8.39	14.40	18.81	19.04	19.76	9.06	1.95	3.74	1.53	0.46	0.31	0.0	0.0	0.0	0.0	0.0
NOR-25	2.11	6.91	12.31	16.53	19.64	20.15	12.50	1.48	1.60	1.55	1.16	0.82	0.61	2.63	0.0	0.0	0.0
NOR-28	5.38	14.76	20.01	21.22	17.38	9.31	4.73	4.13	1.18	0.50	0.68	0.71	0.0	0.0	0.0	0.0	0.0
NOR-31	0.75	2.20	3.13	3.24	2.61	1.69	0.39	0.87	12.30	42.93	13.11	4.72	4.79	2.74	4.51	0.0	0.0
NOR-34	5.18	15.36	22.06	21.65	16.89	10.79	2.26	2.85	0.52	0.39	0.76	1.28	0.0	0.0	0.0	0.0	0.0
NOR-37	4.85	14.30	19.84	21.31	18.80	10.13	3.00	3.77	1.31	0.65	0.92	1.11	0.0	0.0	0.0	0.0	0.0
NOR-38	5.48	14.58	18.59	19.73	18.41	12.32	7.06	1.84	0.41	0.33	0.59	0.65	0.0	0.0	0.0	0.0	0.0
NOR-39	5.57	15.44	20.17	21.52	17.56	12.11	3.86	1.58	0.51	0.34	0.53	0.81	0.0	0.0	0.0	0.0	0.0
NOR-40	11.39	16.66	19.60	18.83	18.85	9.19	4.44	0.75	0.12	0.10	0.04	0.03	0.0	0.0	0.0	0.0	0.0
NOR-43	9.34	9.38	14.07	15.39	13.33	10.87	6.73	8.85	6.48	1.73	1.68	2.13	0.0	0.0	0.0	0.0	0.0
NOR-46	5.87	14.74	19.18	19.63	17.74	11.66	5.80	1.58	0.67	1.13	1.01	0.98	0.0	0.0	0.0	0.0	0.0
NOR-49	15.32	13.23	16.94	17.36	16.43	9.34	6.68	1.03	0.49	0.70	1.49	0.99	0.0	0.0	0.0	0.0	0.0
NOR-52	14.05	13.07	16.88	19.21	16.80	11.37	5.60	0.92	0.68	0.45	0.47	0.51	0.0	0.0	0.0	0.0	0.0
NOR-55	1.85	6.29	11.75	17.40	21.70	22.37	11.05	1.74	3.65	1.73	0.24	0.21	0.0	0.0	0.0	0.0	0.0
NOR-56	3.18	10.11	16.51	20.81	22.90	18.43	5.41	1.10	0.88	0.37	0.11	0.18	0.0	0.0	0.0	0.0	0.0
NOR-57	2.28	7.64	13.03	18.10	22.57	20.80	11.73	1.40	1.51	0.65	0.22	0.07	0.0	0.0	0.0	0.0	0.0
NOR-58	0.22	0.70	1.27	1.81	2.09	1.86	1.30	1.08	15.77	36.01	9.27	4.54	4.52	10.80	8.77	0.0	0.0
NOR-59	0.14	0.48	0.97	1.50	1.93	1.91	0.98	0.78	11.05	36.35	19.09	9.37	7.09	3.92	4.44	0.0	0.0
NOR-60	0.17	0.55	1.04	1.54	1.63	0.95	0.34	0.60	9.70	37.04	17.11	6.16	3.28	1.53	18.35	0.0	0.0
NOR-61	0.28	0.94	1.82	2.64	2.66	2.14	1.44	0.82	14.89	53.26	11.05	4.23	2.45	1.39	0.0	0.0	0.0
NOR-62	1.96	1.57	2.88	4.37	6.13	5.86	2.98	1.36	14.01	36.99	8.63	1.97	0.97	1.76	8.55	0.0	0.0

SAMPLE NUMBER	CLAY 11φ	10φ	9φ	8φ	SILT 7φ	6φ	5φ	4φ	SAND 3φ	2φ	1φ	0φ	-1φ	GRAVEL -2φ	-3φ	-4φ	-5φ
NOR-63	0.27	0.99	2.11	3.43	4.54	5.10	3.92	1.54	15.77	34.65	11.87	4.01	2.70	4.35	4.74	0.0	0.0
