North Carolina Continental Shelf Sand Resource Investigation - Final Report in fulfillment of BOEM Cooperative Agreement No. M14AC00009

Coastal Studies Institute - East Carolina University

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1 Introduction:

Hurricane Sandy battered North Carolina in October 2012 with high waves and tropical storm-force winds (Barnes, 2013). The State's northern Outer Banks, and in particular Dare County, were hard hit by the storm. Ocean overwash and localized ocean and soundside flooding, coupled with ocean beach erosion from the 20 - 30 foot offshore waves being generated by the then Category 1 hurricane, resulted in costly damage in the towns of Duck, Kitty Hawk, and Kill Devil Hills on the northern Outer Banks, and all along Hatteras and Ocracoke Islands to the south. For a storm that only grazed the North Carolina coast with maximum wind gusts of 60 to 70 mph (Mildwurf et al., 2012)—it passed some 250 miles to the east of Cape Hatteras—it left behind large swaths of damage, particularly in the form of eroded and narrowed ocean beaches, that has almost certainly compromised these barrier island's natural ability to weather future storms. As a result of Sandy and other similar storm-related events (e.g., Hurricane Isabel in 2003, Hurricane Irene in 2011, and more recently Florence and Michael in 2018) many communities in NC are looking to beach nourishment as a way to rebuild and restore protective beachfront and dune systems, before it's too late.

The problem that municipalities are encountering all along the North Carolina Coast is a lack of known suitable borrow areas on land and in State waters from which to mine replacement sand. Thus, extending exploration onto the shelf beyond the three-mile state jurisdiction boundary and into federal waters is becoming increasingly more critical. This is especially true in the southern part of the state where prior surveys suggest that sand resources on the nearshore shelf here might be particularly rarified.

Availability of seismic reflection and sediment data from which such resources might be identified varies across the North Carolina shelf. More recent surveys associated with nourishment projects in the Town of Nags Head in 2011, along a portion of Pea Island in 2014, and more recently from Duck south to and including part of Kill Devil Hills in 2017 are well documented. However, most of the coast, both to the north and south are less well explored. It is, however, becoming increasingly clear that the more generous sand resources found off of Dare County simply do not exist along the remainder of the North Carolina coast inshore of 3 nautical miles. If beach nourishment needs grow as expected over the next few decades, it is imperative that more work is needed to find and document new potential resources. Recognition of this need drives the principal objective of this project: to expand our knowledge of the replenishment resources that might potentially be available to North Carolina coastal communities for future beach renourishment projects. As such, we set out to create an inventory and database of existing and newly-acquired information available on sand resources in federal waters of the Outer Continental Shelf (OCS) offshore (3-8 nautical miles) of North Carolina. The goals of this technical report are thus three-fold: 1) to provide an overview of the need for sand resources and related data offshore of North Carolina, 2) to review and interpret the range of geological and geophysical information and data currently available and 3) to identify and prioritize future research needs in the OCS.

2 Need for Sand Resource Information Offshore of North Carolina

Of the one hundred counties that collectively make up the State of North Carolina twenty are classified as coastal and eight of these are identified as oceanfront (Figure 1). From north to south the oceanfront group consists of the counties: Currituck, Dare, Hyde, Carteret, Onslow, Pender, New Hanover and Brunswick. In addition to the counties, several federally managed properties, including military reservations and state or private conservation areas, are located here. The NC Beach and Inlet Management Plan, drafted in 2011 (NC BIMP, 2011) provides a comprehensive overview of the eight counties and coastal lands, describing coastline and coastal management-related activities in the different regions along with their socio-economic value. While shipping commerce and industry makes a home in select areas of the North Carolina Coast, particularly in the Wilmington and Morehead City areas, the lion's share of the economic activity from Currituck in the north to Brunswick in the south is tourism based. Thus, much of the local and regional economy hinges on preserving the fragile infrastructures

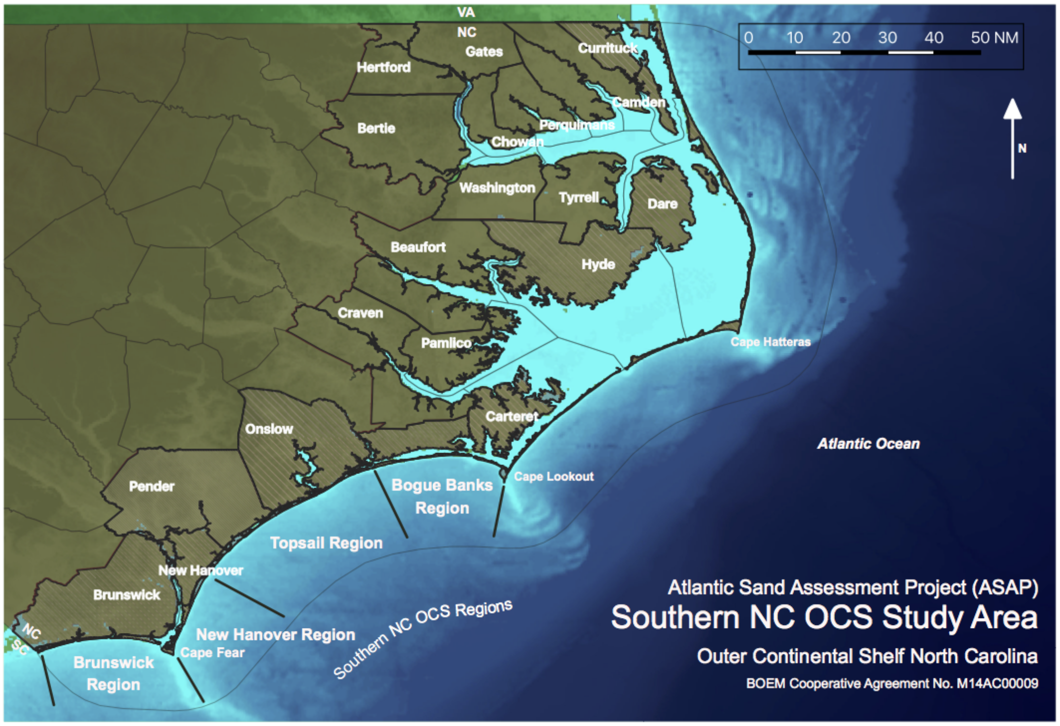


Figure 1: North Carolina's coastal and ocean-fronting counties and the Southern NC OCS Study Area.

and ecosystems (both natural and man-made) that provide the competitive incentives for people to visit. In 2017 the State's one hundred counties amassed more than 23 billion USD in visitation revenue (VisitNC, 2017). Of that amount, more than 1 billion came from a single coastal county (Dare County, pop. 36,700 in 2017) alone (VisitNC, 2017). Dare County was the fifth highest revenue generator in the State for 2017, falling in behind only the much larger Charlotte, Raleigh/Durham, Greensboro/Wake Forest, and Asheville areas in ranking. The allure of Dare and its seven other sister counties for visitors to the coast? In large measure: the beaches (VisitNC, 2017).

The environmental and ecological sustainability of the ocean shoreline is another factor that must be considered for ecosystem services, resources and economic prosperity. This perspective views the coast as a single, multidimensional natural and human-built system where one aspect (e.g. the ocean beaches) does not sit in isolation, but rather is a contributing component to a much larger socio-ecological unit. For instance, the compatibility of sand placed on the beach is important, not only to ensure the design life of a nourishment project is realized, but also for the ecological health of the beach, backing dunes, interior and fringing marshlands, adjacent estuaries, and the many indigenous species found there. This same interwoven importance is equally applied to the lives and livelihoods of residential and business communities that have grown and evolved in the midst of this natural system (NC BIMP, 2011).

The North Carolina Division of Coastal Management monitors erosion along the State's ocean, estuarine, and riverine shorelines. Their mission in doing this is twofold. First, is to understand the risks that coastal change (of which erosion is but one part, albeit an important one) imposes on life, property, and infrastructure located on or adjacent to these coasts. The second is to provide the requisite background and supporting information (including risk assessment) that would enable effective and efficient management of both the natural and anthropogenic systems in the coastal zone. From this monitoring comes much of the waterfront zoning, construction, avoidance, and setback policies that local and regional governments must abide. Relevant to this report, these data are also useful in highlighting shoreline "hotspots": areas where erosion rates are unusually high (> 8 ft/yr). The presence of such sites in a municipality, for this rapid loss, might force officials to appeal to nourishment as a solution sooner, and over time more frequently, than perhaps their counterparts along portions of the coast where rates are much lower. Ultimately, however, if sea level rise continues and North Carolina's beaches continue on the whole to shift landward in response, most or all of the State's coastal communities will be forced to consider renourishment.

A number of areas have a long history of beach renourishment. Since the first project was conducted along Wrightsville Beach in 1939 more than 250 additional projects have been completed, pouring more than 100 million cubic yards of sand along North Carolina's ocean shorelines (Table 1), at a total cost exceeding a half billion U.S. dollars (WCU, 2018). A complete listing of these projects was compiled by the Program for the Study of Developed Shorelines at Western Carolina University. The beach nourishment database can be accessed online at: http://beachnourishment.wcu.edu. More information focusing on coastal storm damage reduction and associated beach nourishment and recovery can be had from the U.S. Army Corps of Engineers. Interested readers are referred to the Army Corps of Engineers website: http://www.saw.usace.army.mil/Missions/Coastal-Storm-Damage-Reduction/.

Table 1: Beach Nourishment Histories for North Carolina Coastal Communities. **Note that projects in Duck, Kitty Hawk, and Kill Devil Hills completed in 2018 are not included here.

Location	First Year of Record	Number of Times Nourished	Total Volume Nourished (cy)
Atlantic Beach/Fort Macon	1958	14	17,525,228
Bald Head Island	1991	12	11,186,190
Cape Hatteras	1966	3	1,812,000
Cape Lookout	2006	1	75,700
Carolina Beach	1955	36	19,803.048
Caswell Beach	2001	2	256,600
Emerald Isle	1984	19	4,571,214
Figure Eight Island	1977	26	6,113,852
Hatteras Island	1974	7	887,801
Holden Beach	1971	49	4.661.045
Indian Beach/Salter Path	2002	3	1,385,692
Kill Devil Hills	2004	1**	38,016
Kitty Hawk	2004	1**	143,000
Kure Beach	1998	6	5,964,932
Masonboro Island	1986	6	3,234,686
Nags Head	2001	3	4,800,000
Oak Island	1986	9	6,545,287
Ocean Isle Beach	1974	18	4,479,790
Ocracoke Island	1986	5	516,062
Onslow	1990	4	405,829
Pea Island	1990	20	9,673,228
Pine Knoll Shores	2002	6	2,969,185
Rodanthe	2014	1	1,618,083
Topsail Island	1982	20	5.394,479
Wrightsville Beach	1939	26	14.709,157

In describing the sand resources mapped offshore of North Carolina this report considers the entirety of the State's continental shelf, from the shoreline seaward out to about 8 nm into Federal Waters and the Exclusive Economic Zone. Much of the sand resource assessment and interpretation focus described in this report, however, is directed toward the southern half of these waters, more specifically, the area from Cape Lookout southward to the North Carolina - South Carolina border. The interpretive region is shown in Figure 2. This area has been less well studied than its northern counterpart. The geologic and geophysical interpretations included here use data collected in association with the Atlantic Sand Assessment Project, a joint federal/state project purposed to locate and map potential beach nourishment sand resources in state and federal waters on the Atlantic Ocean continental shelf.

As shown in Figure 3, the region of the state south of Cape Lookout is partitioned further into a series of subregions based on political units (counties, municipalities) or cooperative groupings, where one or more proximal communities have participated in collective nourishment projects in the past. The southern region consists of 4 subregions, from north to south: Bogue Banks, Topsail Island, New

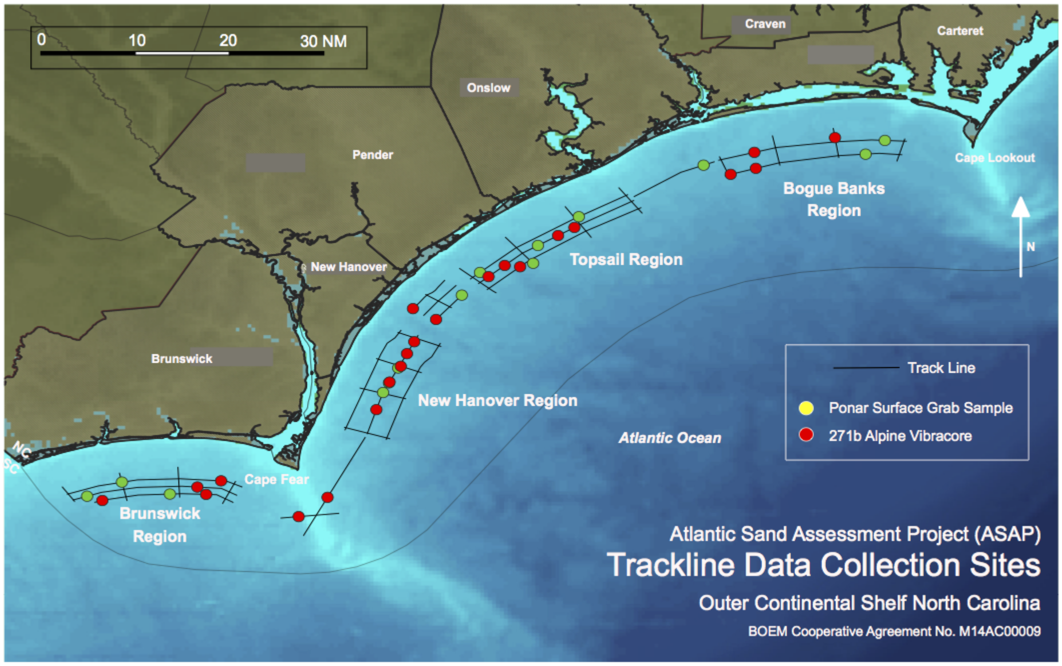


Figure 2: Data collection sites (seismic survey track lines, shallow cores and surface sampling) for 2015 BOEM Atlantic Sand Assessment Project (ASAP) NC OCS Study Area.

Hanover County, and Brunswick County. The highlighted communities and municipalities shown within each of these subregions are locations where one or more renourishment projects have taken place. A similar subdivision of the northern region (that north of Cape Lookout) also exists. Sand resources in these northern areas, however, have already been described in detail in other previously released reports. As such, northern coast sand assessments are herein discussed only in brief.

3 Data and Methods:

3.1 Data Compilation:

Many different entities have conducted seafloor mapping and geological research offshore across the North Carolina continental shelf over the last half century. As a result, a wide variety of spatially-referenced sediment, seismic, and bathymetric datasets with accompanying FGDC-compliant metadata are available from both state and federal sources (NCDCM 2016; BOEM, 2016). The largest data collections (many with large spatial coverage) are available from federal agencies, including NOAA (the National Centers for Environmental Information at https://www.ngdc.noaa.gov/), the U.S. Army Corps of Engineers (e.g., the Corp's Duck North Carolina Field Research Facility; http://www.frf.usace.army.mil/), and the U.S. Geological Survey (USGS) (http://walrus.wr.usgs.gov), including the USGS's usSEABED database, and from a large cooperative study conducted in the 2000s (Reid et al., 2005). Many other data sources come from academic, private, state, and other federal efforts.

3.2 Priority Target Areas and Data Collection:

As noted earlier in this report, the need for beach nourishment in North Carolina is becoming increasingly widespread. Many communities have conducted projects in the past, and others are planning future efforts. As the Earth's climate continues to change, and average atmospheric and oceanic temperatures continue to rise, more frequent, higher intensity tropical and extratropical storms in the short (sub

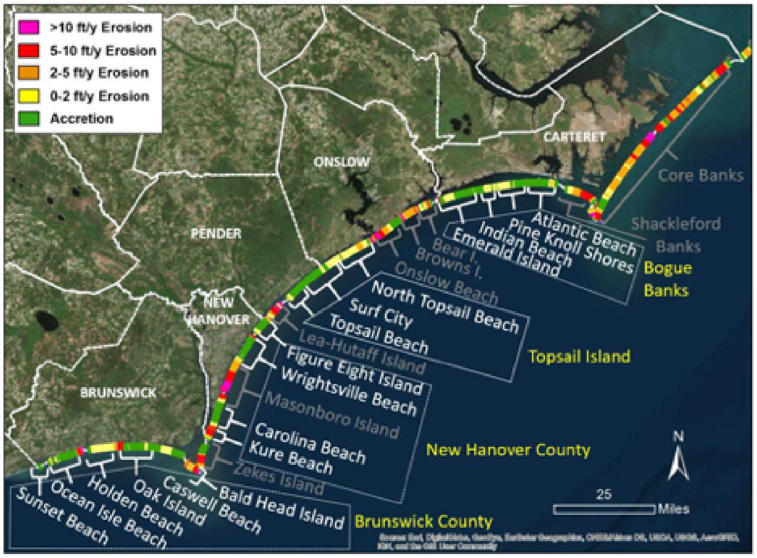


Figure 3: Site map of southern coastal North Carolina and focus areas (labelled yellow). White labels indicate incorporated towns managed with beach nourishment. Gray labels signify undeveloped zones that include state and federal lands unlikely to be nourished. Long-term North Carolina Division of Coastal Management (2017) change (erosion/accretion) rates are superimposed on the shoreline, revealing distribution and variability of change south of Cape Lookout study area.

decadal) term are likely. Over the longer (multi-decadal) term sea level rise will become an increasingly important factor contributing to changes in the coast that will force most if not all coastal communities in North Carolina to consider nourishment at some point in the future.

To minimize costs, it is usually preferred to use a proximal sediment source (e.g., inlet fill) for beach replenishment; however, in many areas, a sufficiently sized source of compatible sand is lacking. In these cases a more distant offshore, continental shelf site may be the only option. Based on the available data, a prioritization schedule was completed in early 2015 to guide data collection for the BOEM-funded Atlantic Sand Assessment Project (ASAP). Using this guidance, reconnaissance and data collection for the ASAP began in the summer of 2015 along the State's Outer Continental Shelf (OCS) south of Cape Lookout (see Figure 2)-an area sparse in geophysical data coverage as compared to the shelf to the north where coverage is more extensive. In the process the USGS-cooperative project (Thieler et al., 2013; 2014) collected some 317 nautical miles of seismic reflection data to map the sub-bottom and sidescan and nadir-scan sonar for bathymetry, along with 24 vibracores and 14 surface sediment sample grabs (Figure 2).

3.3 Core Logging and ^{14}C Dating:

Sub-bottom cores were collected, logged, and verified by CBI and East Carolina University (ECU) research staff. Cores (see Appendix 1) were later subsampled either at lithologic boundaries, or at 30 cm minimum intervals. For grain size analysis standard wet separation and dry mesh sieving techniques were used. Each core sample was first separated into coarse and fine component fractions by passing the disaggregated sediment/dispersant slurry through a 63 micron sieve. The fine fraction passing through the sieve mesh is captured and further analyzed for percent silt and clay content using standard settling tube techniques (Folk, 1980). The coarse fraction captured in the 63 micron sieve is dried and then passed through an array of 12 sieves ranging in mesh size from -2.25 to 4.0 phi using a Tyler Rotap^{TM} shaker. Grain size analysis results are provided in Appendix 2. While logging the cores, 29 in situ shells or shell fragments were extracted for ^{14}C dating (Table 2). The open source software Calib (Stuiver et al., 2019) was used to calibrate age ranges using the radiocarbon age, standard deviation in age, and MARINE13 curve. Two sigma values are reported.

Table 2: ^{14}C Radiocarbon Ages of Shell Artifacts Recovered from ASAP Cores

Sample ID	**Depth (cm)**	**cal y BP (2σ)**
VC03	183	6661 - 6831
VC09	144	969 - 1134
VC09	292	8025 - 8196
VC09	436	44979 - 46075
VC09	495	38745 - 39663
VC09	523	33583 - 34001
VC13	140	7833 - 7978
VC15	201	42253 - 42892
VC17	46	5315 - 5519
VC17	61	2980 - 3177
VC17	373	7980 - 8143
VC18	497	10540 - 10735
VC19	124	8185 - 8338
VC23	67	42119 - 42755
VC23	183	45030 - 46134
VC24	30	1529 - 1677
VC24	241	8531 - 8744
VC25	21	4580 - 4795
VC25	247	4415 - 4598
VC25	328	4769 - 4892
VC27	26	20866 - 21268
VC31	26	1710 - 1858
VC31	43	9875 - 10133
VC31	86	9917- 10156
VC31	122	10500 - 10683
VC31	170	34435- 34952
VC31	267	NA
VC32	23	32415- 33268
VC32	27	42274 - 42933
VC32	61	45083- 46351
VC33	30	563 - 668
VC33	117	9078 - 9313
VC33	197	48446- [50000]
VC33	253	NA
VC34	10	NA
VC34	113	NA
VC34	140	45407 - 46737

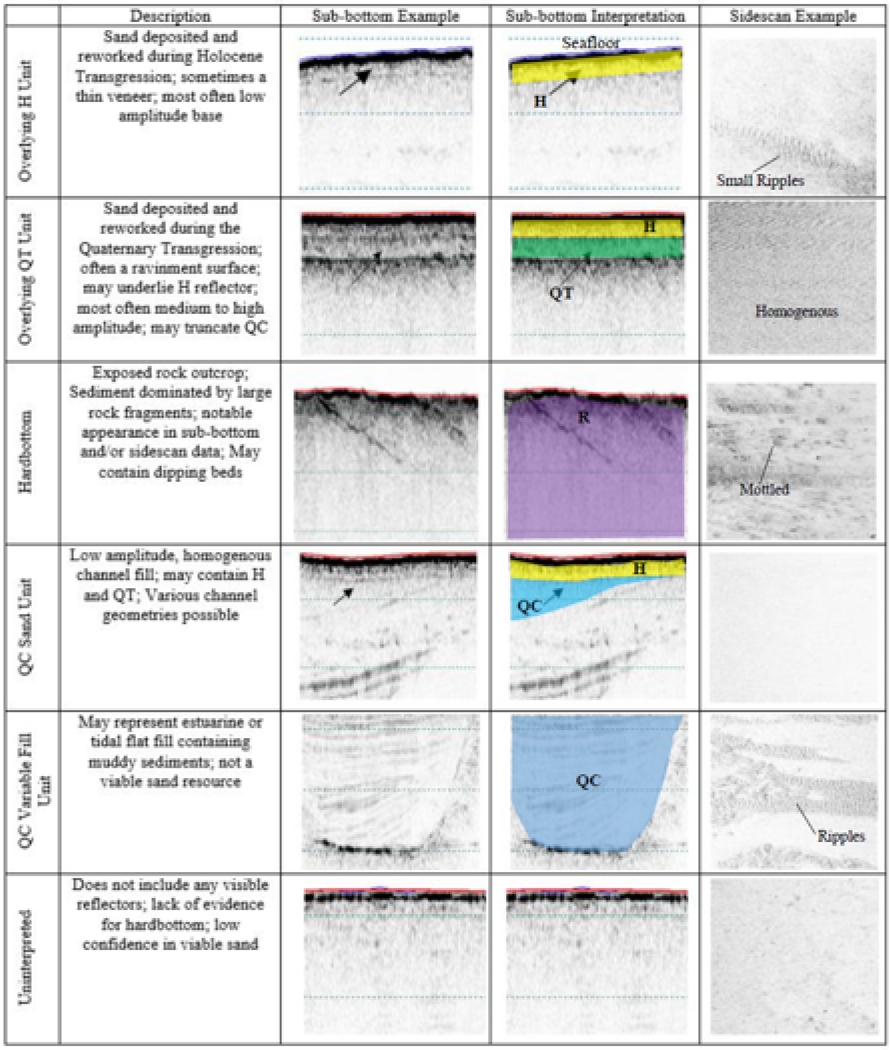


Figure 4: Interpretation guide depicting various seismic unit examples, descriptions, and associated appearances in sub-bottom and sidescan data. Note, this is not all-inclusive and these lithologic units have a variety of geophysical signatures.

3.4 Sand Thickness Analysis:

Sub-bottom seismic data pre-processing, interpretation, and sand thickness calculations were carried out using SonarWiz software (Chesapeake Technology, 2018). SEG-Y Chirp files were imported and smoothed using the SonarWiz swell filter function. Vibracores and grab samples were added to the smoothed data based on coordinate positions within seismic lines. The seafloor reflector was created using the software's automated bottom-tracker. For the purpose of this work, the interpreted base of reworked Holocene sand (H), the Quaternary Transgression Ravinement surface (QT), the base of Quaternary channels (QC), and hardbottom (R) were interpreted and digitized. Examples of these chosen reflectors are shown and described in Figure 4. The most suitable units for potential beach sand resources are above H and QT layers. Channel fill above QC is more variable, although these may contain usable sand. After digitization, the reflector thickness calculator in SonarWiz was used to estimate sand thicknesses between the relevant reflectors and the seafloor. These thicknesses were exported as XYZ text files and imported into a GIS as point features.

3.5 Database Development:

All of the data collected, either via original survey, or through compilation from external sources was gathered into a single consistency-compliant database to cover the continental shelf, nearshore, and coastline areas for the State of North Carolina. Whenever possible, spatial data was stored as either point, line, or polygon structural types for vector data, and x-y position and cell (pixel) attribute value for integer and floating-point raster data. All spatial data, where applicable, are provided in the U.S. State Plane Coordinate System for the State of North Carolina (FIPS 3200, EPSG 32119). Metadata records are included when available from the source. Some nn data layers are currently stored in the sand resource database for North Carolina.

4 Framework Geology of the North Carolina Continental Shelf:

The East Coast of the United States is a passive continental margin lying within the North American plate which is slowly moving away from Europe as a result of mid-Atlantic Ocean seafloor spreading. The stratigraphy of the margin is complex, but in short, it is largely related to sedimentation and stratigraphic build up over the last 200 million years (Emery, 1966). The North Carolina coast is often described as having two regions, or provinces, one north of Cape Lookout and another south (Riggs et al., 1995). These two regions are distinguished by differences in the geomorphology (e.g., the northern region has large estuaries and long barrier islands), which is controlled by the underlying geology. The differing geology is related to long term basin evolution impacted by tectonics, sea level, and sediment supply. Coastal northern North Carolina has a thicker wedge of Quaternary (less than 3 million years old) strata underlying it (Mallinson et al., 2010; The Thieler et al., 2014). Southern North Carolina is characterized by older rock units exposed along much of the seafloor (3 to more than 63 million years old, i.e., Pliocene to Cretaceous; Meisburger et al., 1979; Snyder et al., 1994; Riggs et al., 1995).