NOR-64	0.38	1.23	2.48	4.01	4.92	4.27	3.50	2.29	14.55	37.85	15.53	5.02	3.56	0.40	0.0	0.0	0.0
NOR-65	5.46	4.77	6.35	6.71	6.30	5.34	4.26	3.72	15.01	28.83	8.80	2.18	0.51	1.77	0.0	0.0	0.0
NOR-66	7.42	8.02	11.86	13.88	13.88	11.77	13.23	2.89	9.69	5.80	1.12	0.44	0.0	0.0	0.0	0.0	0.0
NOR-67	2.05	7.11	12.68	16.46	18.05	14.84	4.55	2.08	7.02	12.38	2.12	0.65	0.0	0.0	0.0	0.0	0.0
NOR-68	13.04	13.58	17.42	18.78	16.85	11.62	2.37	1.35	2.55	1.78	0.56	0.13	0.0	0.0	0.0	0.0	0.0
NOR-69	2.80	8.90	14.91	20.08	22.79	18.72	6.75	2.10	1.97	0.66	0.16	0.16	0.0	0.0	0.0	0.0	0.0
NOR-70	12.18	12.64	15.52	17.80	14.79	12.09	5.71	2.03	3.81	2.29	0.69	0.46	0.0	0.0	0.0	0.0	0.0
NOR-71	5.59	14.89	19.44	19.55	17.62	12.17	6.07	2.78	0.42	0.29	0.45	0.72	0.0	0.0	0.0	0.0	0.0
NOR-72	4.73	12.54	17.19	19.33	18.82	14.20	6.91	3.57	1.50	0.60	0.24	0.37	0.0	0.0	0.0	0.0	0.0
NOR-73	14.36	13.33	16.45	17.78	14.94	10.66	4.07	3.45	1.89	1.09	0.97	1.02	0.0	0.0	0.0	0.0	0.0
NOR-74	3.18	9.39	13.50	14.58	13.08	11.75	21.64	5.22	4.23	2.20	0.76	0.47	0.0	0.0	0.0	0.0	0.0
NOR-75	15.02	11.97	15.44	16.45	17.20	12.77	4.66	2.80	1.68	1.00	0.68	0.32	0.0	0.0	0.0	0.0	0.0
NOR-76	2.28	6.75	9.76	10.45	8.98	6.05	2.29	4.74	18.87	22.78	4.55	1.34	1.17	0.0	0.0	0.0	0.0
NOR-77	0.68	1.70	2.11	2.18	1.92	1.23	0.85	1.25	31.49	52.68	2.94	0.68	0.29	0.0	0.0	0.0	0.0
NOR-78	1.75	4.86	6.50	7.03	5.99	3.32	0.64	1.17	8.02	25.39	21.01	7.80	6.52	0.0	0.0	0.0	0.0
NOR-79	3.70	10.60	14.88	16.19	13.84	8.94	4.86	7.30	17.51	1.65	0.35	0.19	0.0	0.0	0.0	0.0	0.0
NOR-80	1.41	1.51	2.19	2.17	1.82	1.29	0.45	1.28	10.38	20.89	8.59	5.62	10.44	26.89	5.07	0.0	0.0
NOR-81	1.26	1.46	2.20	2.50	2.19	1.51	0.57	0.76	14.52	58.10	12.39	1.97	0.56	0.0	0.0	0.0	0.0
NOR-82	3.50	3.82	4.83	4.85	5.14	3.82	2.42	1.50	23.35	44.62	1.85	0.29	0.0	0.0	0.0	0.0	0.0
NOR-83	10.06	9.96	14.43	15.50	14.47	11.20	3.18	4.22	6.16	4.38	3.43	1.81	1.20	0.0	0.0	0.0	0.0
NOR-84	5.01	14.56	20.47	21.37	18.73	12.71	4.89	1.04	0.27	0.26	0.25	0.45	0.0	0.0	0.0	0.0	0.0
NOR-85	6.21	15.39	18.90	19.42	19.05	12.54	5.63	1.40	0.27	0.34	0.46	0.39	0.0	0.0	0.0	0.0	0.0
NOR-86	6.04	15.12	19.22	20.07	19.18	11.28	3.69	1.87	0.83	0.63	1.05	1.01	0.0	0.0	0.0	0.0	0.0