Despite its different geological evolution, most of the North Carolina coast is faced with a similar issues: i.e., areas of appreciable unconsolidated sand suitable for beach nourishment are limited. In general, suitable deposits are restricted to isolated offshore areas, inlets and estuarine channels. Sediment production from erosion is slow and variable (Riggs et al., 1998), and fluvial transport of sand to the shoreline is minimal. The most voluminous areas of sand are in cape shoals (McNinch and Luetich, 2000; NCDENR, 2011; Thieler et al., 2014). Other areas of thicker sediment are associated with paleo-river valleys and sand ridge and shoal features (see Snyder et al., 1994; Riggs et al., 1995; Mallinson et al., 2010; Thieler et al., 2015 and references therein). River incision during sea-level low stands (e.g., the ice ages) has had a strong influence on the development of the coast today, and several studies have related ongoing changes to seafloor features (McNinch, 2004; Miselis and McNinch, 2006).

4.1 Shoals and Ridge Features:

Sand resources in sufficient quantities exist in a variety of geologic forms, ages and locations. In North Carolina, moderate volumes are currently extracted from navigational channels and reused to rebuild nearby shoreline. The work presented here, however, focuses on the shelf, where potential nourishment resources more often take the form of sand shoals and ridges, filled depressions, sediment banks, and/or shoal complexes. Shoals are generally differentiated as either: older or relict shoals (e.g., Oregon or Wimble Shoals; Thieler et al., 2014), cape-associated shoals (Frying Pan Shoals), or sorted bedforms (e.g., Wrightsville Beach; Thieler). On the northern continental shelf in North Carolina, the much larger sand supply (relative to that observed in the southern part of the State) has promoted the formation of shoal fields range in size up to several kilometers wide with relief up to 10 meters (e.g., Oregon Shoals; Thieler et al., 2014). In contrast, unconsolidated sediment is less abundant on the shelf south of Cape Lookout NC, and those sources so far identified are typically smaller in extent and lesser in thickness than their northern counterparts (Hine and Snyder, 1985; Gutierrez et al., 2005; Thieler et al., 2014).

4.2 Submerged Paleo-channel Features:

Fluvial and tidal processes are the primary channel-carving mechanisms (Gutierrez et al., 2003), although glaciofluvial processes also may produce channel-like features like those seen off Long Island, New York (Schwab et al., 2000). Major paleo-river systems on the U.S. East Coast that have been extensively surveyed across the continental shelf include the Hudson (Carey et al., 1998), the Delaware (Fletcher et al., 1992), the Susquehanna/Potomac (Coleman et al., 1990), the Pee Dee/Waccamaw (Baldwin et al., 2007) and the Roanoke/Albemarle Rivers (Riggs et al., 1995; Mallinson et al., 2005). Commonly referred to as incised valleys, these systems generally exhibit dendritic drainage patterns with a large trunk channel. The sediment preservation potential of a paleo-channel is contingent upon four factors: initial channel morphology, tidal enhancement, depth of wave ravinement, and burial (Belknap and Kraft, 1981). The greatest preservation of channel morphology is observed across outer shelf areas where rapid rates of sea level rise during the late Pleistocene/early Holocene, as revealed by seismic data collected along the paleo-Delaware River (Belknap and Kraft, 1981), left little time for waves to erode away these features. As such, the rate of sea-level rise is believed to be critical to the depth of ravinement, and ultimately channel sediment preservation (Belknap and Kraft, 1981).

4.3 Hardbottom Variability:

Hardbottom areas are widely viewed as key habitat for various indigenous neritic and benthic species; unfortunately, interpretations of what constitutes a hardbottom and thus their distribution in the nearshore and further out on the continental shelf are highly subjective. To some, simply the inability to collect a sample using a sediment grab device, or by the presence of large gravel on the bottom may imply a hardbottom environment. To others, the geologic hardbottom context is tied to a specific interpretation using seismic or sidescan data. For still others, direct observation of an actual rock outcrop may be required to make a certain interpretation. Thus, the definition and classification of hardbottom varies and is inconsistent when synthesizing academic, government and private work (Riggs et al., 1996). Hardbottom has been defined by Riggs et al., (1996) as ”a descriptive term for an indurated surface on the seafloor with no implications of synsedimentary cementation or growth of reef-building organisms; the term refers to all hardgrounds, reefs, and rock outcroppings on the seafloor” (Riggs et al., 1996). If the hardbottom serves as a persistent habitat it is often referred to as live-bottom (Riggs et al., 1996). More recently, Street et al. (2005) gave a more encompassing hardbottom description, ”exposed areas of rock or consolidated sediments, distinguished from surrounding unconsolidated sediments, which may or may not be characterized by a thin veneer of live or dead biota, generally located in the ocean rather than in the estuarine system.” Hardbottom may also be called live rock with colonization of algae, sponges, corals and invertebrates (NCDEQ, 2016). According to studies from North Carolina to Florida, hardbottom types include: 1) emergent hard bottom dominated by sponges and gorgonian corals; 2) sand bottom underlain by hard substrate dominated by anthozoans, sponges and polychaetes, with hydroids, bryozoans, and ascidians frequently observed; and 3) softer bottom areas not underlain with hard. (SAFMC 2008a).

Several other terms are often used interchangeably with hardbottom and these may offer confusion. Hardground includes rock surfaces that ”show unmistakable evidence (borings, encrustations, marine cementation) of synsedimentary lithification...” (Bromley, 1975), although these are also hypothesized not to exist in Onslow Bay (Riggs et al., 1996). This study has mapped hardbottom using seismic and sidescan interpretation. While this is good for identifying larger areas of no or low sediment cover, resolution and positioning have their limits.

The interpretations of ASAP data here thus apply a more broad classification of hardbottom (essentially following the definition of Street et al., 2005). This is useful from a habitat and sand resource perspective as it indicates where all forms of hardbottom are likely creating key habitat and dredging is not viable. Figures 4 and 5 show some of the variety of forms of hardbottom within the ASAP data. In Figure 5b, hardbottom is mapped based on the presence of large indurated fragments, although the matrix is sand. Distinguishing this hardbottom based solely on the acoustic signature is less evident, showing that a variety of data forms aids in seabed classification (i.e., sidescan and cores). Figure 5e shows a hardbottom classification based on a mixture of surficial gravel, cobble and large shell fragments, which would likely be classified by Riggs et al. (1996) as lag pavement. Although not technically a hardbottom, from a habitat standpoint it is hypothesized that it would be similar to the seabed shown in Figure 5b. In this light, hardbottom classifications might require new considerations that clarify the geological nature of the substrate (e.g., rock vs. unconsolidated coarse sediments). According to Sny-

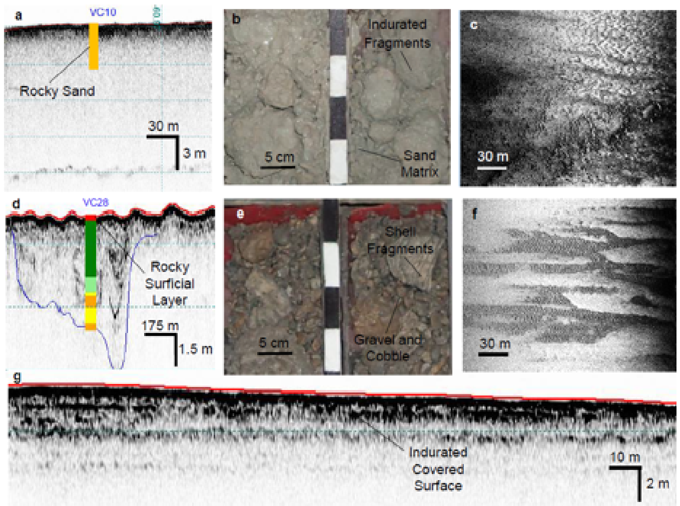


Figure 5: Seafloor examples of New Hanover region hardbottom (a-c) and Topsail Island region non-hardbottom (d-f) areas. Hardbottom interpreted in seismic data from New Hanover and Topsail Island, a and d respectively, with corresponding cores (b,e) and in sidescan data (c,f). Panel G shows the seismic appearance of a hardbottom buried by < 1 m of sand, commonly observed in Brunswick County.

der et al. 1994 and Riggs et al. (1996), hardbottoms character and distribution in Onslow Bay is determined by the outcropping of SE-dipping Tertiary indurated sedimentary strata. The morphology of hardbottoms is quite variable as a result. Past research has shown hardbottom varies in relief with outcrops up to 10 m in vertical relief (farther offshore) to areas that are relatively flat (Riggs et al., 1996; NCDEQ, 2016). The majority of the ASAP mapped hardbottom is low-relief and shallow sloped. More pronounced outcrops with vertical relief up to a few meters were mapped mostly in the New Hanover region, which is consistent with past studies (e.g., NCDEQ, 2016). Most of the ASAP hardbottom likely falls under the Riggs et al. (1996) classification of flat hardbottoms that are "smooth to slightly irregular, semi-indurated to indurated surfaces of great extent that form the upper, lower, and in some places middle bounding surfaces of low-relief and high-relief scarped hardbottoms." In Onslow Bay, flat hardbottoms are generally composed of semi-indurated tertiary muds to muddy sands, are covered by a thin layer of mobile or permanent Holocene surficial sand and "are difficult to recognize by remote sensing" (Riggs et al., 1996; Schmid, 1996).

The distribution of hardbottom is widespread on the southern NC shelf as highlighted by past research and this study, although it is subject to challenges relating to interpretation and definitions described above. From Cape Hatteras to Cape Fear, it is estimated that hardbottom represents 14% (or 500,000 acres) of the seabed between 27 and 101 m water depth (Parker et al. 1983). However, due to the discontinuous and patchy nature of hardbottom, and vastness of the outer continental shelf, more recent efforts have refrained from estimating the overall distribution of hardbottom in NC. Hardbottom distribution is critical to better understand not just from ecological habitat and sand resource perspectives, but because they are an extensive part of the stratigraphic and paleo-oceanographic record on the Atlantic Shelf (Riggs et al., 1996; Riggs et al. 1998). The data from this work suggests hardbottom represents 23% of the seabed in the Bogue region, < 1% in the Topsail region, 15% in the Hanover region and 39% in the Brunswick region, respectively.

Several factors make the delineation of hardbottom in the ASAP dataset challenging. Firstly, these areas contain a variety of hardbottom forms (Figures 4 and 5) Next, in some areas it is difficult to distinguish hardbottom using geophysical signatures alone (i.e. seismic, sidescan) and the sparseness of cores and samples prohibits validation in many cases. Finally, low relief hardbottom areas are subject to ephemeral burial and exposure by moving sand bodies (Cleary et al., 1996; Riggs et al., 1996). This is notable in the ASAP data, as evidenced primarily by sidescan (e.g., Figure 5f). Because the sand veneer covering hardbottom is often thin, the exposure of hardbottom fluctuates as sediments are transported and mobilized during storm events. Ultimately, this data and past research has shown that hardbottom definition, form and distribution is complex and variable on the NC OCS. Because of the described dynamics and interpretation challenges, it is our recommendation that a combination of geophysical and sampling is used to define hardbottom zones, and that a broad, inclusive definition be used.

5 Shelf Habitat:

In addition to serving as potential sediment sources for beach nourishment, many sediment features and hardbottom found in North Carolina shelf waters, both north and south, may also serve as critical habitat for a variety of neritic fish species and other benthic organisms (NCDEQ, 2016; Rutecki et al., 2014). In order to best manage multi-use conflicts (i.e., mining sand from a critical reef habitat), an understanding of the effects of dredging on those habitats is crucial. Moreover, where multiple borrow sources are viable, avoiding habitat disturbance may be possible–if one knows beforehand where these habitats and potential borrow sites coincide. For shelf mineral resource extraction, BOEM policies comply with National Oceanic and Atmospheric Administration (NOAA's) National Marine Fisheries Service and U.S. Department of the Interior's Fish and Wildlife Service guidelines as outlined in the Endangered Species Act (ESA) and Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to preserve and protect sensitive marine habitat environments. Submerged ridge and swale features and cape-associated shoals–both potential renourishment sand resources–have been defined as essential fish habitat by NOAA.

Sand dredging has been shown to have several short- and long-term physical and biological impacts that can adversely affect marine habitats (Rutecki et al., 2014). Physical effects include alteration of sediment grain size, changes in sediment transport behavior, wave and current patterns, and water-column turbidity, all of which can result in one or more direct or indirect biological impacts to a habitat (Drucker et al. 2004, Hayes and Nairn 2004). Direct biological impacts include alteration or outright removal of one or more benthic epifaunal and infaunal communities from an environment. Indirect impacts consider the effect of the direct impact on associated species and linkages at other habitation and trophic levels (Drucker et al. 2004, Hayes and Nairn 2004). Spatially compiling both the biotic and abiotic aspects for potential borrow areas as comprehensively as possible is critical for long-term, sustainable management of multi-use shelf resources.

6 Regional Interpretations:

Much of the work documented in this report focuses on the area of the North Carolina continental shelf south of Cape Lookout. This is a region whose geology and geomorphology has been shown to differ, sometimes markedly, from that observed north of the Cape. The relatively abundant sand resources seen in the north along the Outer Banks are conspicuous for their absence throughout much of the southern portion. Nevertheless, research has also shown that there are potential sand resources here, they're just less ubiquitous and so harder to find. The following discussions detail results from a series of seismic (chirp) and shallow coring (vibracore) surveys performed by CB&I, Coastal Planning and Engineering, Inc. and American Vibracore Services, Inc. in the summer of 2015. The area south of Cape Lookout is partitioned into 4 regions and the discussion follows this geographic format.

6.1 Bogue Banks Region:

The Bogue region shoreline is oriented predominantly E-W and is bordered by Cape Lookout to the east. The survey lines are relatively shore parallel, contain four north-south shore-perpendicular crossing lines, and are between 7.4 and 15.0 km offshore (Figure 6). Water depths range from 15.0 m (closest to shore) to 19.0 m at the seaward edge of the survey area. The shelf in this region exhibits a gently seaward dipping seafloor. Seafloor gradients vary in the region and the shallowest slopes of 0.2 m/km occur to the east (seaward of the 17 m isobath). The steepest slopes of 2.5 m/1 km occur toward the center of the region (seaward of the 18 m isobath). The seafloor is generally low relief and the highest relief of up to 1.5 m occurs at a ridge and depression in the SE quadrant. The eastern half of the region contains three small-scale, shore-detached, shore-detached ridges that extend NW-SE and are approximately 1 m high and 0.5 wide, range in length from 2.0 to 3.4 km and have little to no asymmetry. The ASAP Bogue Region contains an extensive modern sand layer mapped in 49% of the total survey distance with unit thicknesses reaching up to 3.59 m in the northern and southeastern portions (mean = 1.06 m)(Figure 8). These observations are consistent with Hine and Snyder (1985) who also note the patchy presence of a 1-2 m Holocene veneer on the inner shelf, although extensive Holocene deposits are not evident due to the migrating shoreface in response to sea level fluctuations which removed much of the sedimentary record in Onslow Bay. Consequently, Tertiary rocks and sediments outcrop at the seafloor in many locations (Hine and Snyder, 1985; Freeman et al., 2012). The deeper QT reflector is visible

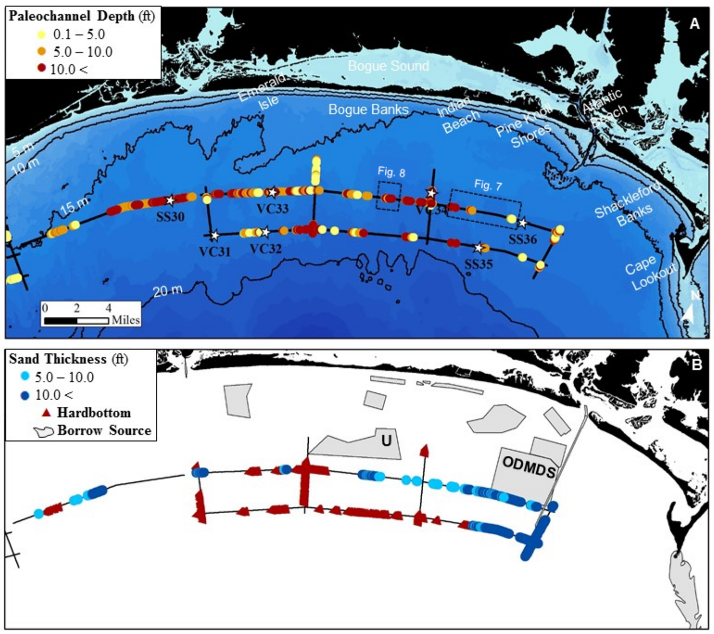


Figure 6: Bogue Banks Region ASAP interpretations and example seismic line (location indicated by dashed rectangle in top panel). Borrow sources U and ODMS are discussed in text.

in the eastern third of this region (20% of the mapped linear distance) and contains thicker sands up to 4.7 m (mean = 2.5 m). Paleochannels and hardbottom are frequently observed in the central region (Figure 7), and are present in 31% and 23%, respectively, of the total mapped distance. When ASAP interpretations are overlain on Hine and Snyder (1985), numerous areas of mapped channels align that are interpreted as relict tidal inlets/lower coastal plain streams which can be identified by truncation in the Tertiary seismic stratigraphy (Figure 8). ^{14}C ages from four cores within channels show two channels contain surficial Holocene sand and variable Pleistocene fill below (VC31 and VC33; Table 2;

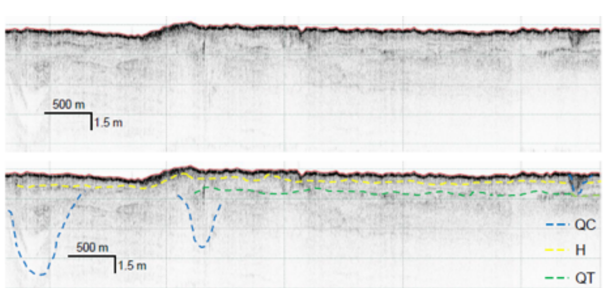


Figure 7: Example seismic line and interpretations from Bogue Region. Location indicated by black dashed box in upper-panel of Figure 6.

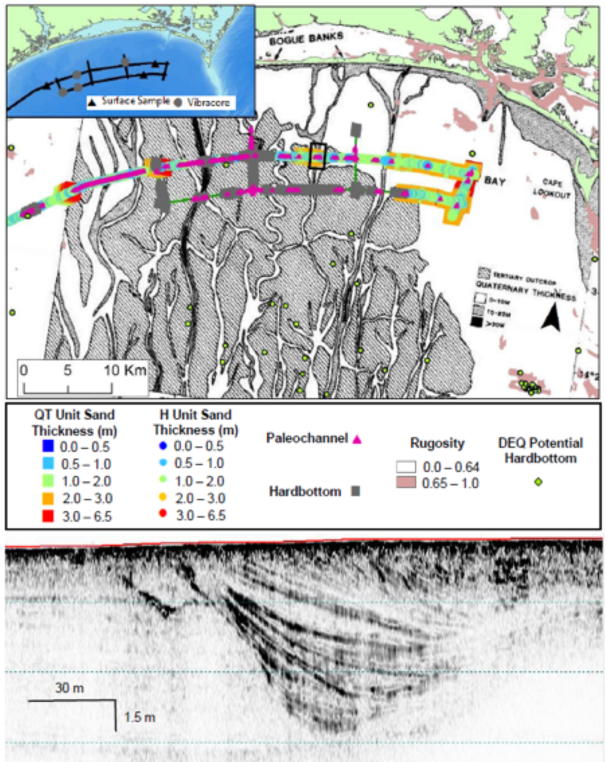


Figure 8: ASAP results draped over geo-rectified interpretations from Hine and Snyder (1985). Areas of thick Quaternary sediments as interpreted by Hine and Snyder (1985) often are corroborated by ASAP results. A channel example is shown (location is indicated black box in top panel) where Hine and Snyder mapped particularly thick (10-20 m) Quaternary sediments.

Figures 4 and 7), whereas the other two channels are filled with Pleistocene or reworked sediments (0.3 - 1.5 m depth) (VC32 and VC34; Table 2, Figure 6 and Appendix 1). The infilling of the paleochannels is variable and complex, and mostly appears to be representative of estuarine and fluvial fill (i.e., sands interbedded with muds and clay and gravel base) (Hine and Snyder, 1985). While some buried channels may be suitable for nourishment, more core validation is needed. Hine and Snyder (1985) show areas of especially thick (10 - 20m) quaternary sediments within channels which are corroborated by ASAP data (see black box focus area in Figure 6).

Several areas of ASAP data are adjacent to previously identified borrow sources. USACE (2014) describe the "U" borrow source which lies closely to the central ASAP section and contains an estimated 8.9 mcy of beach compatible sand. In addition, the Offshore Dredged Minerals Disposal Site (ODMDS) is near the eastern portion of the region that also appears to have similar sand thicknesses, estimated at 28.3 Mcy (Figure 6). At the ODMS site, dredge spoil sand (up to 4.9 m thick) overlies fine and silty sand that is stratified as much as 9.2 m below the seafloor, although its base is not continuous throughout the Bogue region (Freeman et al., 2012).

ASAP reconnaissance data provides several potential high volume areas of beach compatible sand that represent complex geologic history and are in reasonable proximity to a series of towns with a history of nourishment (Table 1). Based on future demand of sand for continued replenishment projects (DCM, 2016) these are viable options, if the need for additional resources arises.

6.2 Topsail Island Region:

The Topsail Region shoreline is oriented NE-SW. The survey lines are shore-parallel and contain five shore-perpendicular crossing lines (Figure 9). Water depths range from 13 m closest to shore (5.4 km offshore) to 17 m at the seaward edge (14.8 km offshore). The NE half exhibits a gently dipping seafloor (0.45 m/ 1 km slope) seaward of the 13 m isobath. The southern half of the region contains a low valley-like feature with sidewalls up to 4 m/ 1 km in slope. The southern section of the region is

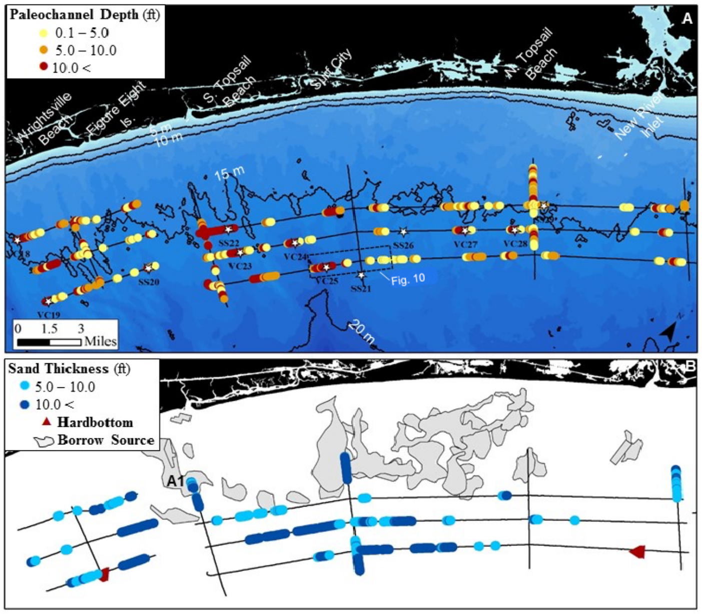


Figure 9: Topsail Island Region ASAP interpretations.

characterized by a bathymetric fabric produced by a series of shore-detached, shore-oblique small scale ridges approximately 1 m high, approximately1 km wide and ranging in length from 3.8 to 4.4 km. The highest local relief is 2.2 m. These ridge features become more pronounced seaward of the survey lines at the -16 m isobath.

Most of the Topsail region contains a modern lens of sand (mean thickness = 1.0 m) reaching up to 2 m and visible in 73% of the total mapped linear distance (Figure 9). However, this modern sand unit is discontinuous and quite thin in most areas, making resource extraction (i.e. dredging) potentially challenging. OSI (2004) and Snyder et al. (1988) indicated much of the region landward of the survey area is characterized by low relief Oligocene limestone and siltstone hardbottom overlain by a thin, patchy veneer of Quaternary sands and gravels and numerous Quaternary channel-fill sequences. The QT reflector is interpreted in 29% of the total linear survey distance (mean QT unit thickness = 2.6 m, range 0.2 to 6.4 m), and appears to be thicker in the central section where many areas exceed 4 m (Figure 10). Paleochannels also are widespread (31% of mapped distance) and are most common in

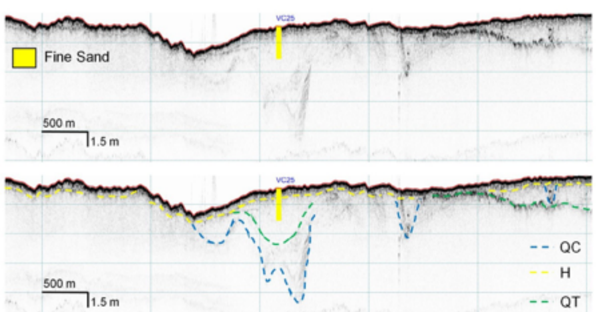


Figure 10: Example seismic line and interpretations from Topsail Region. Location indicated by black dashed box in Figure 9.

central areas (Figure 10). ASAP core data indicate some may contain usable sand, yet others are more heterogeneous and indicative of variable estuarine fill (i.e., silts and clays), also noted by OSI (2004). ^{14}C ages from cores within four separate channels indicate two channels (VC23 and VC27; Figure 9 and Appendix 1; Table 2) are filled with shallow (¡ 2 m) Pleistocene (or reworked) sediments, whereas the other two channels are filled with Holocene sediments overlying the interpreted QT reflector (VC24 and VC25; Figure 9 and Appendix 1; Table 2). The Holocene channel fill is composed of a homogenous fine sand, while the Pleistocene channel fill consisted of variable estuarine lithofacies.

Mapped hardbottom is minimal (1%) (Figure 9). Extensive low to high-relief hard bottom outcrops have been mapped nearshore of Surf City and New River Inlet, although a thin layer of sand covers much of the low relief hardbottom (Crowson, 1980). Using sidescan, multibeam, and diver ground truth data, HDR (2003) reported an irregular exposure pattern of hardbottom in this region extending from the 9.1 m contour to 8 km offshore. Much of the complexity of the exposure is likely due to the intermittent burial of low relief hardbottom areas by sands.