NOR-87	5.45	14.72	19.85	21.24	18.24	12.17	4.28	1.59	1.09	0.43	0.43	0.51	0.0	0.0	0.0	0.0	0.0
NOR-88	6.07	15.73	20.89	21.65	19.68	10.12	3.11	0.78	0.37	0.41	0.59	0.60	0.0	0.0	0.0	0.0	0.0
NOR-89	13.92	14.44	16.50	17.47	18.64	10.87	4.88	1.51	0.49	0.70	0.52	0.07	0.0	0.0	0.0	0.0	0.0
NOR-90A	13.47	12.77	14.83	13.69	12.78	5.85	2.46	3.05	2.17	5.79	4.34	1.71	0.98	0.0	6.00	0.0	0.0
NOR-90B	0.97	3.72	5.67	5.89	4.49	1.91	0.55	2.06	2.66	12.20	11.12	3.91	3.00	2.33	39.52	0.0	0.0
NOR-91	14.01	14.05	17.72	18.35	14.56	10.26	4.53	4.25	0.76	0.42	0.48	0.61	0.0	0.0	0.0	0.0	0.0
NOR-92	2.04	8.31	14.93	18.15	18.46	15.31	12.83	5.80	1.77	1.02	0.82	0.55	0.0	0.0	0.0	0.0	0.0
NOR-93	1.34	5.64	10.67	14.88	16.36	13.26	11.21	9.43	3.63	3.39	4.46	3.32	0.12	2.28	0.0	0.0	0.0

	CLAY				SILT				SAND						GRAVEL		
SAMPLE NUMBER	11ϕ	10ϕ	9ϕ	8ϕ	7ϕ	6ϕ	5ϕ	4ϕ	3ϕ	2ϕ	1ϕ	0ϕ	-1ϕ	-2ϕ	-3ϕ	-4ϕ	-5ϕ
NOR-94	0.39	1.64	3.12	4.25	4.41	2.75	0.64	2.10	15.26	30.44	14.83	6.73	5.21	8.25	0.0	0.0	0.0
NOR-95	1.05	4.43	8.26	12.22	13.39	18.03	16.83	8.36	6.43	4.64	2.26	1.38	0.73	1.99	0.0	0.0	0.0
NOR-96	2.33	9.83	18.02	21.66	21.57	14.85	2.98	3.81	2.73	1.21	0.61	0.40	0.0	0.0	0.0	0.0	0.0
NOR-97	0.40	1.69	3.20	4.27	4.03	2.56	1.04	2.92	24.12	47.93	6.58	0.84	0.43	0.0	0.0	0.0	0.0
NOR-98	0.29	1.29	2.47	3.37	3.27	1.84	0.85	0.59	10.78	54.82	15.25	3.08	0.85	1.25	0.0	0.0	0.0
NOR-99	0.73	2.97	5.48	7.57	8.59	8.84	13.16	4.67	15.29	24.14	5.88	1.83	0.85	0.0	0.0	0.0	0.0
NOR-100	0.77	3.18	5.94	7.88	8.76	6.65	2.91	4.15	18.33	27.71	8.07	2.72	1.63	1.30	0.0	0.0	0.0
NOR-101	0.46	1.86	3.42	4.81	5.71	4.74	1.82	1.87	14.11	25.54	12.11	8.07	7.97	4.24	3.26	0.0	0.0
NOR-102	1.52	6.43	12.07	17.17	18.91	16.17	7.80	5.93	5.94	4.46	2.19	1.20	0.21	0.0	0.0	0.0	0.0
NOR-103	0.46	1.93	3.72	5.11	5.58	3.73	1.44	1.89	15.56	24.70	11.14	6.81	4.35	2.93	10.64	0.0	0.0

APPENDIX C

This table contains the sample weight analyzed, percent gravel (>2.0 mm), percent sand (2.0 mm>x>0.062 mm), percent silt (0.063 mm>x>0.004 mm), percent clay (<0.004 mm), the verbal-equivalent sediment classification (Shepard, 1954), and the related method of moments statistics for each sample. Modes are given in the middle of whole phi intervals.