The most adjacent previously identified borrow sources were recently considered by CPE for Topsail beach projects. CPE conducted design level surveys in USACE delineated A1, yet stopped at the 3 nm boundary. A1 contains an estimated 214 acres and 1.99 mcy of potential beach compatible sand, although the town opted for a closer, less-expensive inlet-derived borrow source. The ASAP data continues the extent of coverage of into federal waters.

6.3 New Hanover County Region:

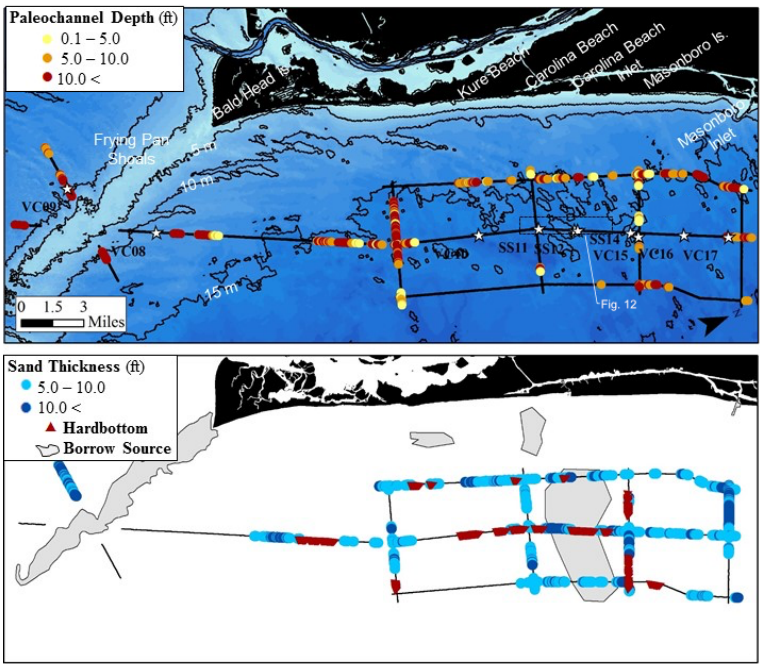


Figure 11: New Hanover Region ASAP interpretations and example seismic line (location indicated by dashed rectangle in top panel). The zoomed location of Figure 12 is shown by the bracket in bottom panel.

The New Hanover region shoreline is oriented N/NE-S/SW. The survey lines are between 5.6 and 15.8 km offshore and are near shore-parallel with four shore-perpendicular crossing lines. Water depths range from 8 m around Frying Pan Shoals (southern extent) to -18 m at the seaward survey extent. This region exhibits the most diverse and variable bathymetry of all the regions. Survey lines cross Frying Pan Shoals which contain ridges up to 1.9 m relief that show moderate asymmetry. Multiple well-developed, shore attached ridges are evident landward of the survey region. Most of the survey coverage is seaward of the 14 m isobath where ridges appear to be shore-detached and are mostly approximately 1-2 m in relief. These wide ridges and platforms have slopes up to 10.0 m/ 1.0 km, are up to 4 km long and approximately1 km wide. Localized shoals in the central and north sections are up to 3.1 m in relief and 2.2 m relief hardbottom outcrop is visible in the southern extent. The modern sand unit in this region has a mean thickness of 1.0 m with thicknesses up to 3.6 m (Figure 11). The H reflector is extensive in the region and visible in 71% of total mapped distance (Figure 12). ^{14}C ages from two cores verify Holocene ages of the surficial modern sand (VC13 and VC17) (Figure 11 and Appendix 1; Table 2). Compared to other regions, this region has the most mapped QT (61%) at a mean unit thickness of 1.7 m and reaching up to 5.3 m (Figure 11). The QT unit generally appears to thicken to the north. A ^{14}C

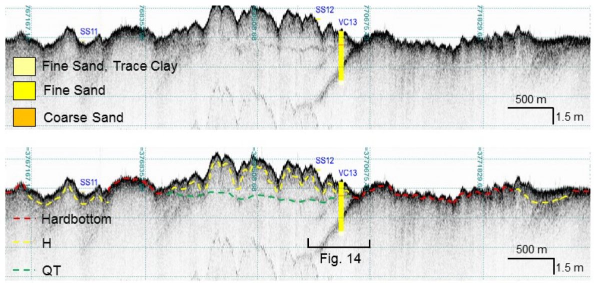


Figure 12: Example seismic line and interpretations from New Hanover Region. Location indicated by black dashed box on Figure 11.

age from a shell just below the QT reflector has a Pleistocene age (42,253 - 42,892 cal y BP; Table 2) (VC15; Figure 7 and 10). Core VC8 contains Pleistocene-aged surficial (approximately1 m depth) sand based on a shell fragment (36346 ? 37361 cal y BP; Table 2; Appendix 1). The New Hanover County region region contains a lesser distribution of paleochannels (25%) and hardbottom (15%) than most of the other regions (Figure 11). A channel sampled by core VC09 estimated a shell fragment dated to the Pleistocene (44979 ? 46075 cal y BP; Table 2; Figure 11). Another channel (VC17) contained a shell fragment dated to the Holocene (5315 ? 5519 cal y BP; Table 2; Figure 11 and Appendix 1). According to the BIMP (2011), few offshore sand sources have been identified in this region and the

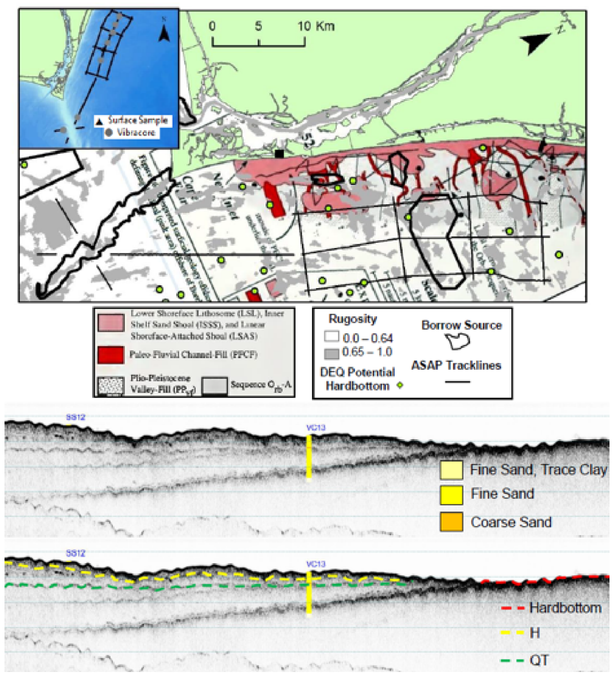


Figure 13: New Hanover Region ASAP interpretations relative to geo-rectified facies from Snyder et al. (1994). The extent of the seismic line is indicated by the black box and is also noted in Figure 8. Note, this area lies within a formerly identified potential borrow source and contains thick shoal deposits that align with high rugosity values. A ^{14}C age date from a shell fragment just above the QT reflector is shown in the black box on the seismic line.

most replenishment projects have used nearby inlets. However, the USGS seabed database indicates a region of possible beach compatible sand (large polygon intersecting with ASAP lines), although it is poorly characterized. ASAP data helps to corroborate this possibility, showing extensive high relief shoal features with thicknesses exceeding 3 m in areas (Figures 11 & 12). The shoals contain both the H and QT reflectors and are often laterally bound by hardbottom outcrop (Figures 11 & 12).

This region borders work conducted by several researchers (i.e., Meisburger, 1979; Hoffman et al., 1991; Zarra, 1991) and several areas of ASAP sands intersect the lithosomes interpreted as lower shoreface lithosome (LSL), the Inner Shelf Sand Shoal (ISSS), and Linear Shoreface Attached Shoal (LSAS), in addition to the Plio-Pleistocene Valley Fill and Sequence Orb-A (Snyder et al., 1994)(Figure 13). These lithosomes represent a variety of depositional settings including barrier, backbarrier, estuarine and fluvial environments that are now subject to erosion at the seafloor (Wren and Leonard, 2005). Prior work, consistent with ASAP observations, has noted the presence of linear shoal features extending up to kilometers in length, hundreds of meters wide, and up to 5 m of relief that are likely "erosional remnants of partially preserved Pleistocene sections deposited during successive Quaternary sea-level fluctuations" (Snyder et al., 1994).

6.4 Brunswick County Region:

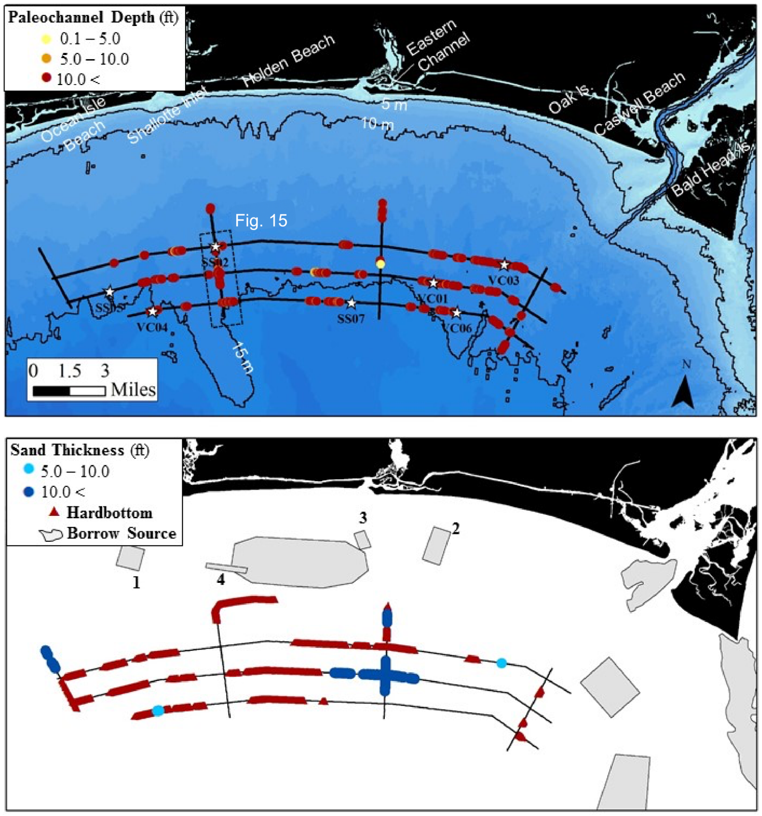


Figure 14: Brunswick County ASAP interpretations and example seismic line (location indicated by dashed rectangle in top panel).

The Brunswick Region shoreline is E-W oriented and bound by Cape Fear at the eastern boundary. Survey lines run shore-parallel with four shore-perpendicular crossing lines (Figure 14). The water depths range from 12 m (7.8 km offshore) to 16 m (15.8 km offshore). The shelf in this region exhibits low-relief, gently seaward dipping seafloor (0.5 m/1 km slope) with the most uniform bathymetry of all the regions (i.e. aligned isobaths). The eastern portion contains the highest relief with ridges up to 1.4 m relief showing little to no asymmetry. Half (50%) of the Brunswick region has a visible H reflector,

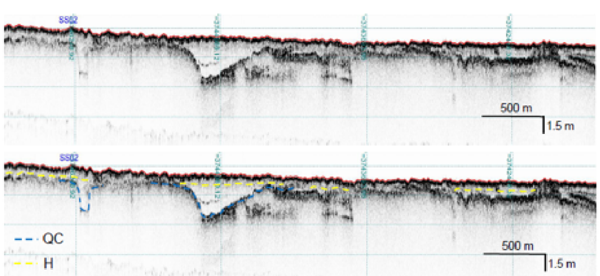


Figure 15: Example seismic line and interpretations from Brunswick Region. Location indicated by black dashed box on Figure 14.

which is most frequently mapped in the eastern section (Figure 15). While the H thickness is also 1.0 m, the range is smaller (0.2 to 1.8 m) (Figure 15). The deeper QT reflector is not noted because of the thinness and in most lines it is difficult to discern two reflectors. Hardbottom is widespread (39%) on the Western segments and is interwoven with paleochannels (20%)(Figure 14). Core and sub-bottom data suggest the presence of sand in the surficial layers of many paleochannel features, although the fill is variable. Figure 15 displays a good representation of the paleochannel and hardbottom appearance. A core sample (VC03) at approximately 2m depth and below the H reflector shows a ^{14}C age of cal BP 6661 - 6831 (Figure 14 and Appendix 1), yet this age may not be representative of all channels in the region. Extensive hardbottom interpreted in the ASAP data is consistent NCDEQ (2016) notes a "thin veneer of sand over relatively flat hard bottom" in this region with some hardbottom areas up to 22 acres.

The ASAP data is somewhat adjacent to an estimated 5.3 Mcy of sand source areas (ATM, 2010). ATM (2010) reports four sites (Figure 11; 1-4 borrow source labels) that range in sand veneer thickness from 0.3 to 1.2 m with pockets up to 1.8 m. Due to the widespread presence of hardbottom as also noted by other studies in the vicinity (e.g., NCDEQ, 2016), these additional sources may be an efficient and viable option to coastal communities. The ASAP data help to fill in previous knowledge gaps and provide potential targets for further investigation.

6.5 Subsurface Paleochannels:

Buried channels on the NC continental shelf reflect a complex variety transgressive and regressive physical processes (Oertel et al., 1991). Due to the lack of fluvial sedimentation coupled with deep shoreface scour during transgression, preserved channels may often be the only depositional record of transgression in the region (Kraft et al., 1987; Oertel et al., 1991). Because inlet channels would be prone to removal by wave beveling during transgression in the wave-dominated system, most large, buried channels found within this region are hypothesized to be paleostream valleys (Hine and Snyder, 1985; Oertel et al., 1991), similar to the inner shelf adjacent to the Cape Henlopen headland of Delaware (Belknap and Kraft, 1985). In other tidal-dominated (as opposed to wave-dominated) shelf regions like in South Carolina, Georgia and Virginia, buried channels may be more reflective of lagoonal and inlet drainage patterns, in addition to paleostream valleys (Henry et al., 1981; Oertel et al., 1991). Tidal-inlet channels are typically discontinuous and have rounded bases (Belknap and Kraft, 1981; Oertel et al., 1991; Riggs et al., 1995). According to Harris et al. (2005), however, tidal channels incising into less-resistant Holocene and Pleistocene sediments exhibit V-shapes with low width-to-depth ratios. On the contrary, U-shaped channels with flat bottoms and high width-to-depth ratios are characteristic of channels in Tertiary strata or compacted Pleistocene muds (Harris et al. 2005). Hundreds of channels were delineated across the ASAP regions with high variability in form and infilling. While characterizing each individual channel is beyond the scope of this work, Figure 16 provides examples of channels characteristic to each region.The Bogue Region contains extensive mapped buried channels that may be associated with the paleo-New River Valley (Cleary et al., 1996). The deepest channels are concentrated to the west and may be related to the antecedent bathymetric depressions extending from the highly irregular 15 m isobath. The prevalence of hardbottom in the central region (Figure 6) appears to influence channel shape (i.e., more flat bottom forms evident) and limit channel distribution, as noted by (Hine and Snyder, 1985). Figure 16a shows an example of a Bogue channel with an asymmetrical rounded bottom, and complex fill, representing multiple episodes of cut and fill implying tidal influence. Below a approximately1.25 m thick sand layer, the heterolithic fill as indicated by the core would not be ideal for beach nourishment (Appendix 1; VC33). The western portion of the channel contains the highest amplitude reflections suggestive of lateral infill and reworking (Oertel et al., 1991). Toward the eastern edge, there is acoustically transparent fill and low amplitude reflections that show bedding planes of upbuilding and constricting strata from flow inhibition (Oertel et al., 1991). A Holocene sand cap, as seen in many studies (e.g., Nordfjord et al., 2006), is verified by a ^{14}C date (Table 2; Figure 16a). Many channels in the region are similar in incision depth (6 to 10 m) to the Folly and Kiawah rivers in SC (Harris et al., 2005).

The Topsail Region contains numerous mapped buried channels (Figure 9) that may also be associated with a paleo-pathway of the New River Valley (Cleary et al., 1996). To the west, the channels

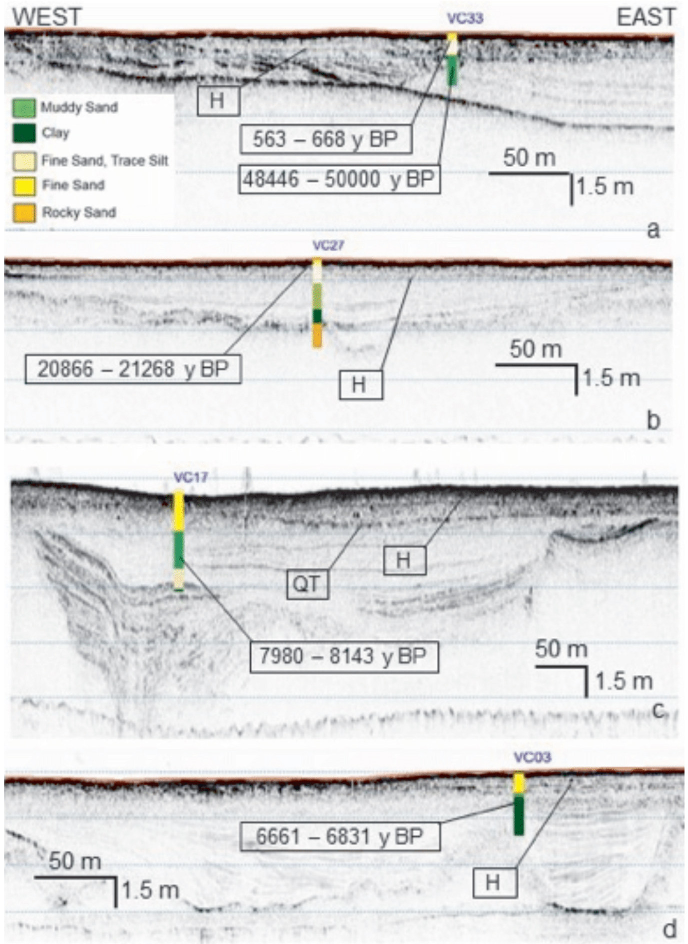


Figure 16: Channel examples, core logs and associated ^{14}C ages. Panel A is from Bogue Banks Focus Area, B is from Topsail Island Focus Area, C is from New Hanover Focus Area and D is from Brunswick Focus Area. Dimensions, fill architecture and geometry are highly variable and described in the text.

are deepest (¿ 5 m), with low width-to-depth ratios, and exhibit angular bottoms (Figure 9). The western-central area of the subregion also exhibits a deep incisional channel network possibly related to the valley-like feature apparent in the bathymetry to the south (Figures 9 and 10). Toward the east, the channels are generally shallower and wider suggesting incision into more resistant strata. High amplitude channel bases are also evident toward the east possibly indicating a coarse fluvial lag (Chaumillion et al., 2007). Sediment facies in VC27, VC33 and VC03 from the region are indicative of estuarine fill and are not ideal for nourishment (Figure 16b and Appendices 1 and 2).

The Brunswick County region contains a number of shallow ($< 5m$) channels as highlighted in Figures. 14 and 15. Most channels are mapped on the eastern portion of the region and are likely related to the Cape Fear Valley (Cleary et al., 1996). These channels are predominantly constrained to areas where there is also a thin modern sand veneer. To the west, more hardbottom is visible, corresponding to a lack of buried paleochannels. Of all the regions, Brunswick likely was subject to the lowest amount of wave scour during transgression, and consequently, the numerous shallow channels ($< 5m$) are indicative of tidal influence. Similar shallow channels have been mapped in tidally-dominated Georgia (Oertel et al., 1991). Additionally, shallow channel incision in this region may be attributable to the differences in shelf slope and more uniform bathymetry (i.e. steeper slopes may have caused incision of deeper channels). The Brunswick channels also differ from the other ASAP regions and areas such as the New Jersey Outer Continental Shelf (Nordfjord et al., 2006), in that they are less likely to be truncated by a transgressive ravinement surface.

In general, the channel observations across the SE NC shelf reflect tidal vs. fluvial development (i.e., the distribution of different channel sizes) as well as the underlying geology into which the channels are incised. The shape of the channels is hypothesized to be governed by the geologic strata of Onslow Bay (Hine and Snyder, 1985). However, the fill and preservation is hypothesized to reflect the relationship between fluvial transport capacity, sea-level rise and local geomorphic changes (which are no longer visible due to wave ravinement). These data show that channel-limited areas tend to be hardbottom-rich and the distribution and depth of large channels is related to paleovalley locations (e.g., Figures 7 and 8). It is reemphasized that channels may contain some sand suitable for beach nourishment where acoustically transparent fill and/or the surficial modern sand (H unit) is observed and validated by core data. However, many channels are complex indicating multiple incisions/processes, and are interbedded with heterolithic fill (i.e., shelly and muddy fluvial and estuarine) making its use impractical.

7 Sand Resources on the North Carolina Continental Shelf:

North Carolina's gently-sloping, submerged continental shelf and emergent coastal plain display a great deal of spatial variability in their geology and resulting geomorphology. As sea-levels began to rise following the Last Glacial Maximum some 20,000 years ago ocean shorelines began to retreat landward. The resulting erosion and sediment reworking which occurred as the shorelines retreated exposed an array of surface and subsurface sedimentary features (e.g., relict barrier island fragments, tidal deltas and fluvial deposits) (Rutecki et al., 2014) whose characteristics differ, sometimes markedly, across the North Carolina shelf and outer coastal plain (that portion nearest the ocean shoreline) between north and south. Divided by Cape Lookout, the State's southern coastline is characterized by short barrier islands with many separating tidal inlets and small, narrow back-barrier estuaries. Offshore the sand veneer covering the shelf is thin, with few thicker sand bodies and numerous older (Pliocene and Cretaceous aged) rocky outcrops dotting the surface along much of the seafloor (Meisburger et al., 1979; Snyder et al., 1994; and Riggs et al., 1995). North of Cape Lookout, on the other hand, the barrier islands are characteristically long and narrow with few tidal inlets (3 at this writing in 2019), and front large, shallow estuaries (Riggs et al., 1995). On the northern North Carolina continental shelf we find a consistently thicker more spatially continuous overlying sand wedge, made up largely of recent (Quaternary aged) sediments with few or no rocky outcrops (Mallinson et al., 2010; Thieler et al., 2014). Differences in rates of relative sea level rise, sources of new sediments, and regional tectonics are the principal reasons for the variability seen, and are further the principal influences on the long-term erosion/accretion response and ultimately the evolution of the State's modern, largely retreating, coastline (Riggs et al., 1995).

Though in this report we place primary focus on sand resources and associated reconnaissance south of Cape Lookout, for completeness we include brief discussions on sand resources found both to the north and south of the Cape. Assessments for both areas come from various previously prepared sources in concert with the interpretations presented here.

7.1 Currituck and Northern Dare Counties:

In 1994 the Marine Minerals Management Service (MMS), now BOEM, authorized the North Carolina Geologic Survey to acquire marine geophysical data along the continental shelf from the town of Duck in Dare County south to Oregon Inlet. These data were used to identify four borrow sources in federal waters offshore of the towns of Nags Head and Kill Devil Hills comprising > 300 Mcy (OCS1-OCS4; Figure 17; Table 3). Due to the spacing of the tracklines (2 nautical miles) and the somewhat limited number of vibracores (56) over such a large area, these volume estimates are relatively coarse but do clearly indicate large volumes of potential sand. For example, OCS3 (Table 2; Figure 19) is only intersected by five tracklines and two vibracores, suggesting the volume estimate of 64.7 Mcy has large associated uncertainty. As part of early feasibility efforts, the USACE (2000) identified three potential borrow sources. Borrow area S 1 is located within State waters offshore Nags Head and contains an estimated 104.5 Mcy (Table 3; Figure 17). The remaining two sites in State waters offshore,N1 and N2, sit offshore of Southern Kitty Hawk and Northern Kill Devil Hills and are believed to contain approximately 8 Mcy, respectively (Table 3; Figure 17). From the information available, it is believed that

Table 3: Borrow Site Sand Resource Assessments–Currituck and Northern Dare Counties

SMFA	Borrow Area Name	Est. Size (Mcy)	Estimated Quality(Suitable, Marginal, Unsuitable, Unknown)	Data Availability (Limited, Good, Excellent, Not Accessible)	Historic Use	Planned Use	Reference for Volume Estimate
C&ND	A (Ctk)	N/A	Suitable	Limited	N/A	N/A	BIMP, 2011
C&ND	B (Duck)	2.7	Suitable	Excellent	N/A	Duck 2017	CPE, 2014
C&ND	C (N1)	5.2	Suitable	Good	N/A	N/A	USACE, 2000
C&ND	D (N2)	2.4	Suitable	Good	N/A	N/A	USACE, 2000
C&ND	E (S1)	104.5	Suitable	Excellent in portions	Nags Head 2011	Nags Head 2011	USACE, 2000
C&ND	F (S2)	7.2	Unsuitable	Good	N/A	N/A	USACE, 2000
C&ND	G (S3)	1.4	Unsuitable	Good	N/A		USACE, 2000
C&ND	H (OCS1)	173.5	Suitable	Excellent	North Dare Beaches 2017	N/A	Boss and Hoffman, 2001
C&ND	I (OCS2)	44.9	Suitable	Good	N/A	N/A	Boss and Hoffman, 2001
C&ND	J (OCS3)	64.7	Suitable	Good	N/A	N/A	Boss and Hoffman, 2001
C&ND	K (OCS4)	23.2	Suitable	Good	N/A	N/A	Boss and Hoffman, 2001

Table 4: Borrow Site Sand Resource Assessments–Southern Dare and Hyde Counties

SMFA	Borrow Area Name	Est. Size (Mcy)	Estimated Quality(Suitable, Marginal, Unsuitable, Unknown)	Data Availability (Limited, Good, Excellent, Not Accessible)	Historic Use	Planned Use	Reference for Volume Estimate
SD&H	L (N. Pea Is.)	68.5	Suitable	Good	N/A	N/A	Boss and Hoffman, 2000
SD&H	M	N/A	Suitable	Excellent	N/A	N/A	Godynamics, 2013
SD&H	N (S. Pea Is.)	55.9	Suitable	Excellent	Rodanthe, 2014	N/A	Boss and Hoffman, 2000
SD&H	O	N/A	Unknown	Limited	N/A	N/A	NCDENR, 2011
SD&H	P (Buxton)	15.5	Suitable	Excellent	Local	Buxton 2017	NCDENR, 2011
SD&H	Q (D. Shoals)	1660	Marginal	Limited	N/A	N/A	NCDENR, 2011
SD&H	R (Hatteras)	28.5	Suitable	Good	Hatteras Nourishments ?		Boss and Hoffman, 2000
SD&H	S	N/A	Unknown	Limited	N/A	N/A	Boss and Hoffman, 2001
SD&H	T	N/A	Unknown	Limited	N/A	N/A	NCDENR, 2011
SD&H	U (Hatt. Inlet)	N/A	Marginal	Limited	Hatteras	N/A	BIMP, 2011
SD&H	V (Ocracoke)	70.1	Marginal	Limited	N/A	N/A	Boss and Hoffman, 2001
SD&H	W	N/A	Marginal	Limited	N/A	N/A	NCDENR, 2011
SD&H	X	N/A	Marginal	Limited	N/A	N/A	NCDENR, 2011
SD&H	Y	N/A	Marginal	Limited	N/A	N/A	NCDENR, 2011
SD&H	Z	N/A	Marginal	Limited	N/A	N/A	NCDENR, 2011

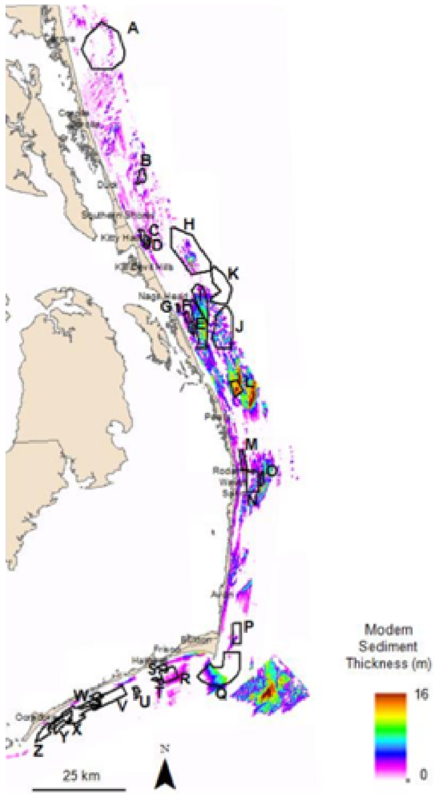


Figure 17: Borrow sources from C&ND and SD&H (See Tables 2 and 3) overlain on sediment thickness isopach map from Thinner et al, (2014). This dataset serves as a good reconnaissance tool for potential sand resources.

all three borrow-area volume estimates were determined based on a combination of seismic-reflection, vibracore and bathymetric data, although data coverage was limited. From 1999 to 2005, a large-scale, multi-institutional sand availability research effort, with funding from the Outer Banks Task Force and the North Carolina Department of Transportation, was conducted across the inner continental shelf off northeastern North Carolina. The reconnaissance relied on high-resolution single-channel seismic data and 121 vibracores (up to 20 ft in length), and yielded six potential sand resources ranging in volume from 11 to 70 million cubic yards. In all, within shelf waters ranging from the Virginia-North Carolina state line southward down to Oregon Inlet, there are 11 identified potential borrow areas associated with sand ridge and shoal complexes, constituting some 403 Mcy (Table 3; Figure 17) of potential sand.

7.2 Southern Dare and Hyde Counties:

Along the North Carolina shelf from Oregon Inlet south to Ocracoke Inlet, 15 potential borrow sources have been identified. A total of 238 Mcy have been estimated for five of these sources (Table 4). According to Boss and Hoffman (2000), Diamond Shoals is a potentially huge borrow source for sand, approximately 1.6 billion cubic yards, but there are potentially high costs associated with mining the sand stored here. However, for many of these potential sources, the volume estimates are based on limited data as they were made prior to the USGS surveying (Table 4). For example, some of the potential sources with large estimated volumes like that offshore Ocracoke (70.1 Mcy) (Boss and Hoffman, 2000) are only intersected by 9 seismic tracklines (0.5 mi spacing) and twelve cores. Furthermore, only five vibracores were used to assess the Diamond Shoals resource (Boss and Hoffman, 2000).

7.3 Bogue Banks:

Several potential borrow sites have been investigated to determine the sediment quantity and quality potentially available for placement on Bogue Banks (Figure 18). Initial areas of investigation included the Beaufort Inlet Ebb Tide Delta, Bogue Inlet, and several sites offshore of Bogue Banks (Figure 18). These locations appeared to cover a significant area and have usable depths, i.e., sand thicknesses greater than 2 feet. Environmental concerns and/or the presence of cultural or historic artifacts eliminated all but 3 possible borrow areas: Y, U, and the Morehead City Ocean Dredged Material Disposal Site (ODMDS), which lies within Area Q2 (Figure 18). However, it should be noted that the borrow areas eliminated from the CSDR may still be suitable and sizable as beach fill. If future need arises, these areas could be investigated more closely (OSI, 2014). Several potential borrow sites have been investigated to

Figure 18: Recommended borrow sites moving forward include Area Y, the Old and Current Dredge Material Disposal Site (ODMDS), Area U, and Bogue Inlet. From the BBBMNP, 2017.

determine the sediment quantity and quality potentially available for placement on Bogue Banks (Figure 18). Initial areas of investigation included the Beaufort Inlet Ebb Tide Delta, Bogue Inlet, and several sites offshore of Bogue Banks (Figure 18). These locations appeared to cover a significant area and have usable depths, i.e., sand thicknesses greater than 2 feet. Environmental concerns and/or the presence of cultural or historic artifacts eliminated all but 3 possible borrow areas: Y, U, and the Morehead City Ocean Dredged Material Disposal Site (ODMDS), which lies within Area Q2 (Figure 18). However, it should be noted that the borrow areas eliminated from the CSDR may still be suitable and sizable as beach fill. If future need arises, these areas could be investigated more closely (OSI, 2014).

More recent data collection has focused on Area Y and the ODMDS. In fact, the Revised Study Area omits borrow area U (Figure 18). The field program off Bogue Banks proposed additional core and geophysical data collection on Area Y and the ODMDS. More than 50 additional vibracores were collected in these two proposed borrow areas to better define the quality and quantity of the resource. The estimated amount of material in these two borrow areas (ODMDS and Y) total 22,453,557 cy.

7.4 Topsail Island:

Several areas of sand resource availability exist to aid the towns along Topsail Island with shoreline management. Sand from maintenance dredging and channel realignment has been useful and cost-effective in the past (e.g., Phase 1 renourishment for North Topsail Beach). A state-wide evaluation of sediment availability in federal navigation channels has not been conducted to the knowledge of the authors, although the USACE does regularly resurvey and maintain (i.e., dredge) areas of shoaling. Offshore research (Snyder et al., 1982; 1988; Hine and Snyder, 1985; Riggs et al., 1985) has, however, revealed how Paleogene and Neogene marine sedimentary rocks are exposed on the shelf and overlying sediment is generally thin or absent. U.S. Army Corps of Engineers (USACE, 2004) sponsored research was conducted in Spring 2003 in an area between 0.5 and 5 miles offshore. The associated report did not identify specific borrow areas, but gave key insights and nicely reviewed earlier studies (USACE, 2004). This research corroborated how unconsolidated sandy sediments offshore are found in isolated areas. Based on the data and analysis from the Corps-sponsored study, along with sidescan sonar mapping of the surficial seafloor (USACE, 2004), 16 potential borrow sites were identified holding an estimated total of 50 million cubic yards (Figure 19; USACE, 2010). Given the spacing of available core and seismic data, these estimates must be viewed as very approximate.

Table 5: Borrow Site Sand Resource Assessments–New Hanover County

SMFA	Borrow Area Name	Est. Size (Mcy)	Estimated Quality(Suitable, Marginal, Unsuitable, Unknown)	Data Availability (Limited, Good, Excellent, Not Accessible)	Historic Use	Planned Use	Reference for Volume Estimate
New Hanover	Figure Eight I-III	N/A	Suitable	Limited, N/A	None	None	USACE (2015a)
New Hanover	A-North	8.2	Suitable	Good, N/A	Yes, Kure Beach CSDR	Yes, Kure Beach CSDR	USACE, (1993)
New Hanover	A-South	2.47	Suitable	Good, N/A	Yes, Kure Beach CSDR	Yes, Kure Beach CSDR	USACE, (1993)
New Hanover	B-West	14.54	Marginal	Limited	N/A	N/A	USACE, (1993)
New Hanover	B-East	N/A	Unsuitable	Limited	None	None	USACE, (1993)

While there appears to be a considerable volume of sediment offshore for future nourishment projects, it is evident that the available material is not exhaustive and much is potentially not ideal. The Corps of Engineers USACE (2010), for instance points out that borrow areas A, F, L, S, and P did not meet compatibility standards based on their initial evaluation. During PED analysis, borrow areas A, G, H, J, L, O, and P failed to meet state-established grain size and mineralogy requirements, although were found to be acceptable according to USACE Wilmington District practices (USACE, 2013). At the moment, it is believed that only reconnaissance-level data exist for the potential borrow areas except A and Q, which was surveyed for Phase 5. Because of the need for a borrow area for Topsail Beach and the determination that area A would not have a sufficient quantity of suitable material, Finkl et al (2008) identified Borrow Area X and estimate a volume of 2.02 million cubic yards (Figure 20).

7.5 New Hanover County:

Past nourishment projects in New Hanover County SMFA have largely relied on inlet or other navigation channel sands. The one exception to this is Kure Beach, which has utilized an offshore borrow area (Figure 21). The sustainability of using inlet or channel sediment requires replenishment of these dredge sources. A sediment budget analysis completed by Jarrett and Associates (1978) estimated that 155,000 cy was being trapped annually by the Masonboro Inlet jetty system. To account for these losses, an equivalent average annual volume was determined for nourishment of Wrightsville Beach (USACE,

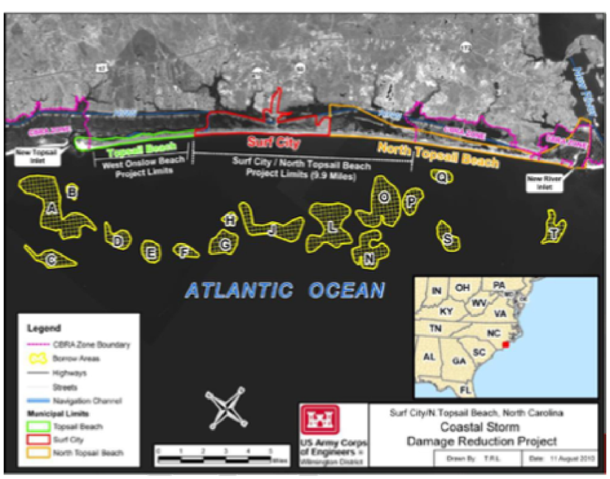


Figure 19: Map of sand management projects and potential offshore borrow areas (from Civil Works Review Board Presentation on USACE, 2017). Note, several previously identified borrow areas (I,K,M,R) were excluded based on sidescan sonar mapping results (USACE, 2010), and Borrow Area X, is not shown as it was identified later.

Figure 20: Borrow areas near New Topsail Inlet. Note Area X is at entrance (USACE, 2017).

1982).

Meisburger et al. (1979) completed a seismic-reflection survey and collected cores across a wide area of the inner continental shelf from Cape Lookout to the SC border (Figure 22). Based on 824 km of seismic-reflection and 139 cores, it was determined that only in a few shoal areas were sediments possibly suitable for beach nourishment. Based on 123 km of seismic-reflection data and observations from earlier work, Synder et al. (1994) created an interpretive map of the geology offshore of New Hanover County (Figure 23). The mapped "Inner Shelf Sand Shoals" are the best areas of potential sand resources (shaded in pink).

USACE (2015a) indicates that three possible borrow areas were identified offshore of Figure Eight Island, although use is planned at the current time (Table 5). To identify borrow source possibilities for Kure Beach, the findings of Meisburger et al. (1979) guided investigations (USACE, 1993). In 1991, a seismic scan was completed (no specifics are given), and 68 vibracores were collected across borrow areas "A" and "B". Based on the available data, volumes were estimated for "A-North", "A-South", and "B-West" (Figures 24 and 25; Table 5). Grain-size analysis indicated the sediment in the areas analyzed could be suitable for nourishment, but "Borrow Area A-South" was not sampled (USACE, 1993).

7.6 Brunswick County:

Based on all available data as of this writing, the known compatible sand resources along the Brunswick coast and shelf, not including Cape Fear Shoals, is estimated to be approximately 243 to 247 Mcy.

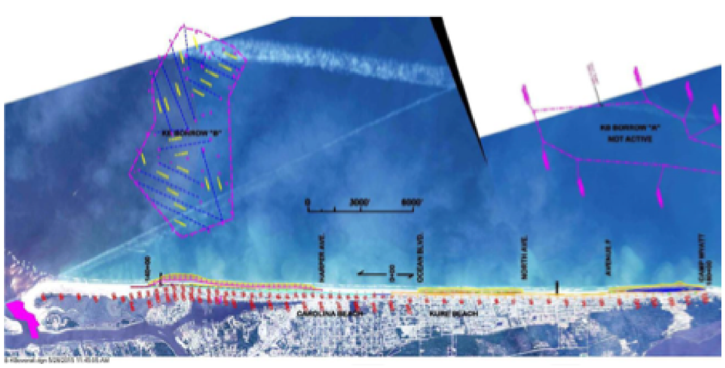


Figure 21: Map of nourishment areas in Carolina Beach and Kure Beach and associated borrow areas for 2016 CSDR cycle. The Carolina Beach nourishment used an inlet borrow area to the north (pink-shaded polygon), and the Kure Beach project used sediment from "B". Figure from USACE (2015b).

Table 6: Borrow Site Sand Resource Assessments–Brunswick County

SMFA	**Borrow Area Name**	**Est. Size (Mcy)**	**Estimated Quality(Suitable, Marginal, Unsuitable, Unknown)**	**Data Availability (Limited, Good, Excellent, Not Accessible)**	**Types of Data**	**Historic Use**	**Planned Use**	**Reference for Volume Estimate**
BCB	Jinks Creek Nav Project	0.1	Suitable	Excellent,	Cores, bathymetry	None	Nav Project	M&N 2017b, 2017c (2015a)
BCB	Tubbs Inlet	N/A	Suitable	Good	Cores	None	N/A	OPE, 2015b
BCB	Shallotte Inlet	1.1-1.7	Suitable	Excellent	Cores, bathymetry	OIB	OIB term groin & CSDR	OPE, 2015b; OIB 2016
BCB	Lockwoods Folly Inlet & Eastern Chan.	7	Suitable	Excellent	Cores, bathymetry	Oak Island	HB term groin; OI CSMP	M&N 2016; DCA 2015; ATM 2013
BCB	Offshore Tubbs Inlet	unknown	Suitable	Good	Cores, bathymetry	None	N/A	CPE 2015b
BCB	Offshore Central OIB	0.4	Suitable	Good	Cores, bathymetry	None	N/A	CPE 2015b
BCB	Priority 1 Borrow Area	1.87	Suitable	Good	Cores, seismic	None	N/A	ATM 2010
BCB	Priority 2 Borrow Area	2.16	Suitable	Good	Cores, seismic	None	N/A	ATM 2010
BCB	Priority 3 Borrow Area	0.76	Suitable	Good	Cores, seismic	None	N/A	ATM 2010
BCB	Priority 4 Borrow Area	0.49	Suitable	Good	Cores, seismic	None	N/A	ATM 2010
BCB	USGS R1a	unknown	Suitable	Good	Cores	None	N/A	M&N 2016; DEQ 2003
BCB	Long Bay (1998/2003 surveys)	unknown	Unsuitable	N/A	Cores, seismic	None	N/A	C&C 1999, 2003
BCB	Wilmington Harbor ODMS	166	Unsuitable	Good	Cores	None	N/A	M&N 2016; NCDENR 2011
BCB	Central Reach	3.3	Suitable	Good	Cores, bathy, seismic	Holden Beach	Central Reach	M&N 2016; DCA 2015
BCB	Jaybird Shoals	50	Suitable	Good	Cores, bathymetry	BHI term groin	N/A	M&N 2016; NCDENR 2011
BCB	Cape Fear Shoals BHI	5.2-8.5	Suitable	Good	Cores, bathy, seismic	None	BHI	BHI 2016
BCB	Cape Fear Shoals (CFA) total	1400	Suitable to Moderate (too fine in areas)	Limited	Cores, seismic	None	BHI	M&N 2016; Meisburger, 1979

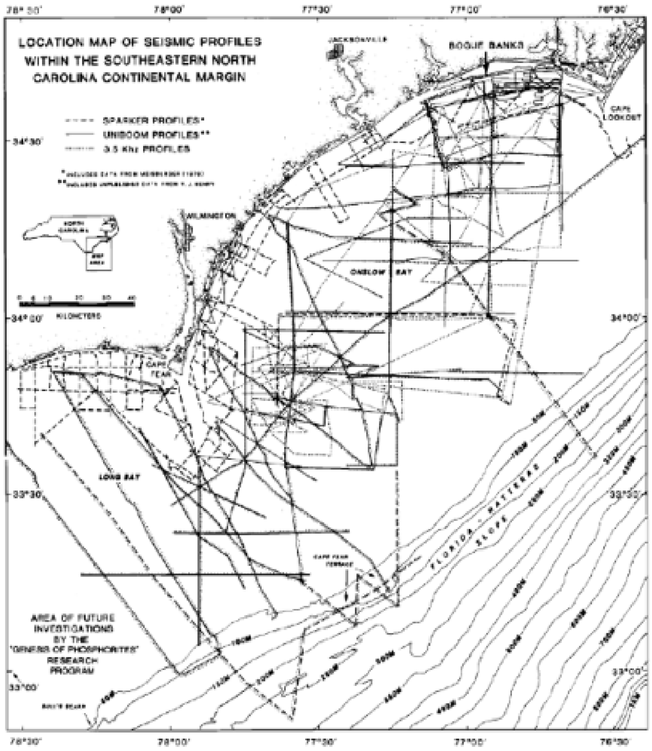


Figure 22: Map of seismic-reflection data in southern NC before 1985. Note the abundance of data near Bogue Banks are from Snyder et al. (1982) while data from Meisberger (1979) cover the inner shelf offshore New Hanover County and Brunswick County. From Riggs et al. (1985).

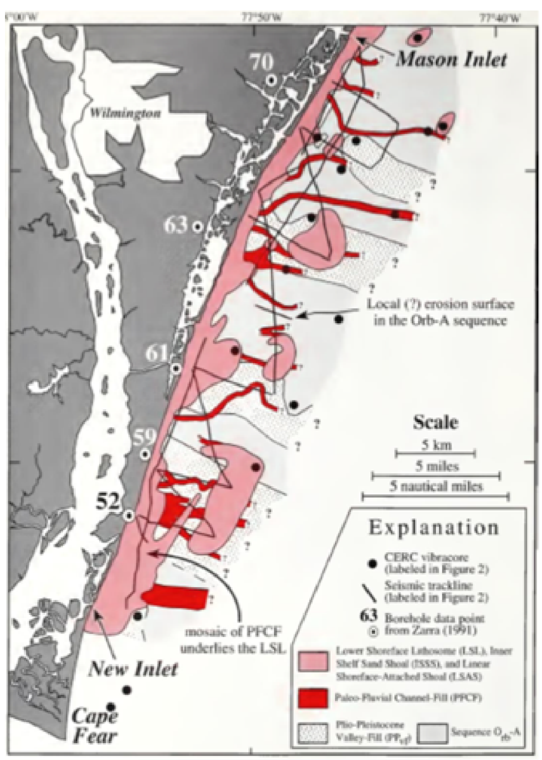


Figure 23: Interpreted surgical geology offshore New Hanover County. Note the single line defining the shoal (pink area) offshore of Borehole 61. From Snyder et al., (1994).

Cape Fear Shoals represents a vast resource of perhaps an additional several hundred million cy. Inlet sites, from navigation channel maintenance, are difficult to estimate, but could provide an additional

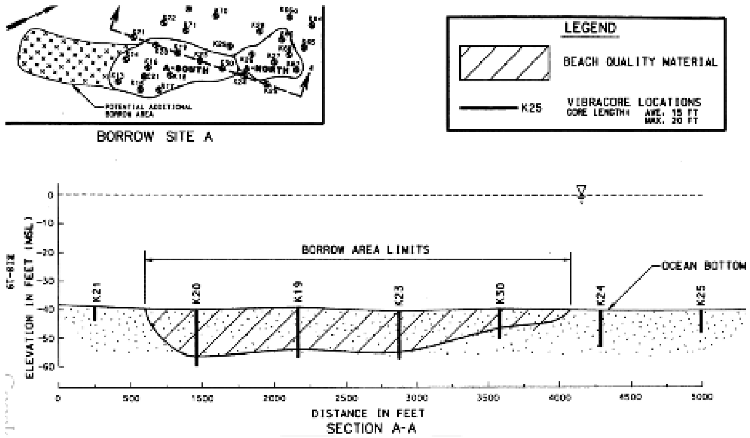


Figure 24: Map and cross-section of Borrow Area A based on USACE cores (USACE, 1993).

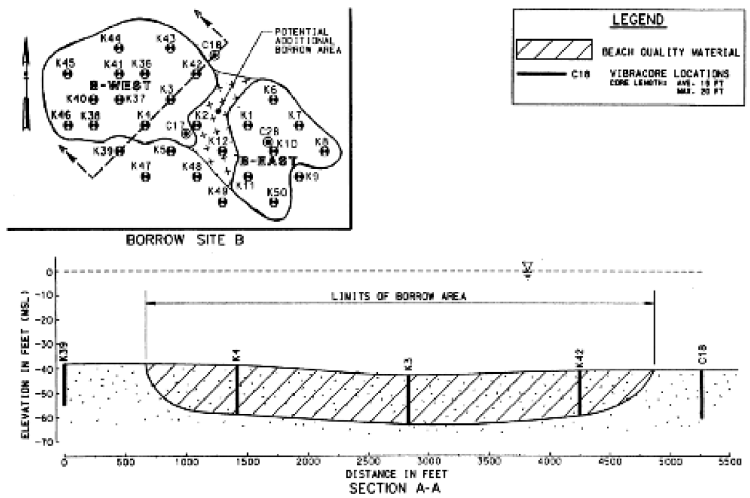


Figure 25: Map and cross-section of Borrow Area B based on USACE cores (USACE, 1993.

beach compatible sand supply well in excess of 245,000 cy/y (the estimate for Lockwoods Folly Inlet alone). Additional sand resources will also be contributed by future dredging projects for navigation purposes in high trafficked and commercial areas such as Wilmington Harbor channel, Eastern Channel, and the AAIW. These navigation projects have collectively provided approximately 11.3 M cy of beach nourishment material since 1971. The full extent of shelf resources along this portion of North Carolina is unclear as there is insufficient characterization of many regions due to the low density of cores, and, geophysical data (Table 6).

8 Resource Summary and Influence of Geologic Framework:

Due to the drastic differences in framework geology across NC, each region is unique in terms of the character of potential and historically used borrow sources. The NE Region of the state has plentiful sand shoal complexes, as shown by a host of researchers (e.g., Boss and Hoffman, 2001; Thieler et al., 2014). As such, ASAP collection efforts were focused on the southern half of the state, which is also based on increased demand and projects.

A primary control on the distribution of ASAP interpreted sands is the underlying geologic framework and consequent lack of sediment input to the region. The NE region of the state is a drastic contrast that has plentiful shoal complexes (e.g., Boss and Hoffman, 2001; Thieler et al., 2014). As many researchers have emphasized, like other high-energy shelves on passive continental margins, the southern NC shelf and Onslow Bay are considered sediment-starved due to either lack of fluvial input, entrapment of sediment within estuaries or transport to slope environments (Emery, 1968; Cleary et al., 1996; Riggs et al., 1996; Riggs et al., 1998). Consequently, Onslow Bay is dominated by hardbottoms (Mearns et al., 1988; Cleary et al., 1996; Riggs et al., 1996). Modern sands are limited to a discontinuous veneer as shown by the data in the ASAP regions (Cleary et al., 1996; Riggs et al., 1996; Riggs et al., 1998). Similarities are noted on the South Carolina shelf, where the modern sediment layer is patchy and thin due to lack of fluvial input and reworking over an irregular transgressive erosional surface, allowing for underlying strata to crop out at the seafloor (Gayes et al., 2003, Baldwin et al., 2007; Denny et al., 2013). Physical and bioerosion processes are hypothesized to be responsible for creating much of the modern sands in Onslow Bay and SC that reflect the composition of underlying Tertiary and Pleistocene hardbottom being eroded (Cleary et al., 1996; Riggs et al., 1998; Gayes et al., 2003; Putney et al., 2004; Baldwin et al., 2007). While the majority of ASAP-delineated sand can be considered a veneer, in multiple areas two or more deeper reflectors (i.e., H and QT) are visible that represent thicker sand deposits. In addition, this ASAP effort has mapped numerous channels that may be a viable source of offshore sand in sediment-starved areas.

The Bogue Region is fortunate to have a diverse range of historic borrow sources, including inlets, dredge spoil sites and offshore resources (DCM, 2017). ASAP data show a thin modern sand veneer is present, although a mean thickness of approximately1 m likely makes dredging impractical. However, these data also reveal that the SE third contains two modern reflectors likely indicative of sand over 2-3 meters thick, potentially representing a voluminous dredging resource. This section in particular, aligns with the findings from the adjacent region of the ODMS and Freeman et al., (2012). Toward the western half a few stretches exceed three m of thickness, although they are localized. As necessary, these areas, and multiple mapped channels, can be surveyed at the design scale to further constrain volumes and extraction costs.

The Topsail region also contains a variety of historic borrow sources (NCDCM, 2016). While the H unit is widespread, it is often less than a meter, making dredging not feasible. The QT unit, however, is also well distributed and thicknesses exceeding 2-3 m represent a more viable sand source. Multiple mapped channels, appearing to be bathymetrically controlled, also indicate viable sand thicknesses and others can be verified by coring as sand resources.

The Hanover region also contains extensive H unit, yet again, with a mean thickness of 1 m, resource extraction may not be possible. At a 61% coverage, the QT unit presents a more usable sand resource especially with a mean thickness of 1.7 m. These thicker sand layers are believed to be related to a series of shore-detached ridges and relict paleo-cape sediments.