SAMPLE NUMBER	WEIGHT (GRAMS)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT	PERCENT CLAY	SEDIMENT CLASS	MEDIAN (ϕ)	MEAN (ϕ)	STANDARD DEVIATION	SKEWNESS	KURTOSIS	MODE 1 (ϕ)	MODE 2 (ϕ)	MODE 3 (ϕ)
NOR-1	35.4442	16.51	65.21	12.34	5.94	GRAVELLY SEDIMENT	1.30	1.74	3.08	0.44	0.34			
NOR-4	37.4205	3.70	88.37	5.77	2.16	SAND	1.44	1.64	1.96	0.81	5.07	1.5		
NOR-9	38.2641	19.50	73.24	5.63	1.63	GRAVELLY SEDIMENT	1.23	0.92	2.42	0.27	1.73	1.5	-3.5	
NOR-10	20.6488	11.31	26.96	53.08	8.66	GRAVELLY SEDIMENT	4.76	4.03	3.23	-0.24	-0.60	5.5	1.5	-2.50
NOR-13	29.3632	0.13	10.36	64.37	25.13	CLAYEY SILT	6.65	6.45	2.22	-0.43	0.83	6.5		
NOR-16	18.6373	0.15	8.30	55.40	36.16	CLAYEY SILT	7.23	7.10	2.22	-0.32	0.47	7.5		
NOR-19	20.1062	0.00	13.60	61.54	24.86	CLAYEY SILT	6.68	6.44	2.22	-0.32	0.04	6.5	2.5	
NOR-22	17.2359	0.00	8.00	66.67	25.33	CLAYEY SILT	6.69	6.62	1.97	-0.26	0.43	5.5		
NOR-25	16.9771	3.25	6.60	68.82	21.33	CLAYEY SILT	6.38	6.15	2.50	-0.68	2.81	5.5		
NOR-28	16.5764	0.00	7.21	52.64	40.15	CLAYEY SILT	7.54	7.30	2.01	-0.49	1.44	7.5		
NOR-31	34.6123	12.04	73.94	7.94	6.08	GRAVELLY SEDIMENT	1.47	1.80	2.82	0.50	1.43	1.5		
NOR-34	17.2837	0.00	5.80	51.60	42.60	CLAYEY SILT	7.66	7.41	1.98	-0.65	2.89	8.5		
NOR-37	15.3572	0.00	7.77	53.24	38.99	CLAYEY SILT	7.48	7.24	2.06	-0.58	2.00	7.5		
NOR-38	15.6858	0.00	3.82	57.53	38.65	CLAYEY SILT	7.42	7.29	1.91	-0.40	1.42	7.5		
NOR-39	16.7186	0.00	3.78	55.05	41.18	CLAYEY SILT	7.59	7.43	1.88	-0.52	2.35	7.5		
NOR-40	15.9222	0.00	1.04	51.31	47.64	CLAYEY SILT	7.87	7.82	1.70	-0.16	-0.32	8.5	6.5	
NOR-43	19.2175	0.00	20.88	46.33	32.79	SAND-SILT-CLAY	6.86	6.49	2.70	-0.26	-0.38	7.5	3.5	
NOR-46	15.8660	0.00	5.36	54.84	39.80	CLAYEY SILT	7.48	7.26	2.07	-0.53	1.84	7.5		
NOR-49	16.7749	0.00	4.70	49.82	45.48	CLAYEY SILT	7.74	7.55	2.24	-0.49	1.44	7.5		
NOR-52	16.5883	0.00	3.02	52.98	43.99	CLAYEY SILT	7.69	7.62	2.01	-0.35	1.02	7.5		
NOR-55	17.0513	0.00	7.58	72.52	19.90	CLAYEY SILT	6.41	6.41	1.86	-0.19	0.45	5.5		
NOR-56	17.0522	0.00	2.65	67.55	29.80	CLAYEY SILT	7.03	7.07	1.66	-0.17	0.72	6.5		
NOR-57	17.5595	0.00	3.85	73.20	22.95	CLAYEY SILT	6.60	6.67	1.72	-0.08	0.25	6.5		