Finally, the Brunswick region also contains inlet sources as well as multiple inner shelf borrow sources which have been effective at sustaining long-term federal nourishment cycles (NCDCM, 2016). Comparatively, this region appears to contain the least amount of potential outer shelf sands, as it is difficult to distinguish a QT reflector and H is quite thin in most areas (less than 1 m). Many channels, however, contain at least a modern sand cap, and many may be composed of more sand at depth as indicated by acoustically transparent fill, making further investigation an option.

9 Management Implications:

Collected in what were prior data gaps, this new reconnaissance effort provides a broad starting point to search for offshore sand resources. As sand resources may diminish with increased demand, these data are critical for effective coastal management in response to storm events. Moreover, they provide some framework for advanced planning and/or long term RSM, as well as economic evaluations to help constrain costs relative to known volumes. As many researchers have emphasized, there is a lack of knowledge regarding compatible sand volumes and availability on the OCS.

Reconnaissance data for seabed geology, habitat potential and resource evaluation is quite valuable not just on this regional level, but globally, as many sandy coastlines throughout the world experience similar erosion issues. OCS areas are increasingly being used or considered for other resources and functions including wind farms, aquatic habitat, commercial/recreational fishing, hydrocarbon exploration/extraction, marine sanctuaries,etc. Because these OCS resources may overlap (in both space and time), multi-use conflicts may arise. Therefore, data collection and interpretation efforts like this work are important to ensure shelf value can be assessed before the areas are exploited for resources. Prioritization of vital habitats and/or potential sand borrow sources is essential, especially in regions where there is a high demand for nourishment but a shortage of OCS sand availability.

10 Prioritization for Future Data Collection in the Outer Continental Shelf:

It is hoped that this report has made two very important points clear to the reader. First, North Carolina's coastline is largely erosive. Coastal lands are being lost, and in some areas this rate of loss is quite high, so much so that it is threatening the livelihoods and even the very existence of many communities located here. Second, the most viable antidote to this loss of coastline for most of these communities is beach sand replacement, or renourishment. As discussed, many communities in North Carolina have already conducted one or more renourishment projects–some, like Wrightsville Beach, have been renourishing for almost 80 years. Given, however, the constant losses more and cities and towns along the coast will find it necessary to turn to renourishment sooner or later. When then do decide to rebuild the beach, success will hinge on a number of factors, most importantly, the availability of suitable sand resources in sufficient quantities, that can be economically mined and placed. This report details work done in the past and work currently underway (or recently completed) to locate and assess the quality and quantity of these mineral resources, but the results presented here can only be considered a beginning in a quest to understand the sand resources available along the continental shelf off North Carolina. Much more work needs to be done in order to have a good assessment of what sand materials are out on the State's continental shelf.

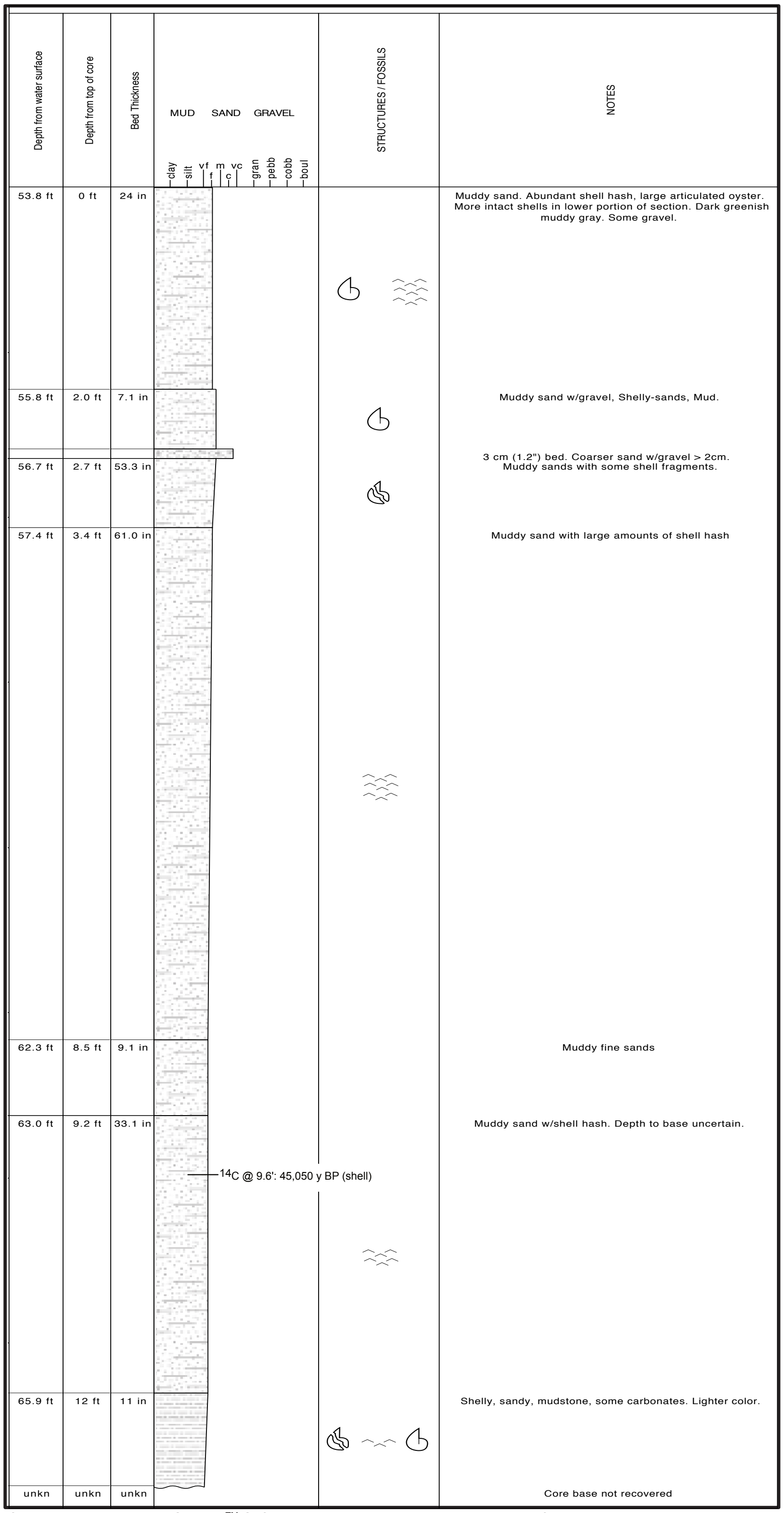
Appendix 1:
Vibracore Logs

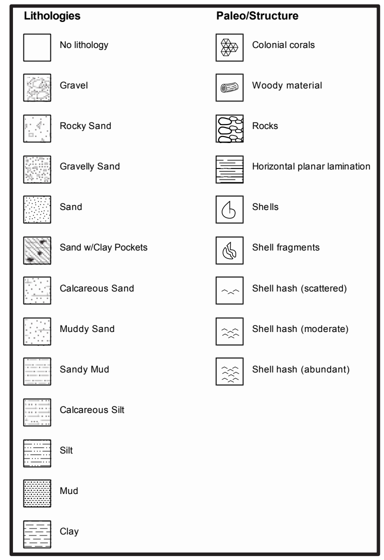
This appendix contains graphic diagrams detailing the sedimentary and fossiliferous content, characteristics, and selected artifact ages for each of the 24 vibracores collected as part of the study. Included are cores: VC01, VC03, VC04, VC06, VC08, VC09, VC10, VC13, VC15, VC16, VC17, VC18, VC19, VC23, VC24, VC25, VC27, VC28, VC31, VC32, VC33, VC34, VC37, and VC37A.

The core log graphics were initially created using the software SedLog[1] with additional work done using Serif Europe's vector design program Affinity Designer.

[1]SedLog: a shareware program for drawing graphic logs and log data manipulation", D. Zervas, G.J. Nichols, R. Hall, H.R. Smyth, C. Lthje and F. Murtagh, Computers & Geosciences, 35, 2151-2159, 2009.

NC-BOEM-2015 VC01





Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

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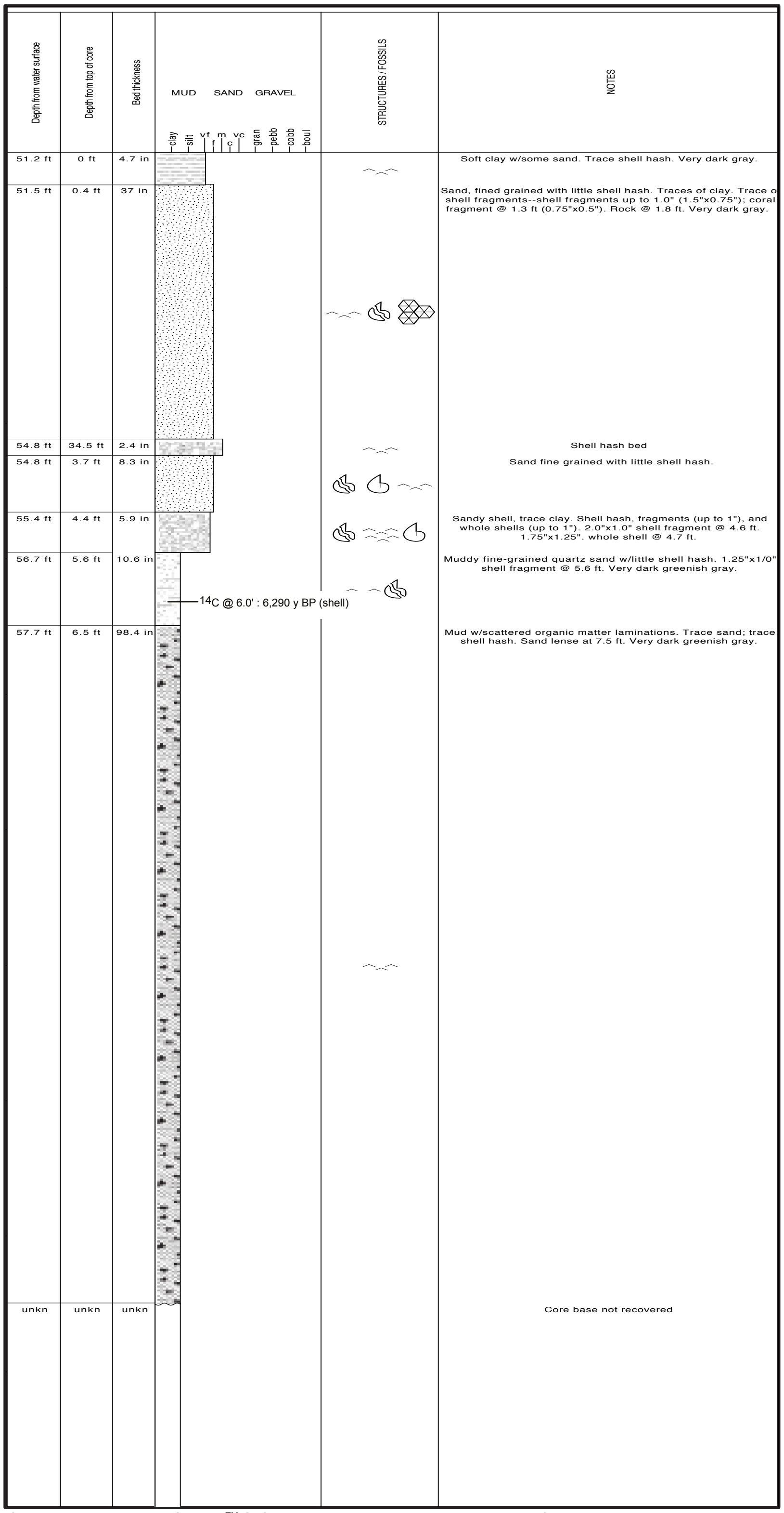
NC-BOEM-2015 VC03



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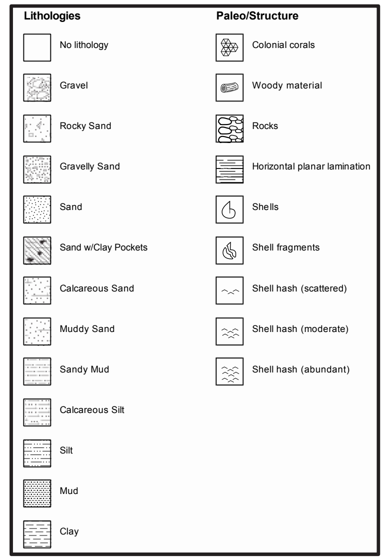

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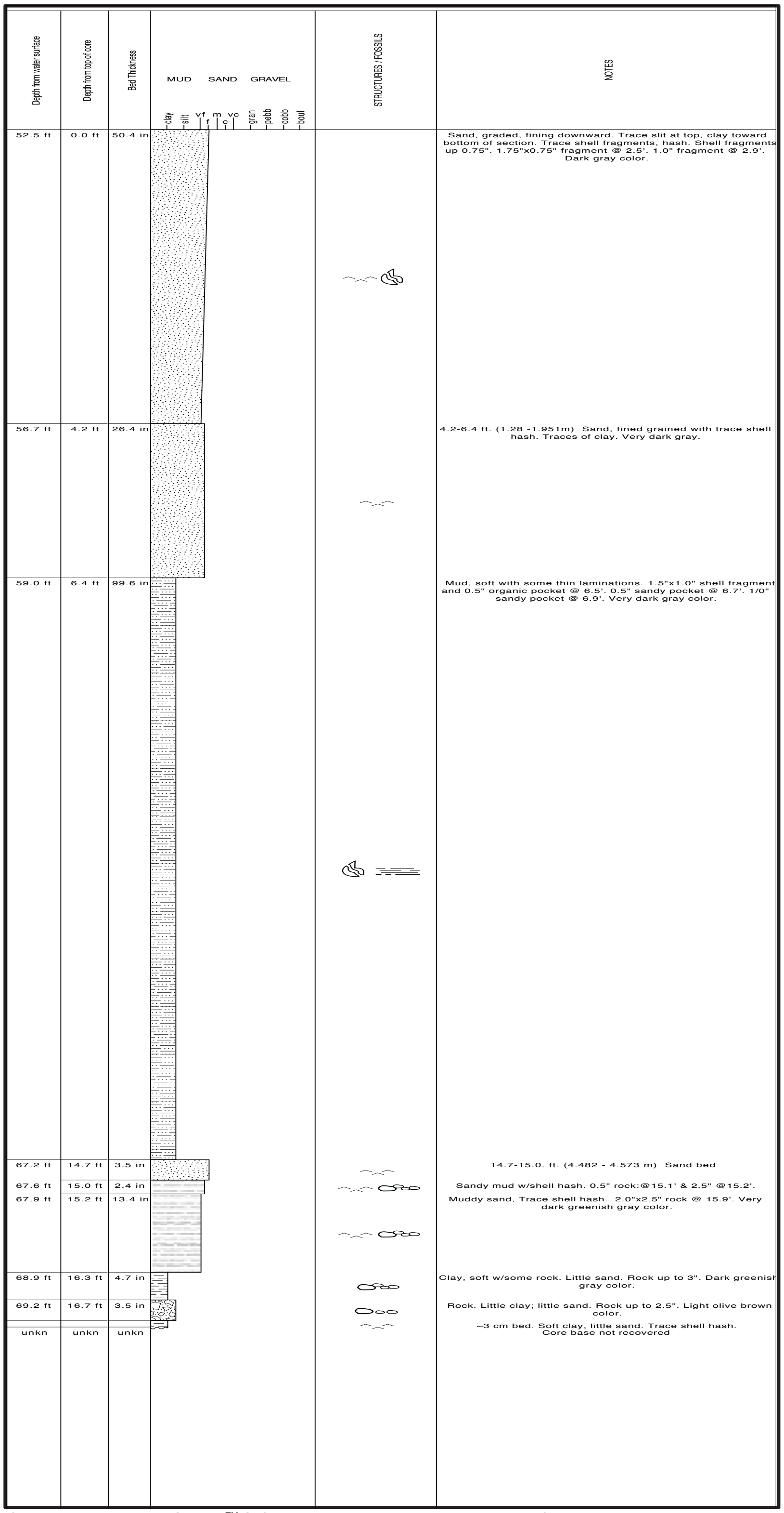
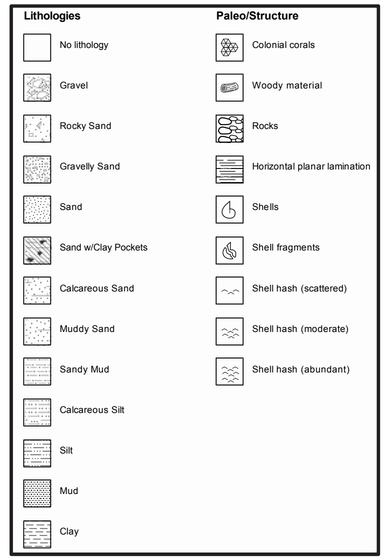
NC-BOEM-2015 VC04

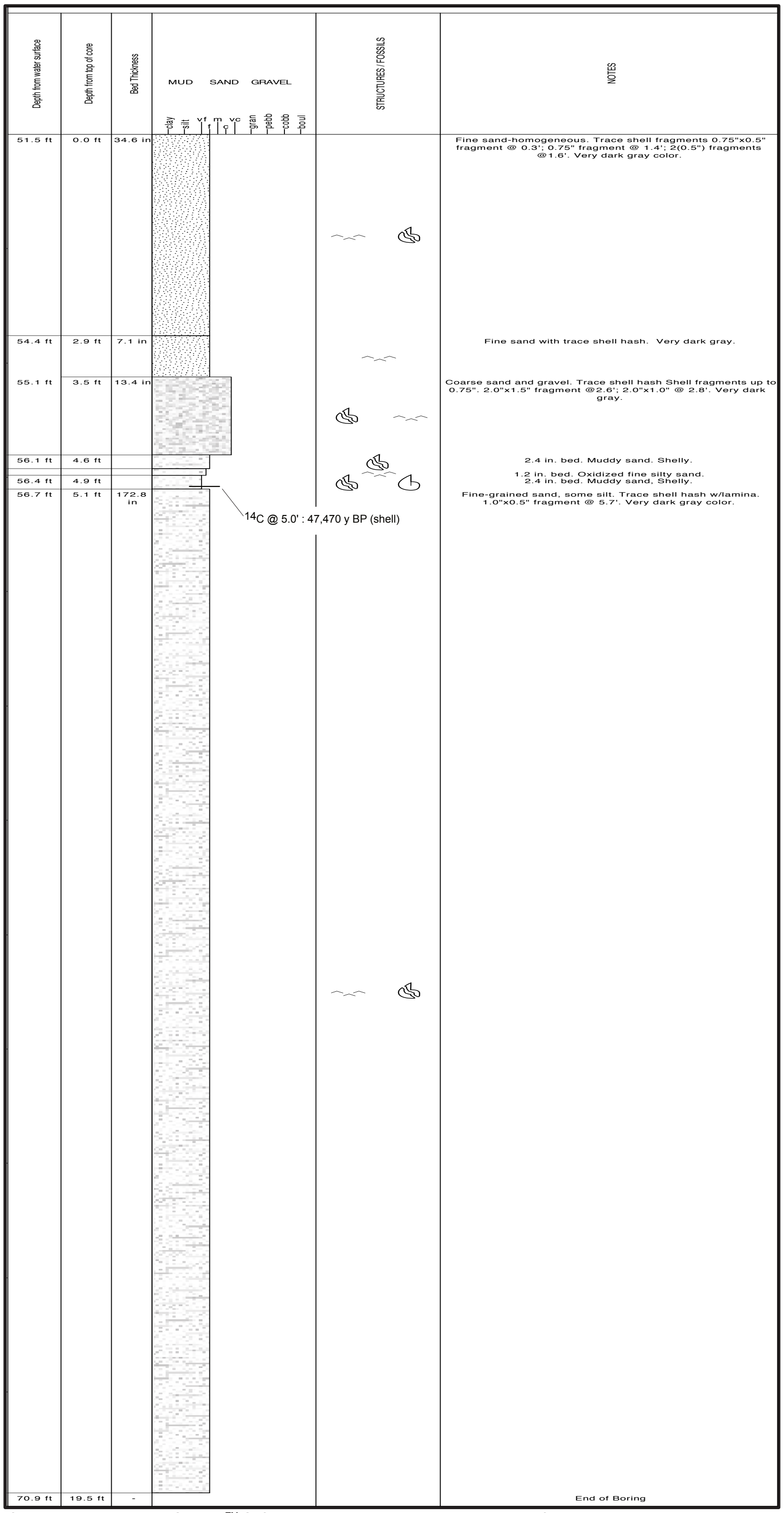


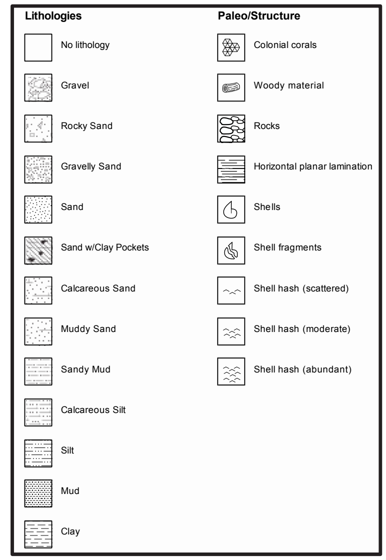


Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

NC-BOEM-2015 VC04

NC-BOEM-2015 VC06





Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

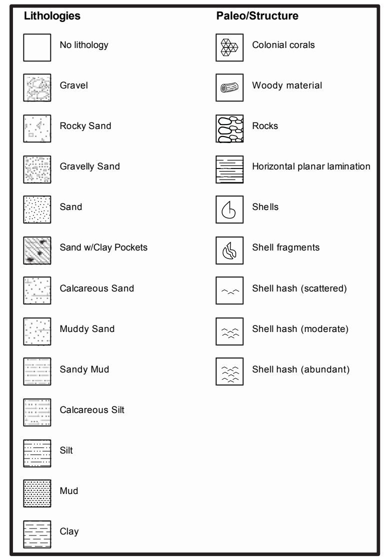
NC-BOEM-2015 VC06

NC-BOEM-2015 VC08

Depth from water surface	Depth from top of core	Bed Thickness	Notes
42.0 ft	0.0 ft	5.9 in	Sand, fine grained. Little shell fragments. Trace clay. Trace shell hash. Fragments up to 0.75" Dark gray. (N-4/0)(SW-SC)
42.6 ft	0.5 ft	14.6 in	Sand, fine grained, quartz. Little clay. Trace shell hash. Dark gray.(N-4/0)(SC)
44.0 ft	1.7 ft	13.4 in	Sand, medium grained, quartz, little clay. Trace shell hash. Dark gray. (N-4/0)(SC)
44.9 ft	2.8 ft	13.4 in	Muddy sand, soft. Trace shell hash. Very dark gray. (N-3/0)(CL)
45.9 ft	3.9 ft	7.1 in	Sandy mud, soft. Little shell hash. Dark gray. (N-3/0)(CL)
46.6 ft	4.5 ft	3.5 in	Muddy sand, 2" clayey pocket @ 4.7'. (5GY-4/1)(SP-SC)
46.9 ft	4.8 ft	16.9 in	Sand, fine gran quartz, trace clay. Trace shell hash. 2" clayey pocket @ 6.1'. Greenish gray. (5GY-4/1)(SP-SC)
48.2 ft	6.2 ft	4.7 in	Muddy sand, soft. Little shell hash. Dark gray. (N-4/0)(CL)
48.9 ft	6.6 ft	9.4 in	Muddy sand. Shell hash and fragments up to 0.75". Dark greenish gray. (5GY-4/1)(GC)
49.5 ft	7.4 ft	40.9 in	Muddy sand. Shell fragments up to 0.75" and very abundant shell hash. Dark greenish gray. (5GY-4/1)(GC)
52.8 ft	10.8 ft	14.6 in	Muddy sand, fine grained, quartz. Shell hash. 2.5"x1.5" fragment @ 11.2'. Dark greenish gray. (5GY-4/1)(SC)
54.1 ft	12.0 ft	5.9 in	Muddier but still shelly muddy sand. Little shell hash. Dark greenish gray. (5GY-4/1)(CL)
54.8 ft	12.5 ft	3.5 in	Muddy sand, shell hash bed, gravel. (5GY-4/1)(CL)
55.1 ft	12.8 ft	5.9 in	Muddy, sandy (shell) gravel. Whole shells and fragments,up to 1". 1.5" whole shell @ 13.3 ft. Dark greenish gray. (5GY-4/1)(GC)
55.4 ft	13.3 ft	73.2 in	Shelly, muddy, sand. (shell gravel). Shell components are shell hash, fragments, and whole shells upt o 2". 1.5" whole shell @ 16.2'; 3" rock @ 16.5'. (5GY-4/1)(GC)
unkn	unkn	unkn	Core base not recovered

^{14}C @ 3.16' : 33,230 y BP (shell)

^{14}C @ 10.48' : 42,130 y BP (shell)



Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

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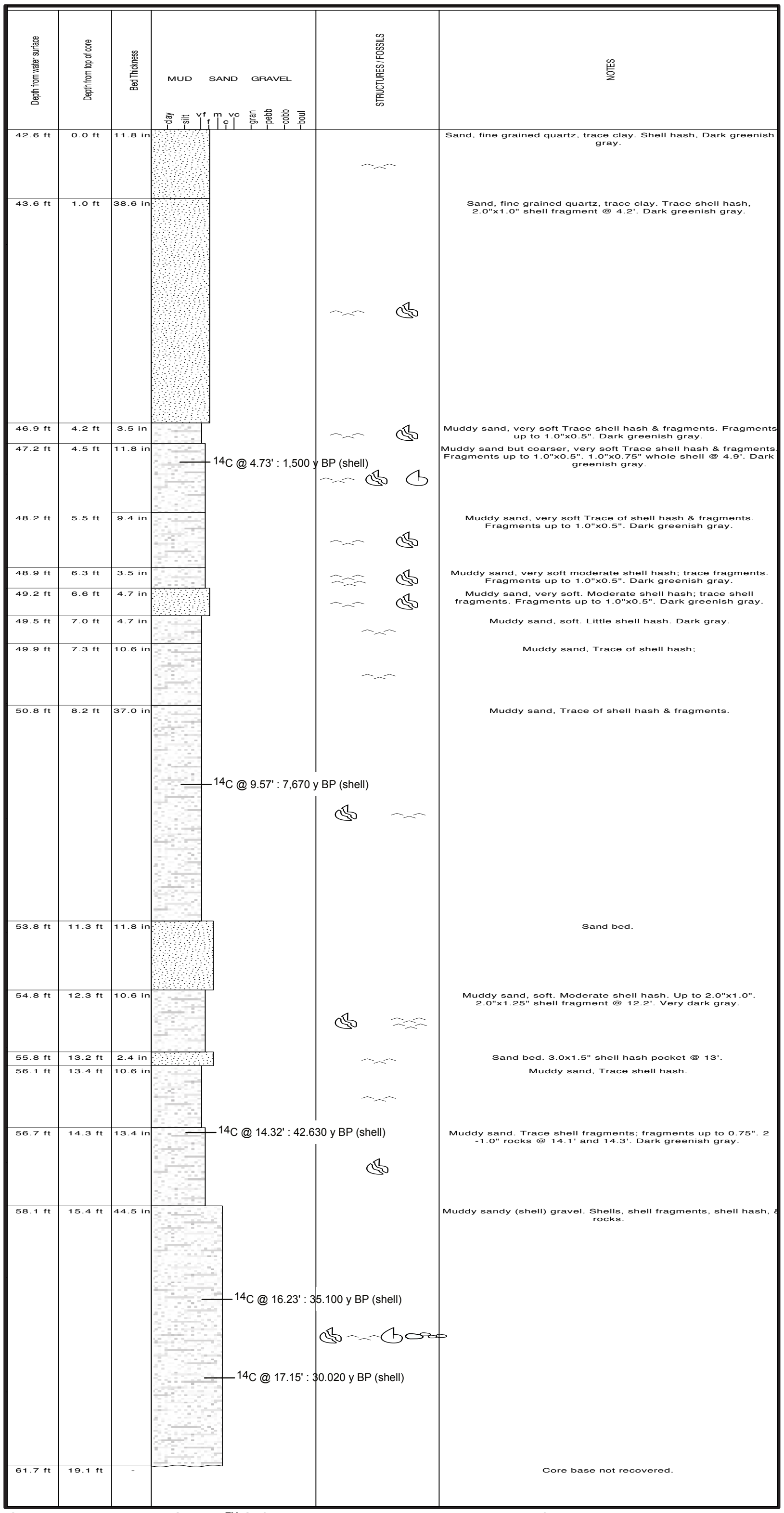
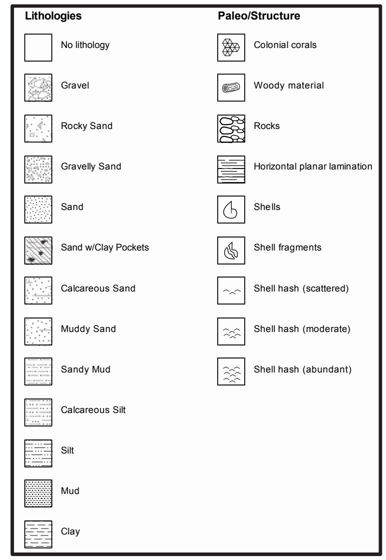
NC-BOEM-2015 VC09





Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

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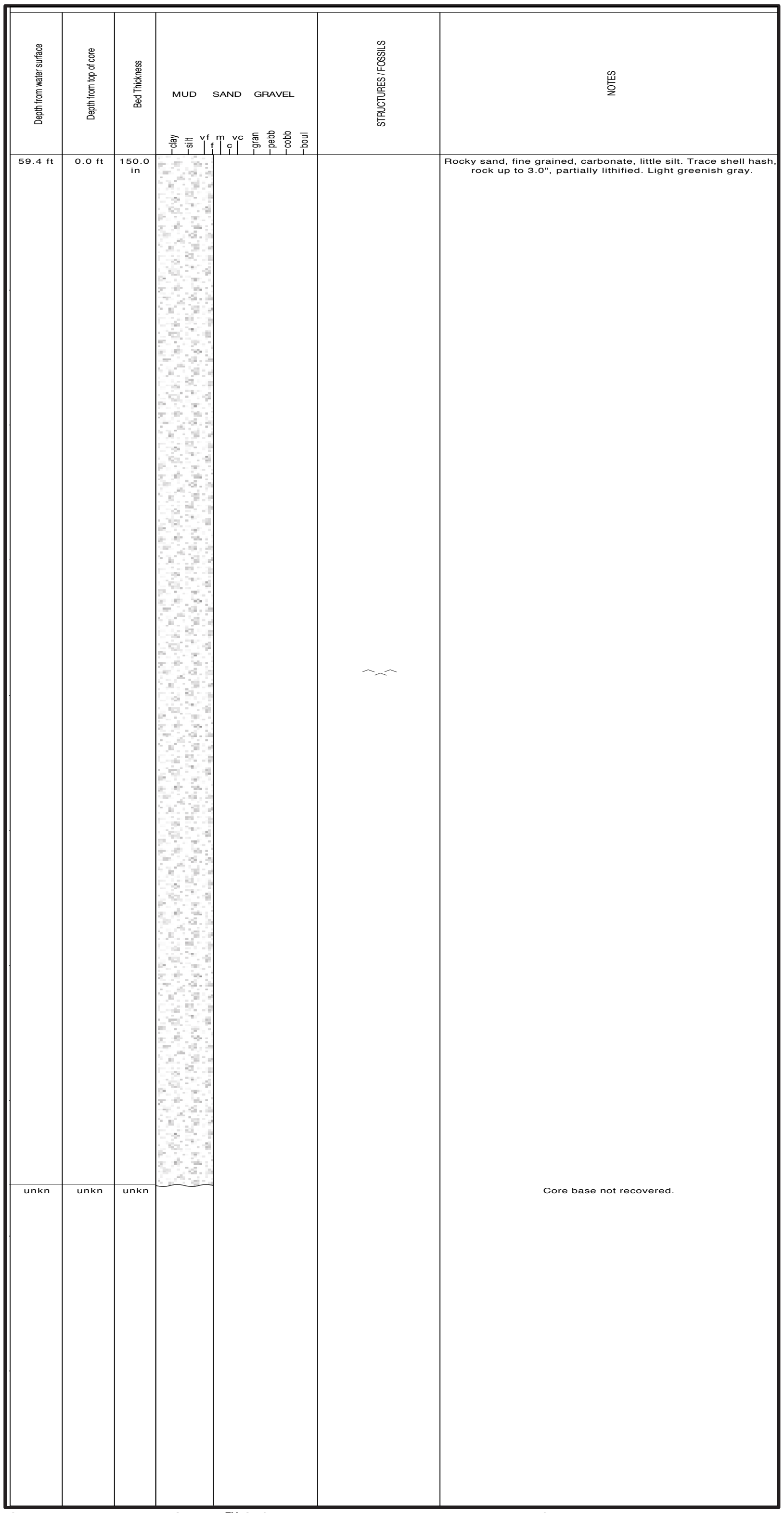
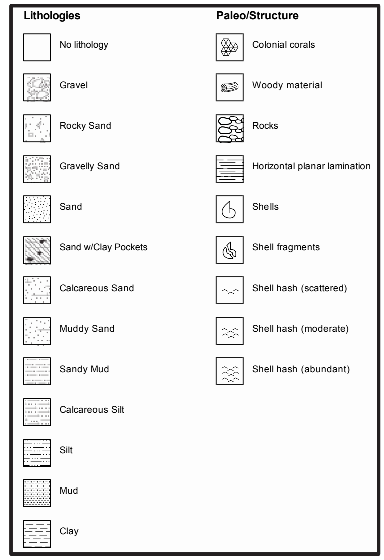
NC-BOEM-2015 VC10





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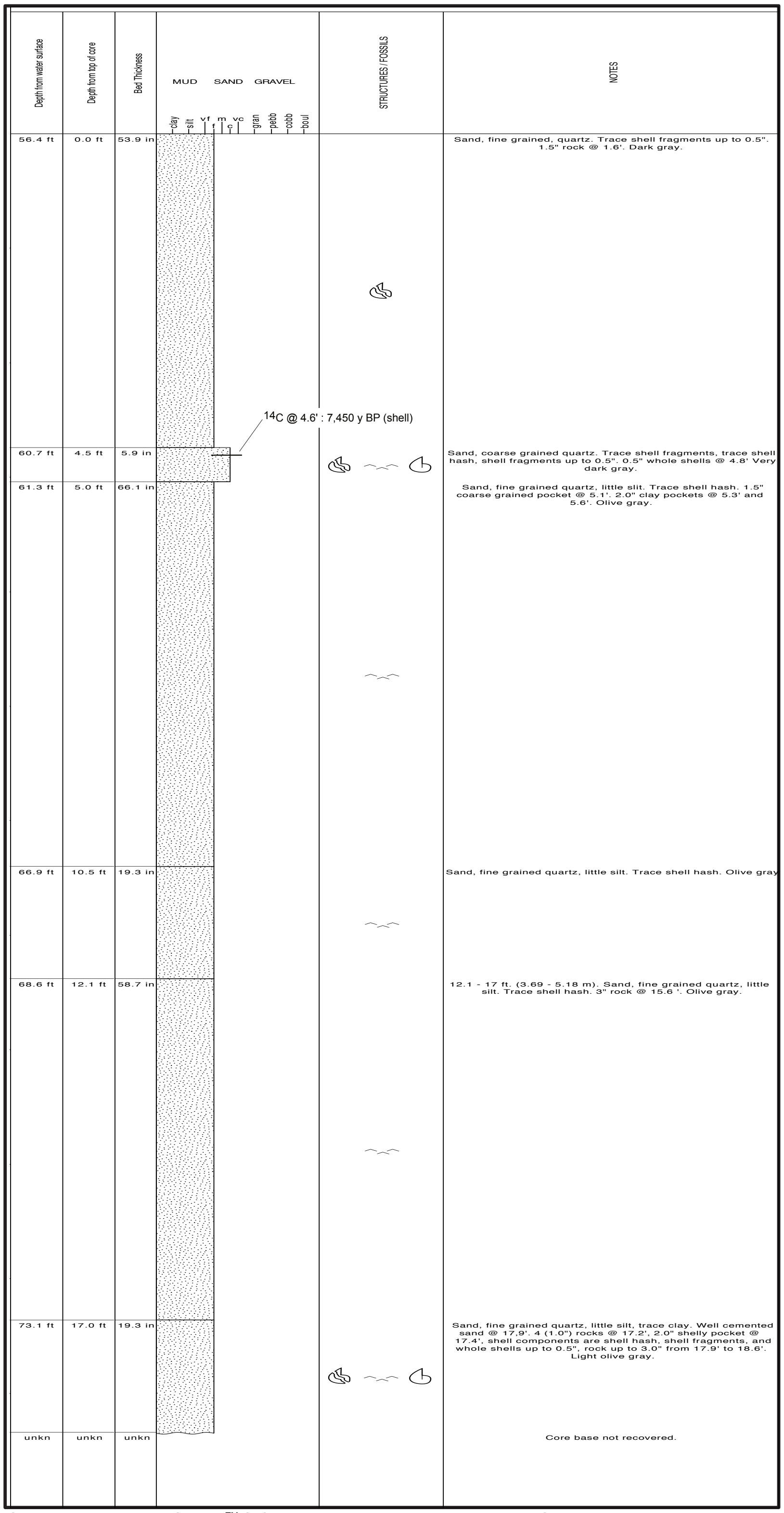
NC-BOEM-2015 VC13



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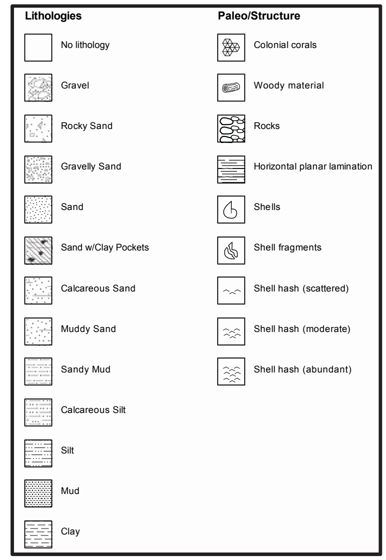

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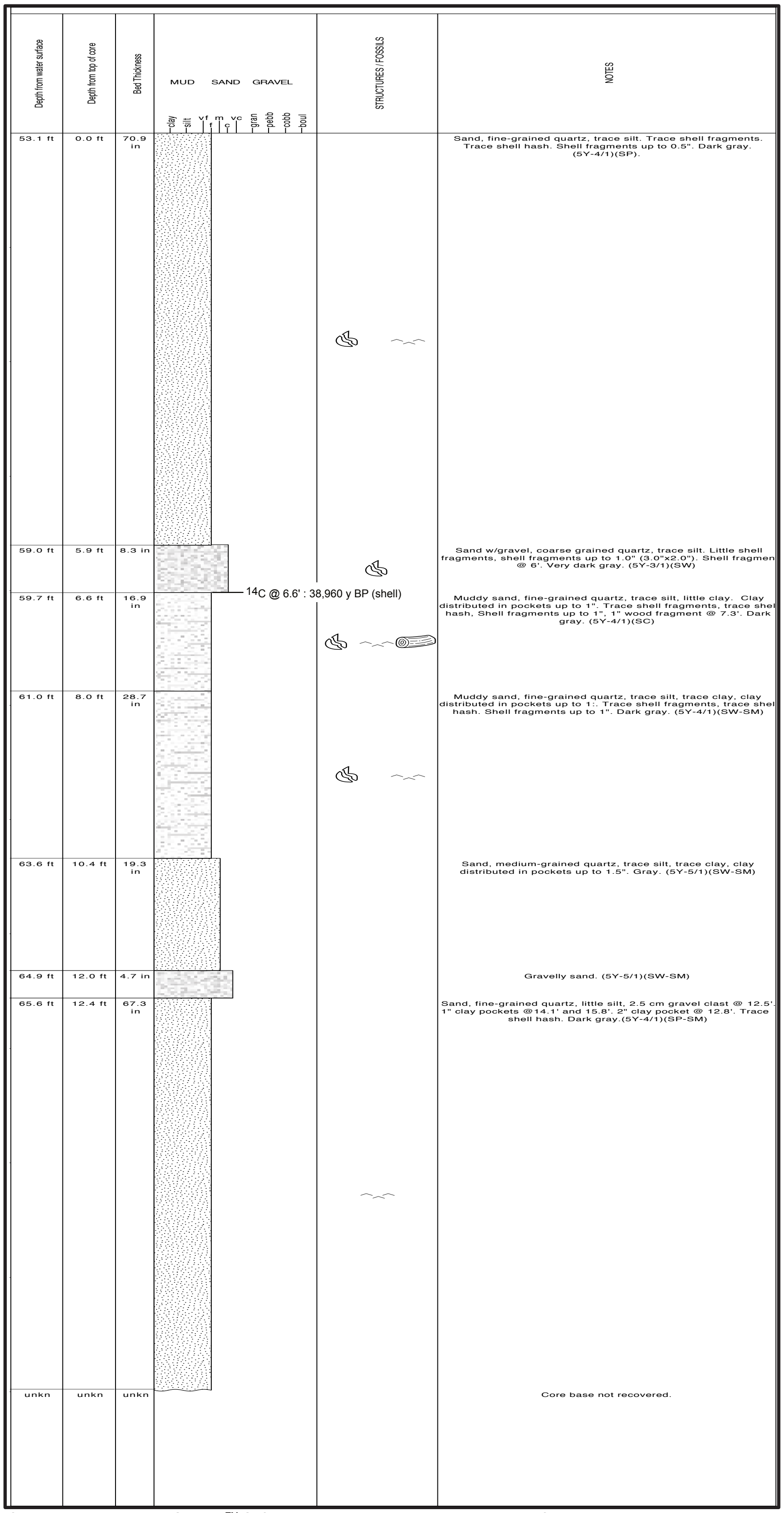
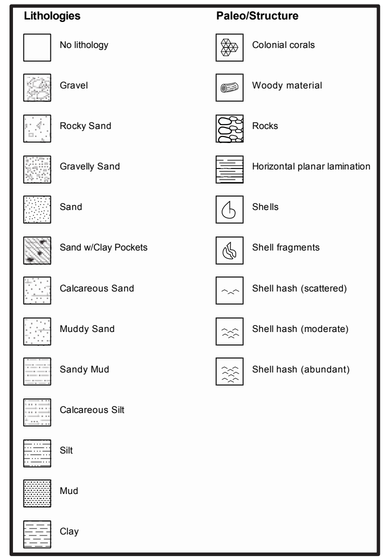
NC-BOEM-2015 VC15





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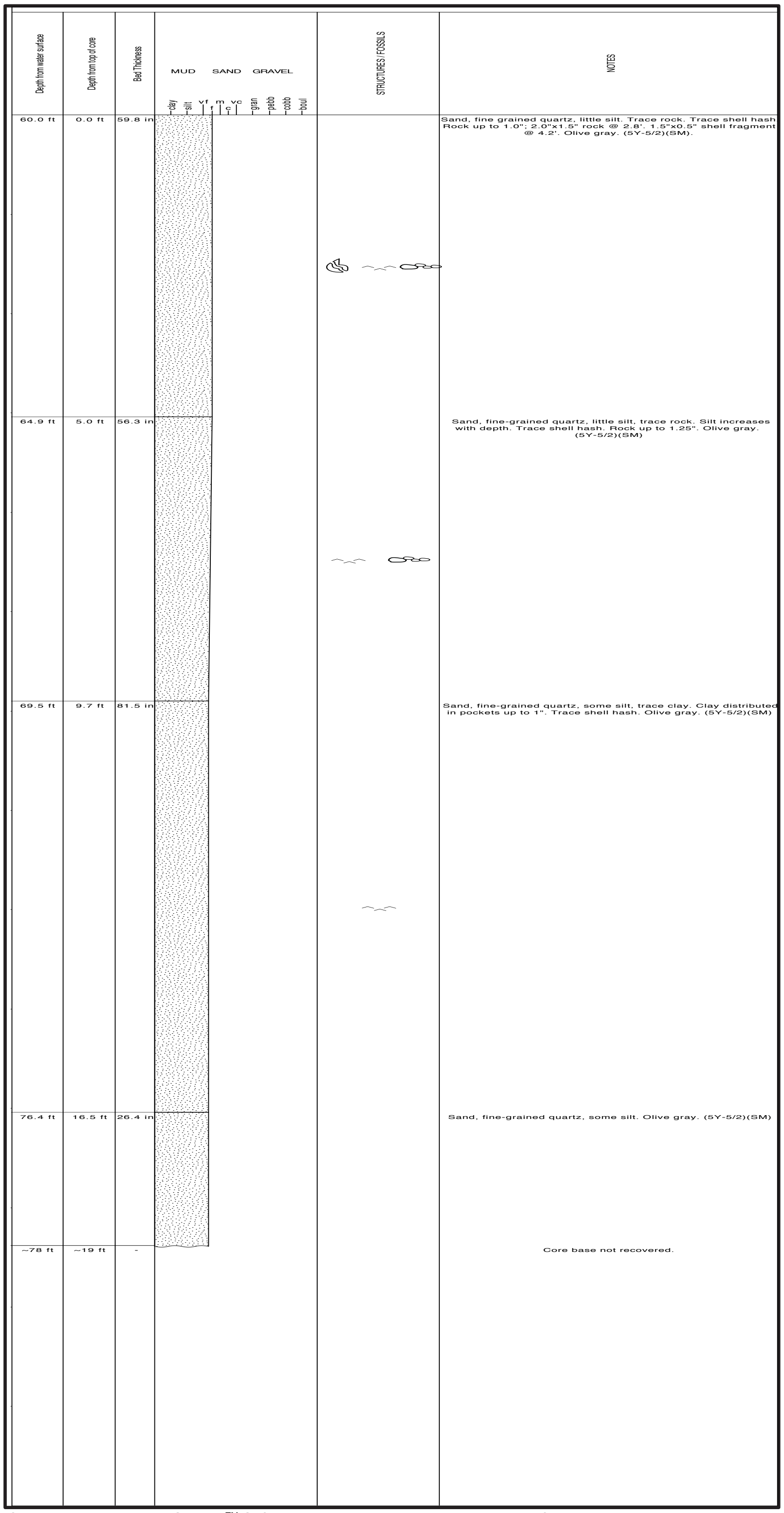
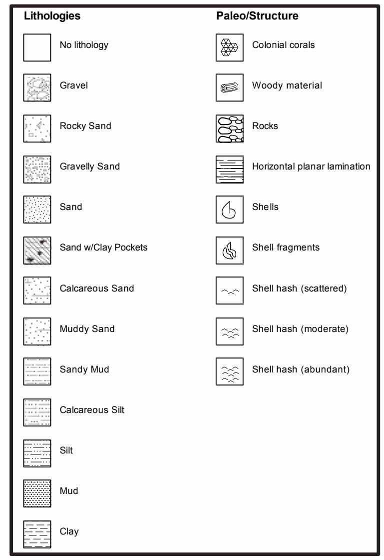
NC-BOEM-2015 VC16





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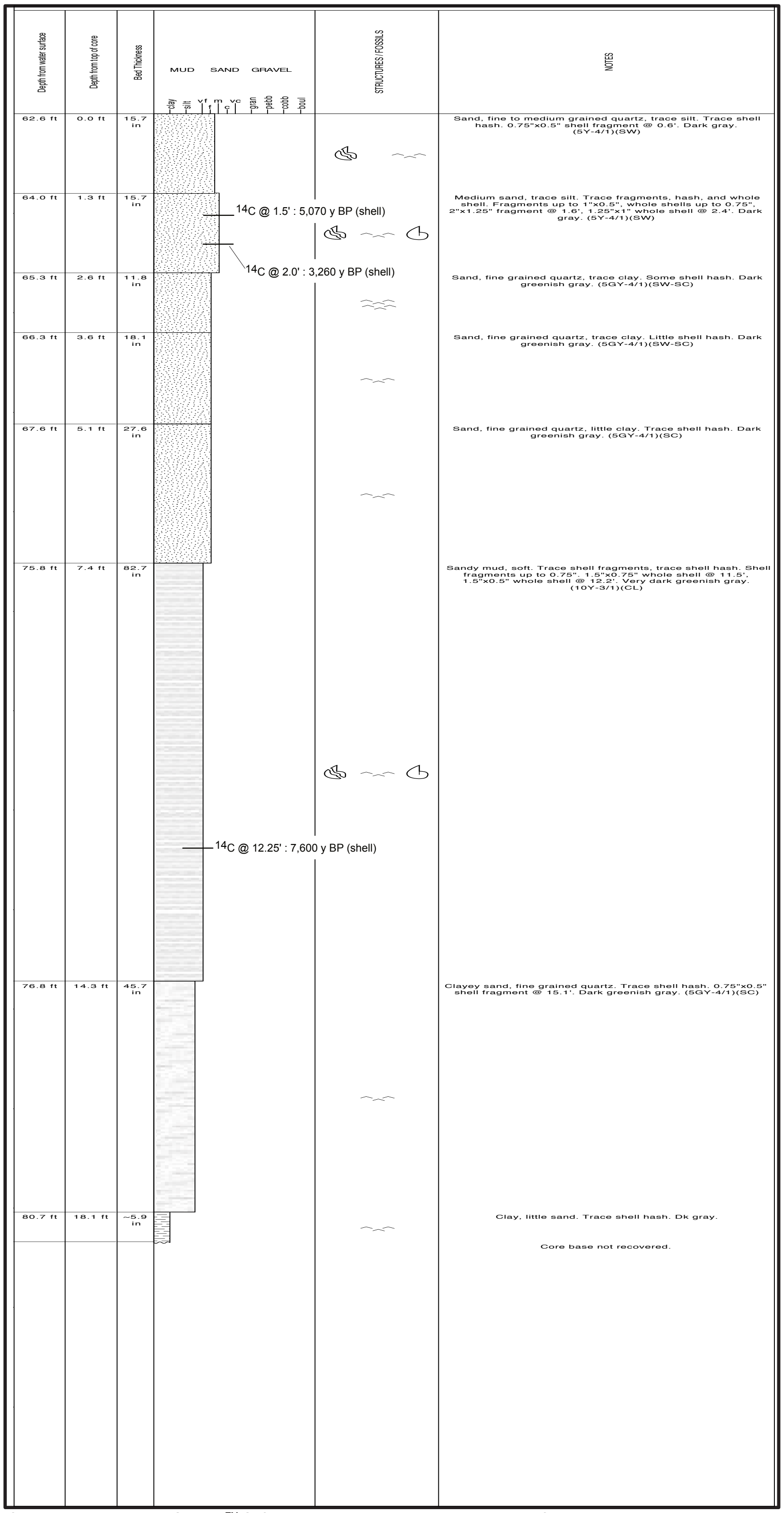