NOR-58	38.1007	24.09	66.67	7.06	2.18	GRAVELLY SEDIMENT	1.34	0.98	2.70	0.25	0.92	1.5	-2.5	
NOR-59	40.0337	15.45	76.64	6.32	1.59	GRAVELLY SEDIMENT	1.17	1.07	2.26	0.43	2.48	1.5		
NOR-60	39.3372	23.16	70.61	4.46	1.76	GRAVELLY SEDIMENT	1.10	0.59	2.63	0.22	1.30	1.5	-3.5	
NOR-61	33.4927	3.83	84.24	8.89	3.04	SAND	1.58	1.99	2.09	0.84	3.53	1.5		
NOR-62	29.4677	11.28	62.96	19.35	6.41	GRAVELLY SEDIMENT	1.76	2.41	3.20	0.19	0.13	1.5	-3.5	6.5

SAMPLE NUMBER	WEIGHT (GRAMS)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT	PERCENT CLAY	SEDIMENT CLASS	MEDIAN (ϕ)	MEAN (ϕ)	STANDARD DEVIATION	SKEWNESS	KURTOSIS	MODE 1 (ϕ)	MODE 2 (ϕ)	MODE 3 (ϕ)
NOR-63	33.2789	11.80	67.85	16.99	3.37	GRAVELLY SEDIMENT	1.64	2.00	2.78	0.24	0.46	1.5	5.5	
NOR-64	32.9831	3.96	75.24	16.70	4.09	SAND	1.67	2.38	2.47	0.58	0.82	1.5		
NOR-65	26.7476	2.28	58.53	22.60	16.58	SILTY SAND	2.53	3.88	3.30	0.28	-0.85	1.5	7.5	
NOR-66	19.0040	0.00	19.94	52.77	27.30	CLAYEY SILT	6.36	6.17	2.62	-0.12	-0.78	6.5	4.5	2.5
NOR-67	20.7856	0.00	24.26	53.91	21.84	SAND-SILT-CLAY	6.35	5.84	2.63	-0.25	-0.76	6.5	1.5	
NOR-68	16.6090	0.00	6.34	49.62	44.04	CLAYEY SILT	7.68	7.53	2.12	-0.41	0.78	7.5		
NOR-69	18.1306	0.00	5.05	68.34	26.61	CLAYEY SILT	6.86	6.86	1.76	-0.20	0.56	6.5		
NOR-70	18.1619	0.00	9.27	50.39	40.34	CLAYEY SILT	7.46	7.22	2.34	-0.36	0.24	7.5		
NOR-71	15.5700	0.00	4.67	55.42	39.92	CLAYEY SILT	7.48	7.32	1.93	-0.42	1.40	7.5		
NOR-72	18.2382	0.00	6.30	59.25	34.45	CLAYEY SILT	7.20	7.08	1.93	-0.28	0.49	7.5		
NOR-73	18.6966	0.00	8.42	47.45	44.13	CLAYEY SILT	7.67	7.43	2.32	-0.45	0.89	7.5		
NOR-74	17.9016	0.00	12.88	61.05	26.07	CLAYEY SILT	6.28	6.26	2.25	-0.11	-0.49	4.5	7.5	
NOR-75	17.9547	0.00	6.49	51.08	42.43	CLAYEY SILT	7.54	7.45	2.18	-0.32	0.37	6.5		
NOR-76	23.7673	1.17	52.28	27.77	18.79	SILTY SAND	3.27	4.49	3.11	0.14	-1.31	1.5	7.5	
NOR-77	36.1933	0.29	89.04	6.18	4.49	SAND	1.87	2.43	1.92	1.25	5.81	1.5		
NOR-78	27.4894	6.52	63.39	16.98	13.11	SILTY SAND	1.58	2.92	3.39	0.39	-0.78	1.5	7.5	
NOR-79	19.4429	0.00	27.00	43.83	29.17	SAND-SILT-CLAY	6.67	6.20	2.55	-0.14	-1.13	2.5	7.5	
NOR-80	39.4337	42.40	46.76	5.73	5.11	GRAVELLY SEDIMENT	0.23	0.48	3.24	0.59	1.10	-2.5	1.5	
NOR-81	35.8124	0.56	87.75	6.78	4.92	SAND	1.60	2.20	2.15	1.15	4.75	1.5		