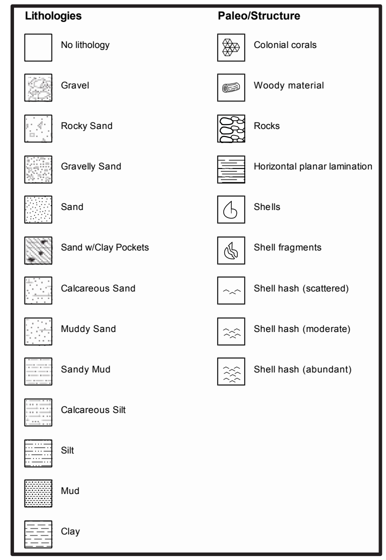

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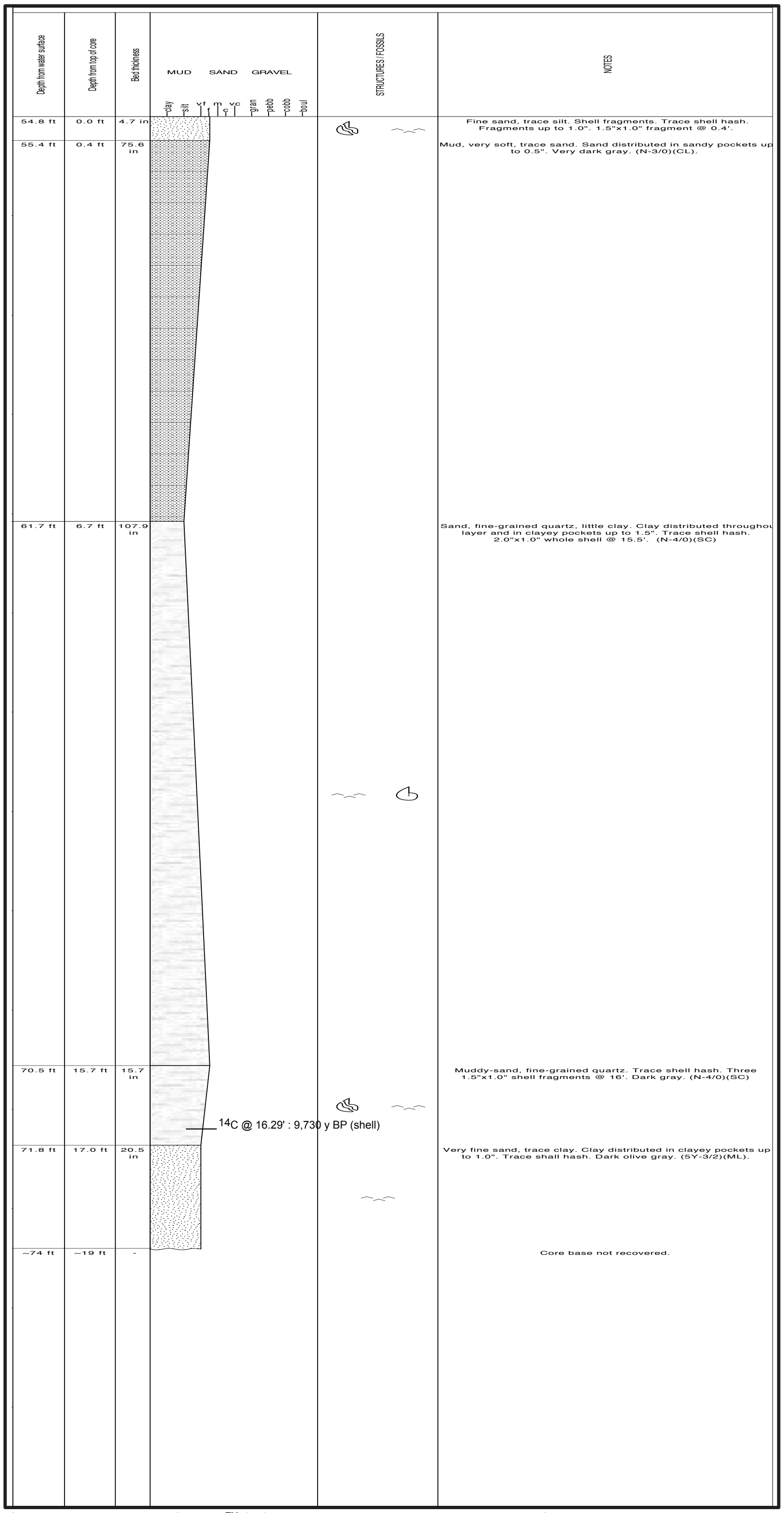
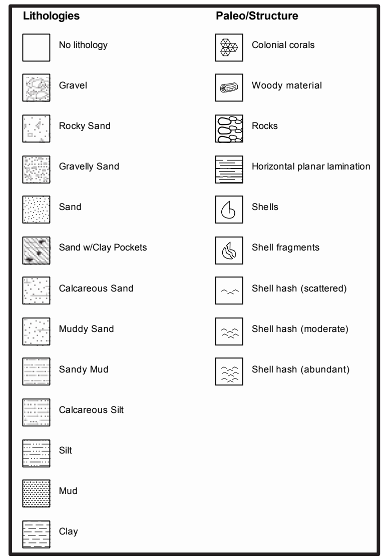
NC-BOEM-2015 VC17

NC-BOEM-2015 VC18





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Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

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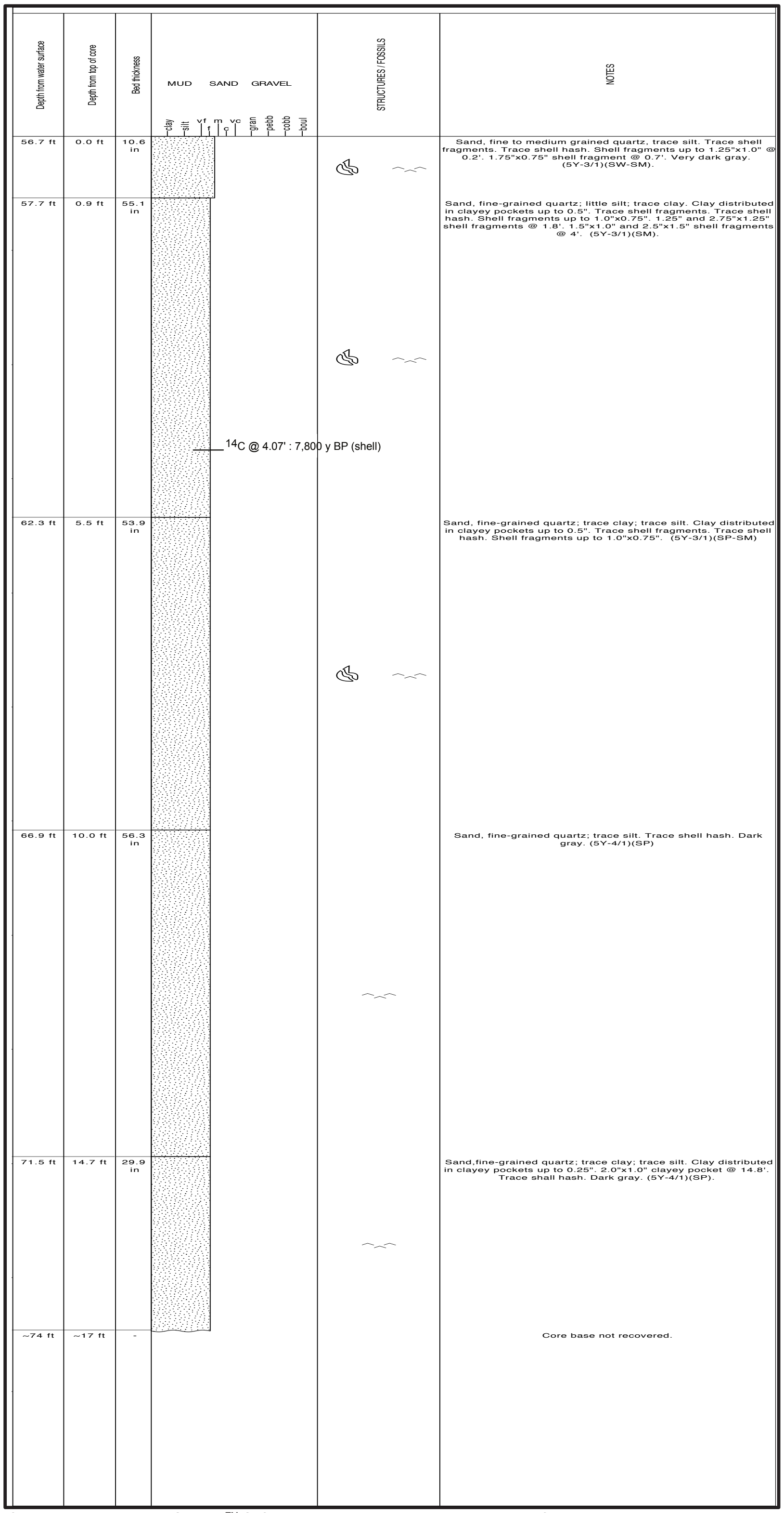

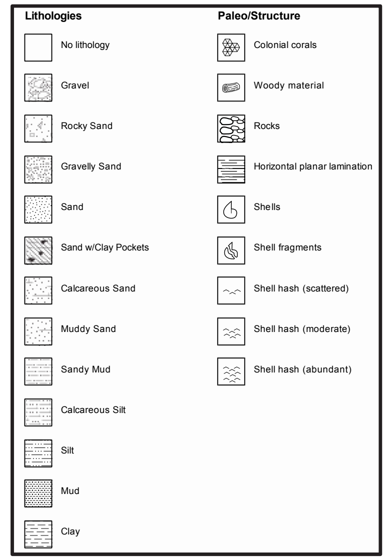

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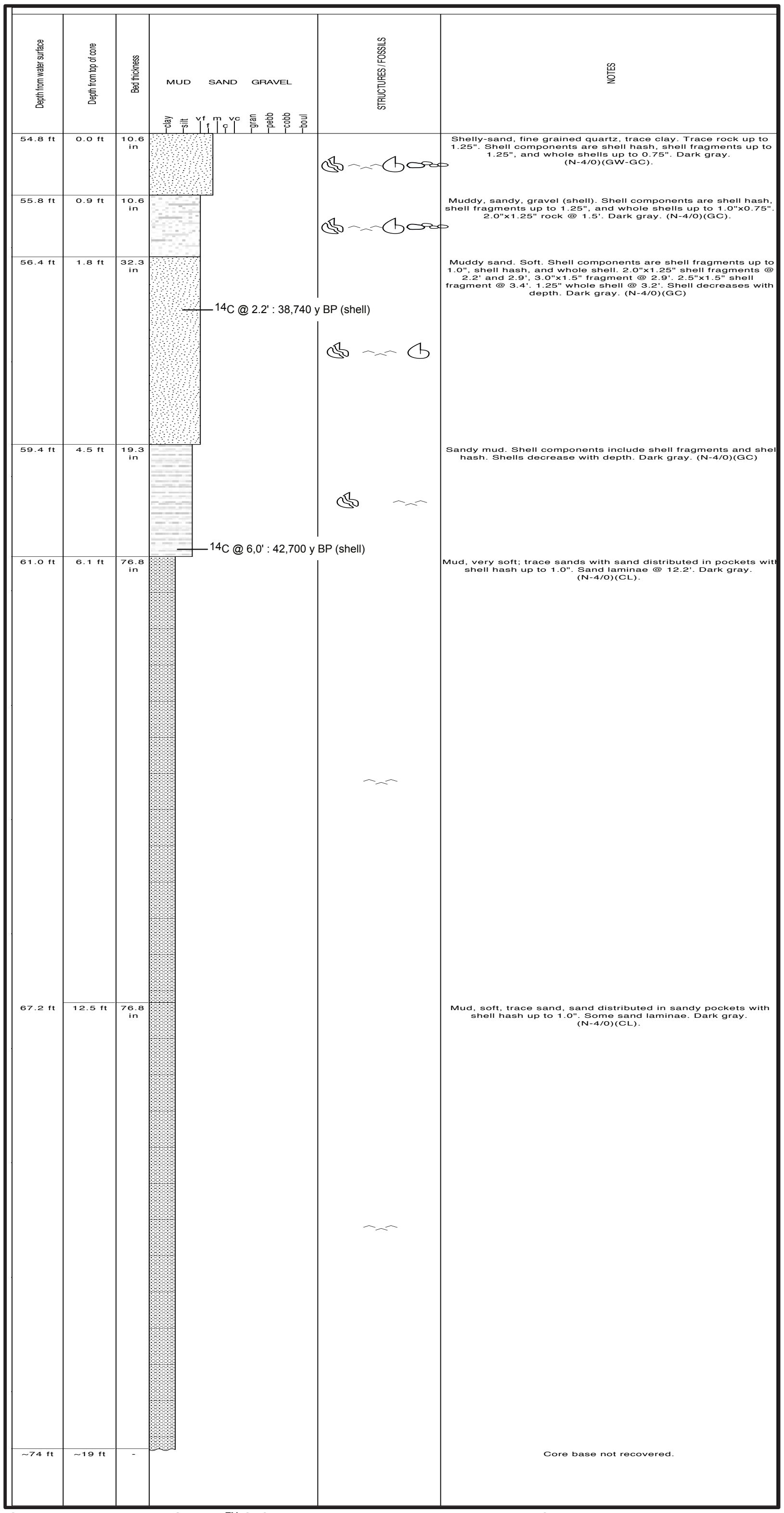
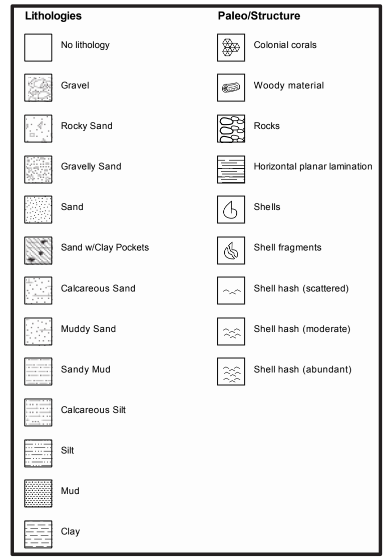
NC-BOEM-2015 VC23





Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

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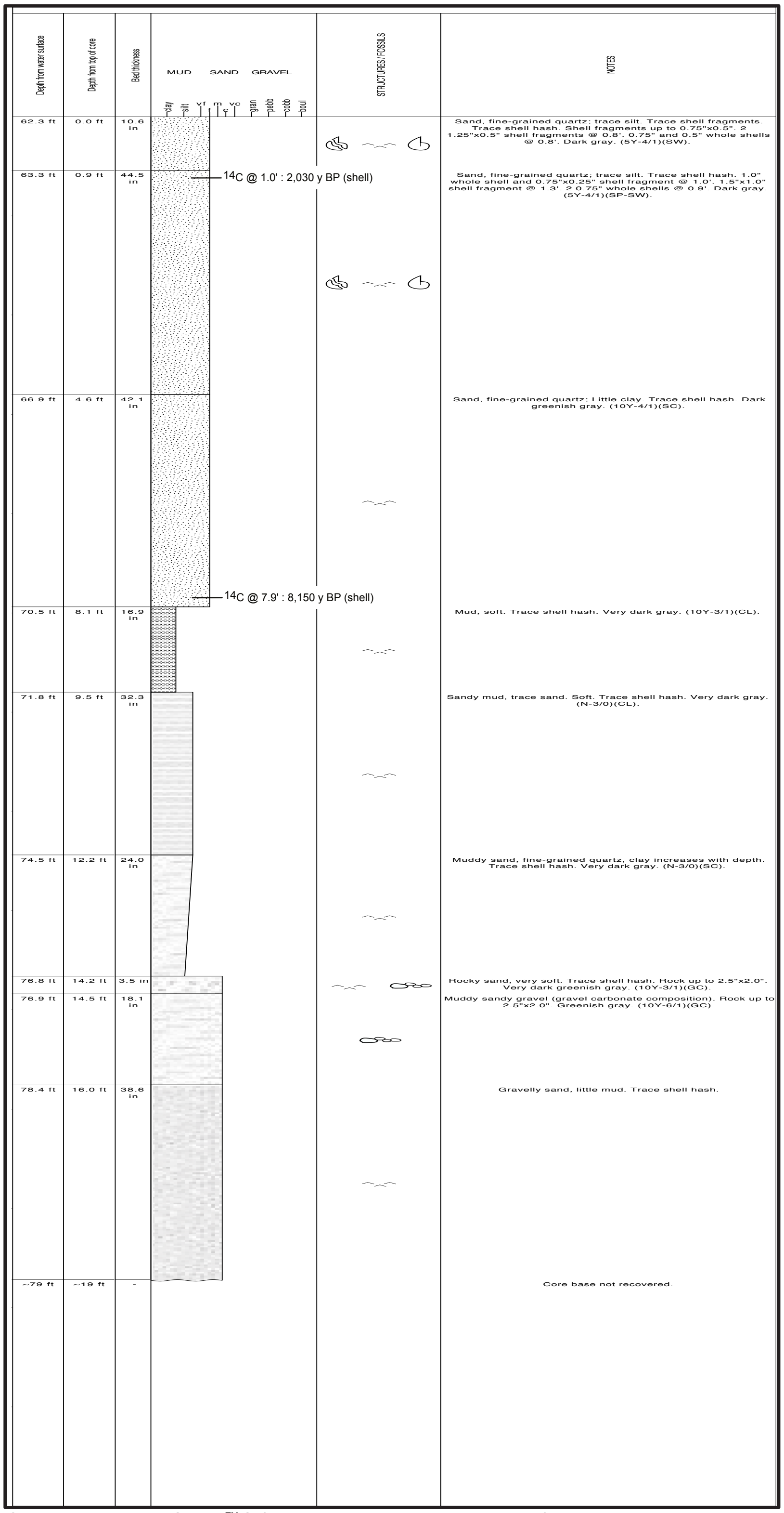
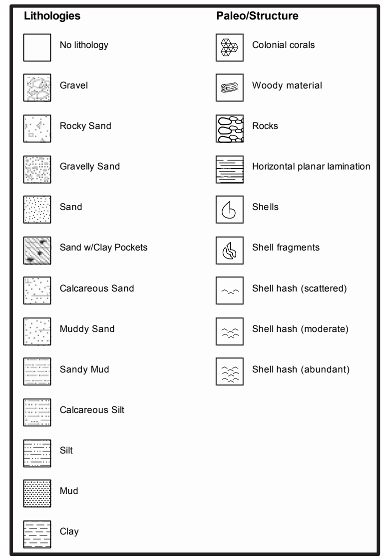
NC-BOEM-2015 VC24





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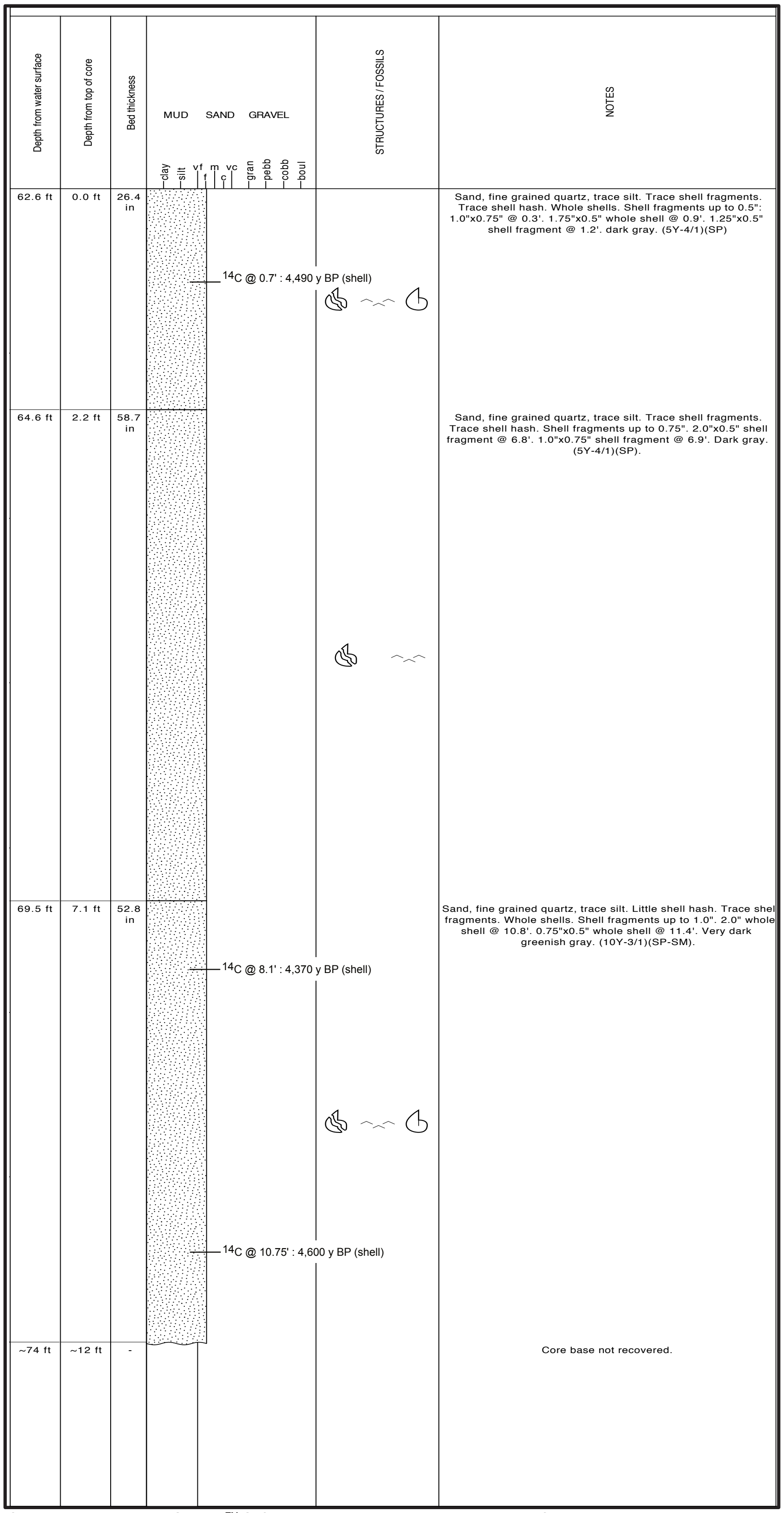
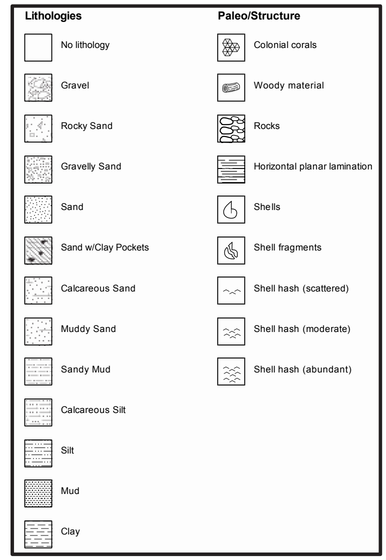
Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

NC-BOEM-2015 VC25





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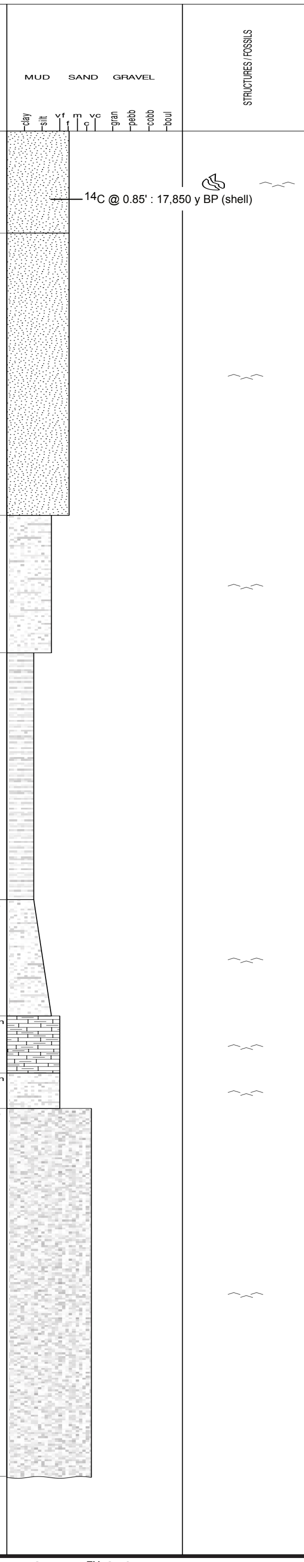
NC-BOEM-2015 VC25

Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

NC-BOEM-2015 VC27

Depth from water surface	Depth from top of core	Bed thickness	NOTES
56.7 ft	0.0 ft	16.9 in	Sand, fine grained quartz, trace silt. Trace shell fragments. Trace shell hash. Shell fragments up to 1.25"x0.5". 3.0"x2.0" shell fragment pocket. Shell fragments up to 2.5"x1.0". Dark gray. (5Y-4/1)(SW)
58.1 ft	1.4 ft	46.9 in	Sand, fine grained quartz, trace silt. Trace shell hash. Very dark gray. (5Y-3/1)(SP-SM).
62.0 ft	5.3 ft	22.8 in	Muddy, silty sand, fine grained quartz, some clay Trace shell hash. Dark gray. (N-4/0)(SC).
64.0 ft	7.2 ft	40.9 in	Sandy mud, very soft. Very dark gray. (N-3/0)(CL)
67.2 ft	10.6 ft	19.3 in	Muddy sand, graded: decreasing mud moving top to bottom. Trace shell hash. Dark gray to dark greenish gray.
68.9 ft	12.2 ft	9.4 in	Muddy sandy carbonate gravel. Trace shell hash. Rock up to 2.0"x1.0"; 2.0"x1.0" rock @ 12'. 3.0"x2.0" rock @ 12.4'. Dark greenish gray. (5GY-4/1)(CL)(GC)
69.5 ft	13.0 ft	5.9 in	Muddy sand, trace rock. Trace shell hash. Rock up to 0.25". Dark greenish gray. (5GY-4/1)(CL)
70.2 ft	13.5 ft	61.0 in	Indurated gravelly sands. Trace shell hash. Rock up to 3.0". 2.75"x2.0" rock @ 13.7'. Greenish to dark greenish gray. (10Y-5/1)(10Y-6/1)(GW-GC)
~75 ft	~19 ft	-	Core base not recovered.



Lithologies

- No lithology
- Gravel
- Rocky Sand
- Gravelly Sand
- Sand
- Sand w/Clay Pockets
- Calcareous Sand
- Muddy Sand
- Sandy Mud
- Calcareous Silt
- Silt
- Mud
- Clay

Paleo/Structure

- Colonial corals
- Woody material
- Rocks
- Horizontal planar lamination
- Shells
- Shell fragments
- Shell hash (scattered)
- Shell hash (moderate)
- Shell hash (abundant)

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NC-BOEM-2015 VC27

Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

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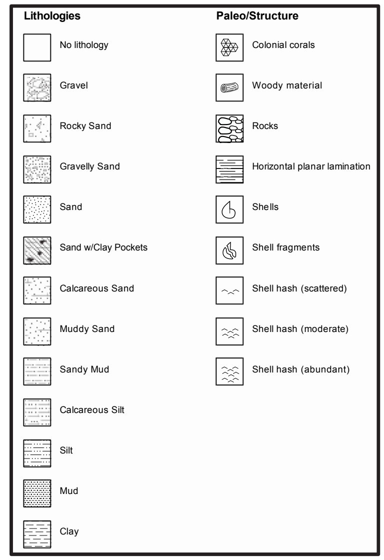
Depth from water surface	Depth from top of core	Bed thickness	NOTES
59.4 ft	0.0 ft	3.5 in	Calcic gravel/rock, little sand. Rock up to 2.0"x1.5". Shell fragments to 1.0". Trace whole shells to 0,75". Gray brown.
59.7 ft	3.0 ft	4.7 in	Sandy rock, little clay. Rock up to 5.0"x3.0". Shell fragments up to 0.75". Dark greenish gray. (10Y-4/1)(GC).
60.0 ft	0.7 ft	111.4 in	Mud, soft, with trace sand. Sand distributed in pockets with she hash up to 0.5". Very dark greenish gray. (10Y-3/1)(CL)
69.2 ft	10.0 ft	11.8 in	Muddy sand, very soft. Dark greenish gray. (5GY-4/1)(CL)
70.2 ft	11.0 ft	18.1 in	Muddy sand. Trace shell hash. Dark greenish gray. (5GY-4/1)(SC).
71.8 ft	12.5 ft	5.9 in	Medium sand, little mud. Trace rock. Rock up to 0.25". Little shell hash. Gray. (5Y-5/1)(SC)
72.5 ft	13.0 ft	15.7 in	Sandy (calcic) gravel, rocky. Rock up to 2.0"x1.5". Trace silt. Little shell hash. Gray. (5Y-6/1)(GW)
73.8 ft	14.3 ft	10.6 in	Gravelly sand, gravel--calcic composition. Rock up to 2.0"x1.0" Little shell hash. Gray. (5Y-6/1)(GW)
74.5 ft	15.2 ft	27.6 in	Gravelly sand. Gravel calcic composition. Little silt. Little rock; rock up to 1.25". 2.0"x1.5" rock @ 15.3'. Little shell hash. Light gray. (5Y-7/1)(GM).
76.8 ft	17.5 ft	14.6 in	Sand with small calcic gravel. Trace silt. Trace rock. Rock up to 1.0". 3.0"x2.0" rock @ 18.2'. Trace shell hash. Gray. (5Y-6/1)(SW-SM).
			Core base not recovered.