NOR-82	31.1111	0.00	71.62	16.24	12.15	SILTY SAND	2.14	3.47	2.80	0.62	0.07	1.5	6.5	
NOR-83	19.5670	1.20	20.01	44.35	34.44	SAND-SILT-CLAY	7.00	6.45	2.96	-0.37	-0.22	7.5	2.5	
NOR-84	16.6377	0.00	2.27	57.69	40.04	CLAYEY SILT	7.53	7.43	1.74	-0.37	1.62	7.5		
NOR-85	16.0730	0.00	2.86	56.63	40.51	CLAYEY SILT	7.51	7.42	1.83	-0.35	1.24	7.5		
NOR-86	14.8111	0.00	5.39	54.23	40.38	CLAYEY SILT	7.52	7.34	2.02	-0.57	2.36	7.5		
NOR-87	16.0860	0.00	4.05	55.93	40.02	CLAYEY SILT	7.53	7.39	1.86	-0.44	1.66	7.5		
NOR-88	15.3365	0.00	2.75	54.56	42.69	CLAYEY SILT	7.66	7.55	1.79	-0.54	2.79	7.5		
NOR-89	16.9368	0.00	3.29	51.86	44.85	CLAYEY SILT	7.71	7.65	1.97	-0.28	0.42	6.5		
NOR-90A	20.0140	6.98	17.07	34.89	41.07	SAND-SILT-CLAY	7.35	6.22	3.89	-0.54	0.25	8.5	-3.5	1.5
NOR-90B	35.9470	44.84	31.95	12.84	10.36	GRAVELLY SEDIMENT	0.11	0.67	4.44	0.36	-0.84	-3.5	1.5	7.5
NOR-91	18.5469	0.00	6.53	47.70	45.77	CLAYEY SILT	7.77	7.58	2.13	-0.39	0.75	7.5		
NOR-92	17.8692	0.00	9.97	64.75	25.28	CLAYEY SILT	6.64	6.52	2.02	-0.25	0.30	6.5		
NOR-93	20.4612	2.39	24.24	55.71	17.66	SANDY SILT	5.92	5.42	2.84	-0.38	0.15	6.5		

SAMPLE NUMBER	WEIGHT (GRAMS)	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT	PERCENT CLAY	SEDIMENT CLASS	MEDIAN (ϕ)	MEAN (ϕ)	STANDARD DEVIATION	SKEWNESS	KURTOSIS	MODE 1 (ϕ)	MODE 2 (ϕ)	MODE 3 (ϕ)
NOR-94	36.0365	13.46	69.34	12.05	5.15	GRAVELLY SEDIMENT	1.49	1.92	2.87	0.45	0.52	1.5	-2.5	
NOR-95	20.9594	2.72	23.06	60.48	13.74	SANDY SILT	5.41	5.24	2.59	-0.32	0.53	5.5		
NOR-96	16.5161	0.00	8.77	61.05	30.18	CLAYEY SILT	7.08	6.91	1.93	-0.44	1.17	7.5		
NOR-97	34.1161	0.43	82.39	11.89	5.29	SAND	1.88	2.69	2.24	0.85	1.88	1.5		
NOR-98	35.7087	2.10	84.52	9.33	4.05	SAND	1.54	2.10	2.22	0.43	3.70	1.5		
NOR-99	26.3816	0.85	51.81	38.16	9.18	SILTY SAND	3.43	3.94	2.67	0.21	-0.84	1.5	4.5	
NOR-100	28.5365	2.93	60.97	26.21	9.89	SILTY SAND	2.47	3.53	2.93	0.26	-0.78	1.5	6.5	
NOR-101	32.5102	15.47	61.71	17.08	5.74	GRAVELLY SEDIMENT	1.56	2.07	3.13	0.31	-0.16	1.5	6.5	
NOR-102	20.5383	0.21	19.71	60.71	20.03	SAND-SILT-CLAY	6.32	5.98	2.39	-0.32	-0.05	6.5	2.5	
NOR-103	32.7014	17.92	60.10	15.87	6.11	GRAVELLY SEDIMENT	1.57	1.90	3.36	0.22	-0.28	1.5	-3.5	6.5