MUD SAND GRAVEL: clay, silt, vf, f, m, c, vc, gran, pebb, cobb, boul

STRUCTURES / FOSSILS



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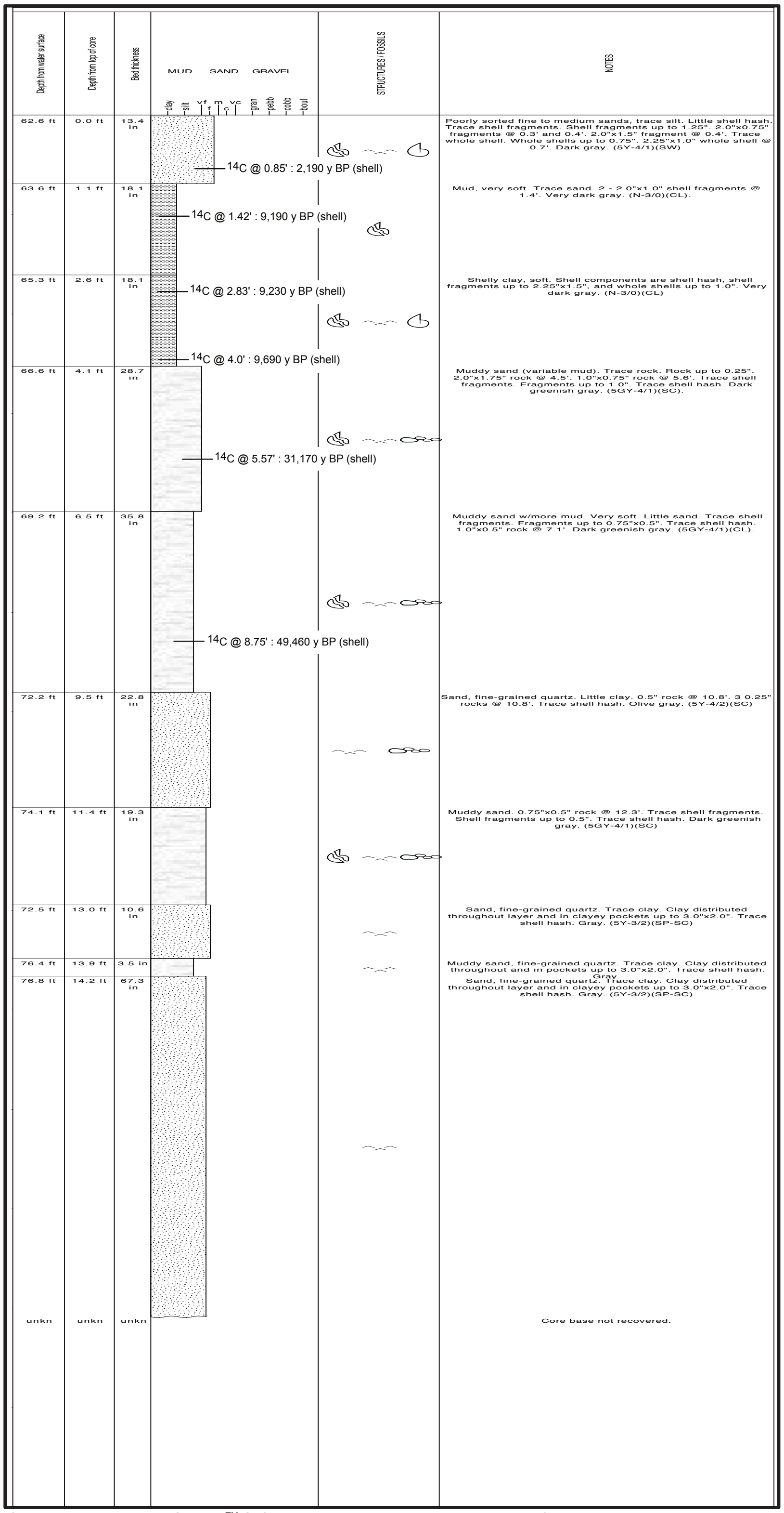
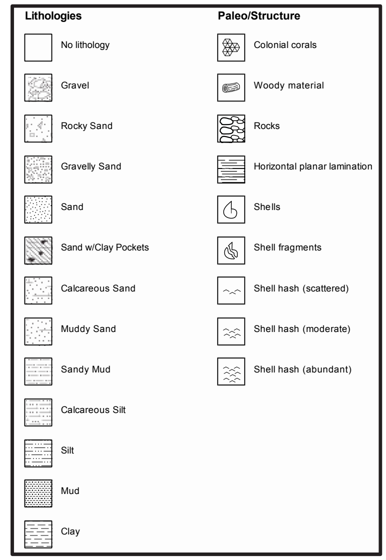
Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

NC-BOEM-2015 VC31





Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

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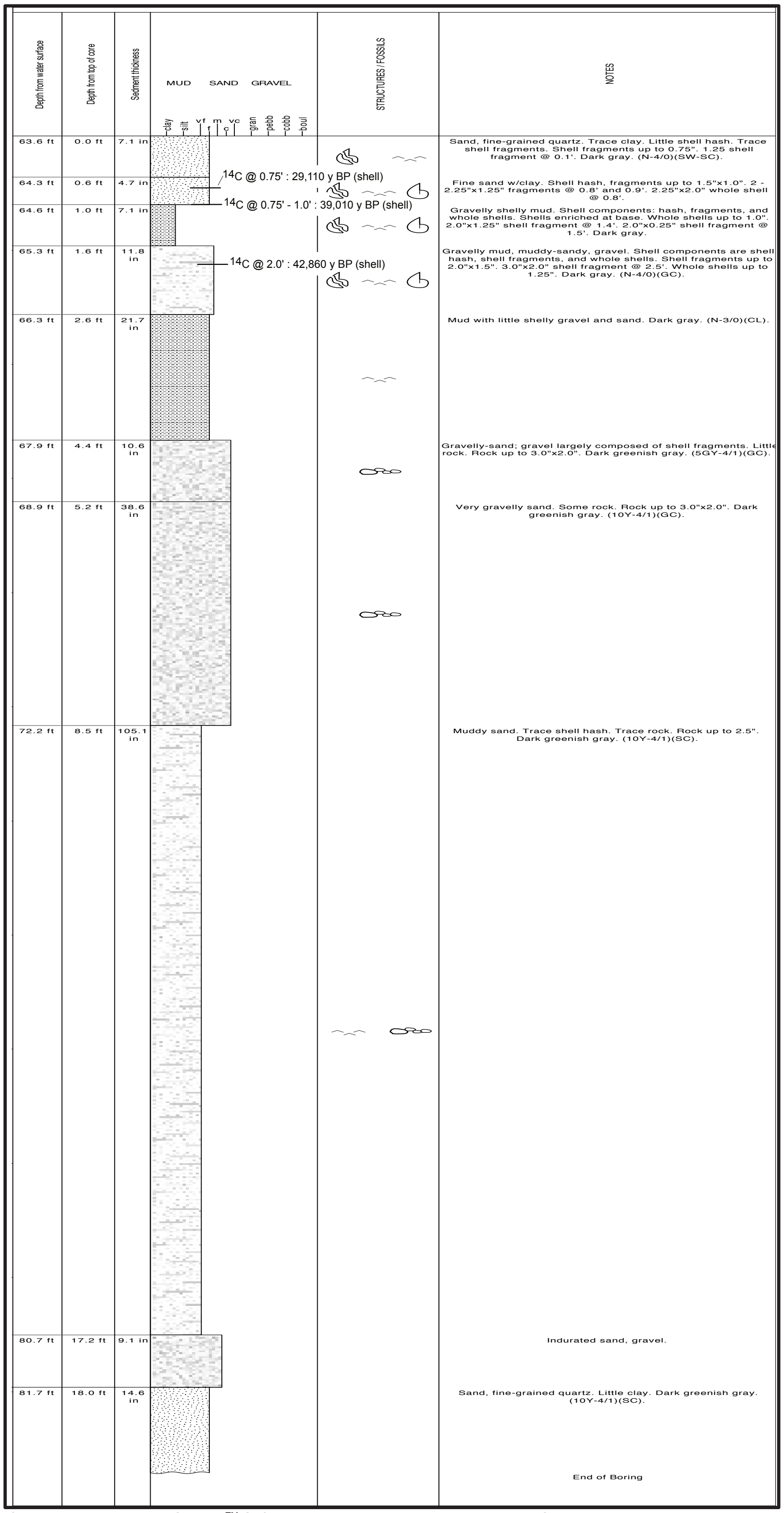
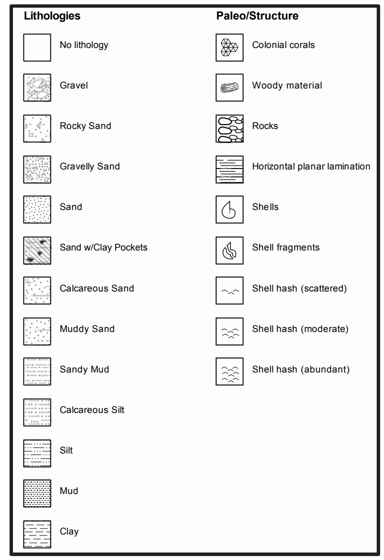


Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

NC-BOEM-2015 VC32



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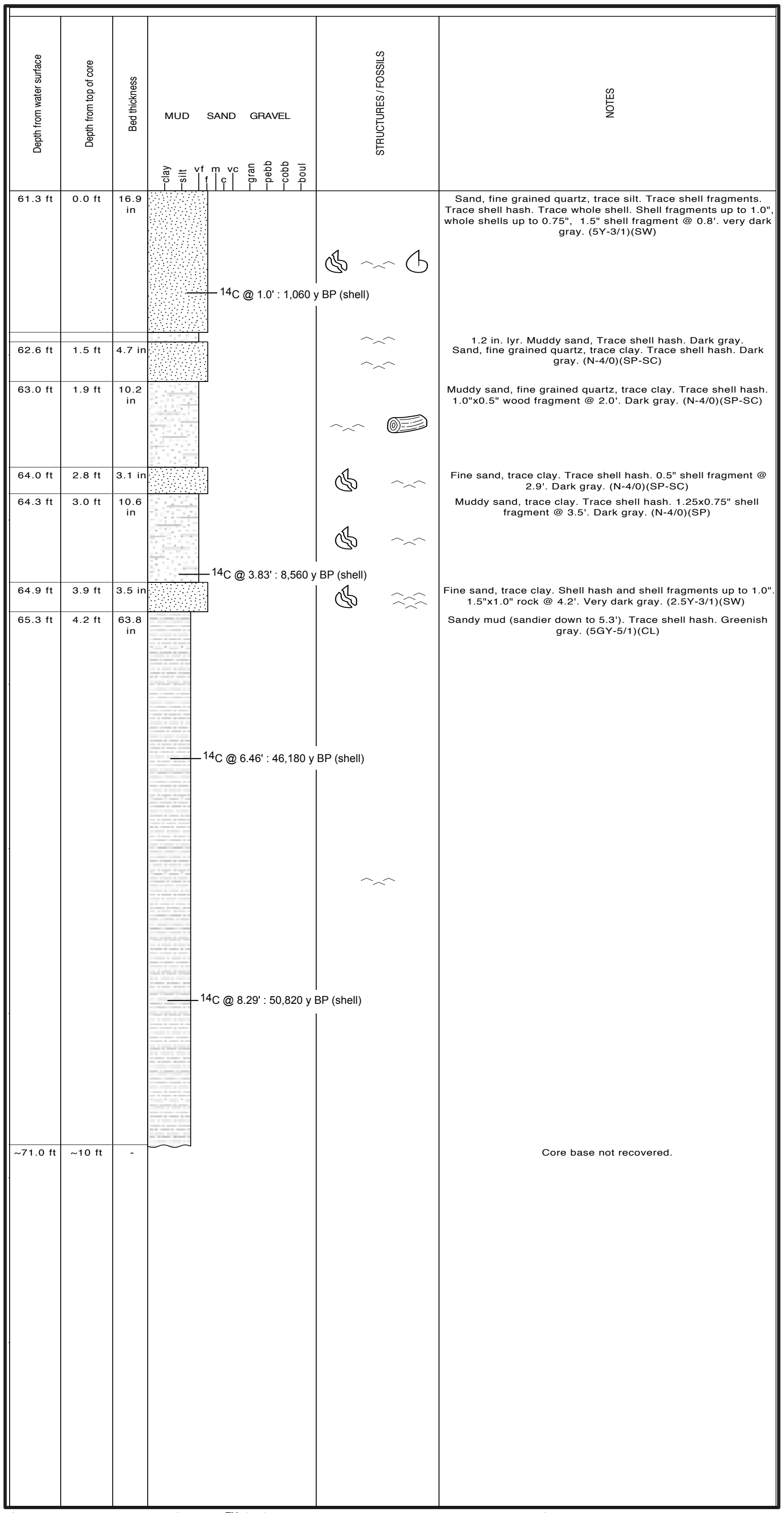
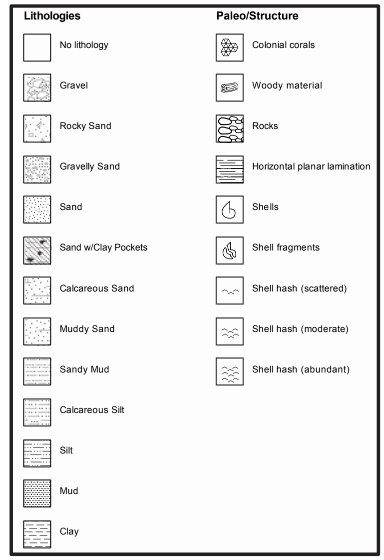
NC-BOEM-2015 VC33





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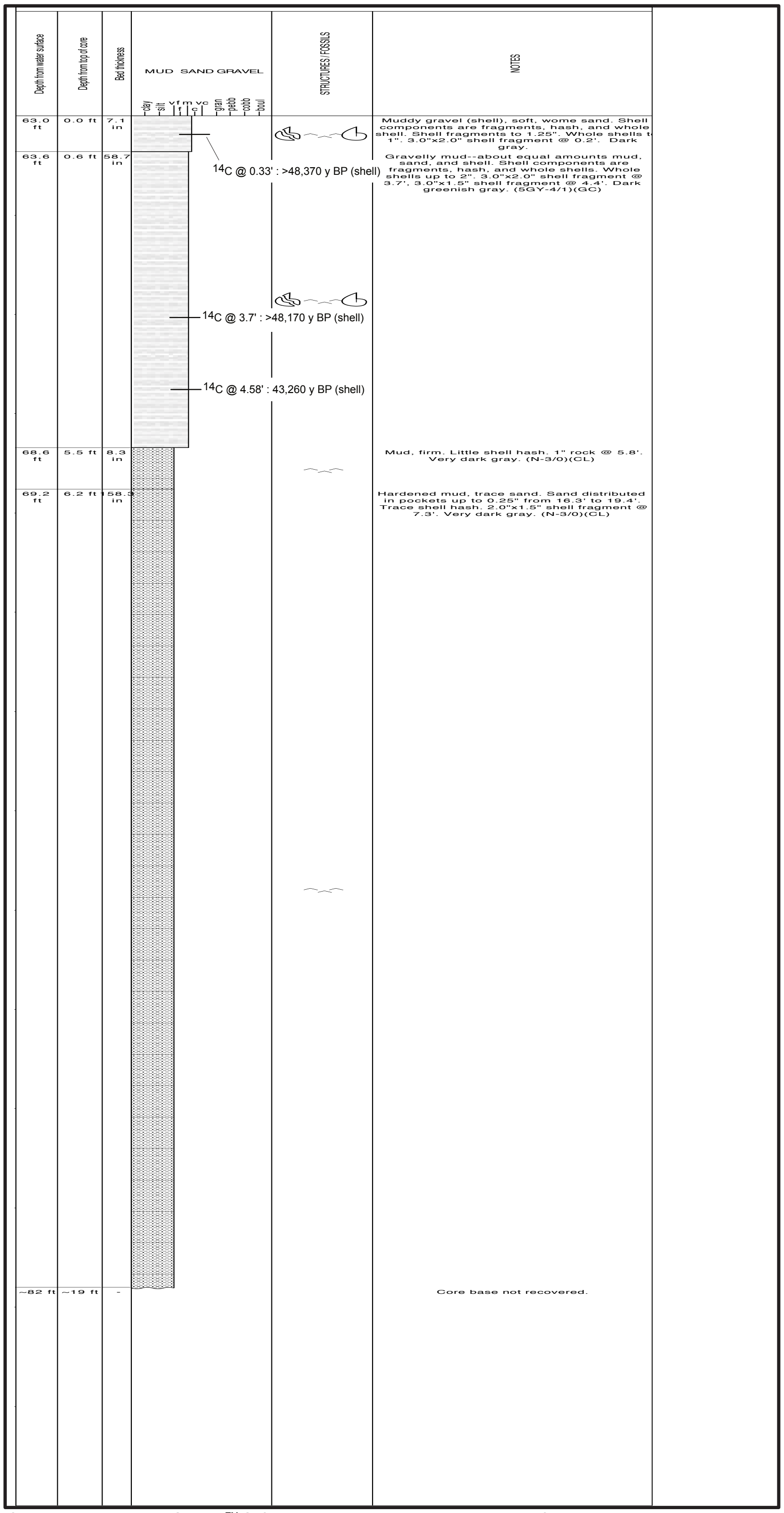
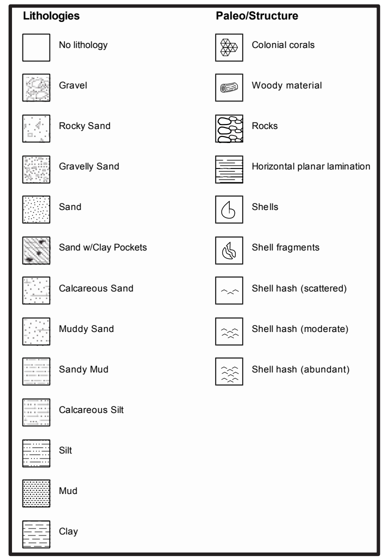
NC-BOEM-2015 VC34





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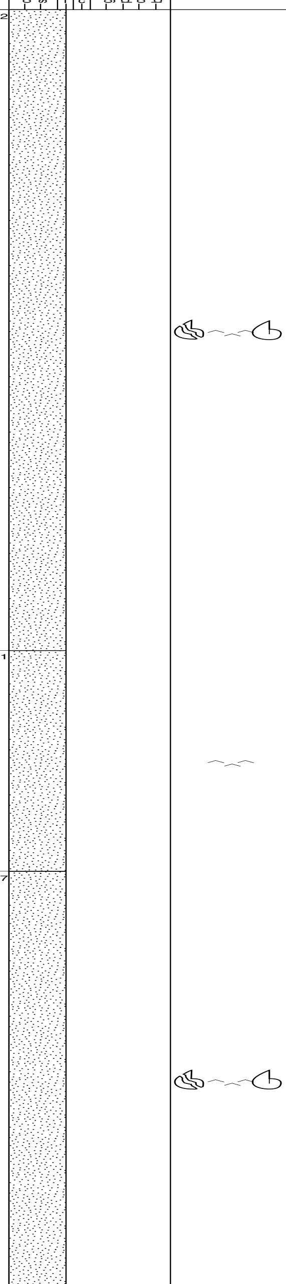
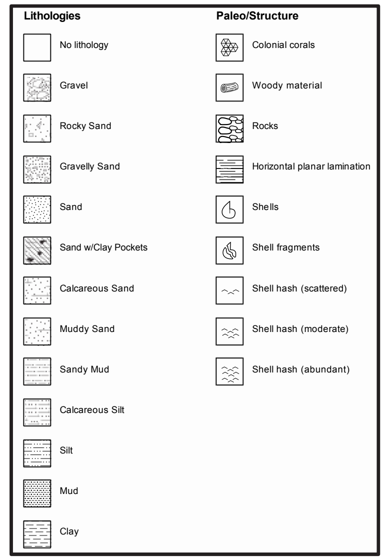
NC-BOEM-2015 VC34

Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

NC-BOEM-2015 VC37

Depth from water surface	Depth from top of core	Bed thickness	MUD SAND GRAVEL (clay, silt, vf, f, m, c, vc, gran, pebb, cobb, boul)	STRUCTURES / FOSSILS	NOTES
61.3 ft	0.0 ft	90.2 in			Sand, fine-grained quartz. Trace silt. Trace shell hash. Trace shell fragments. Trace whole shells. Fragments and whole shells up to 0.5". 0.75"x0.5" whole shell @ 0.5'. Dark gray. (5Y-4/1)(SP).
68.9 ft	7.5 ft	31.1 in			Sand, fine-grained quartz. Trace silt. Trace shell hash. Very dark gray. (5GY-3/1)(SP)
71.5 ft	10.1 ft	58.7 in			Sand, fine-grain quartz. Trace silt. Trace shell hash. Trace shell fragments. Trace whole shell. Shell fragments and whole shells up to 0.5". Gray. (5Y-5/1)(SP).
					End of Boring





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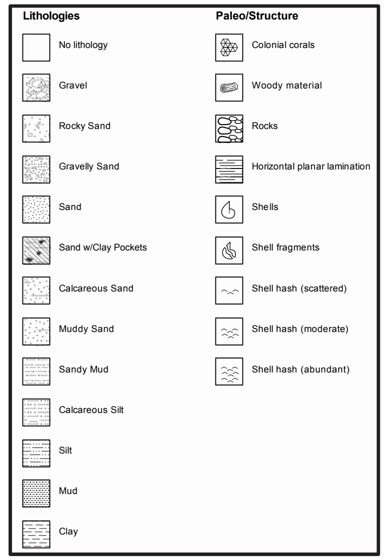
NC-BOEM-2015 VC37

Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.

NC-BOEM-2015 VC37A

Depth from water surface	Depth from top of core	Bed thickness	MUD SANDGRAVEL	STRUCTURES / FOSSILS	NOTES
61.0 ft	0.0 ft	146.5 in			Jetted to 12.2 ft. No sample.
73.1 ft	12.2 ft	28.7 in	^{14}C @ 12.4' : 30,440 y BP (shell)		Sand, fine-grained quartz. Trace silt. Trace shell hash. Trace shell fragments. Trace whole shells. Shell fragments and whole shell up to 0.5". Gray. (5Y-5/1)(SP).
75.4 ft	14.6 ft	4.7 in			Sand, fine-grained quartz. Trace silt. Trace shell hash, fragments, and whole shells. Fragments up to 0.5". Whole shells to 0.25". Gray.
75.8 ft	15.0 ft	11.8 in			Sand, fin-grained quartz. Trace silt. Trace shell hash and fragments. Shell fragments up to 0.5". Gray. (5Y-5/1)(SP).
76.8 ft	16.0 ft	4.7 in			Muddy sand. Trace shell hash and fragments. Fragments to 0.5". 2.0" soft clay pocket at 16.'. Silt decreases with depth. Dark gray.
77.4 ft	16.4 ft	10.2 in			Trace muddy sand, fine-grained quartz. Trace shell hash. Trace shell fragments. Shell fragments up to 0.5". Silt decreases with depth. Dark gray. (5Y-4/1)(SM).
78.1 ft	17.2 ft	5.5 in			Sand, fine-grained quartz. Trace silt. Trace shell hash and fragments. Fragments up to 0.5". 1" shell fragment @ 17.6' Silt decreases with depth. Dark gray. (5Y-4/1)(SM).
~79 ft	~18 ft	~11 in			Sand, fine-grained quartz. Little silt. Olive gray. (5Y-4/1)(SP-SM).
unkn	unkn	unkn			Core base not recovered.

Core logs created using SedLog™ Software (r3.1). Royal Halloway University of London. 2019.



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Appendix 2:
Core Sediment Sample Grain-size Analyses Data

This appendix contains analysis results for sediment analyses performed on the 24 Vibracores collected as a part of this component of the North Carolina Outer Continental Shelf sand resource study. Sediment samples were collected from the cores typically at 1 foot intervals beginning at the top of the core and analyzed each as an individual sample. Four tables and one graphic are included for each of the 24 cores. The tables include:

- Sediment fraction weights from mechanical sieving of the dried coarse ($> 65\mu m$ portion of the sample
- Sediment fraction weights from wet sieve and settling tube as total silt ($4\phi - 8\phi$), total clay ($< 8\phi$), and total fines (silt + clay fraction).
- Sediment weights and weight percentages by size class (gravel, sand, silt, clay).
- Sediment grain-size descriptive statistics (25^{th} and 75^{th} quartiles, mean (ϕ), median (ϕ), standard deviation (SD, ϕ), skewness (unit-less), and kurtosis (unit-less). Note that statistics use computational approach of Folk, 1980 and were only computed for those samples where mechanical sieve partitioning was carried out.

The included figure graphic consists of four panel subplots. From left to right these include:

- a 2-D histogram (results are shown only for samples mechanically sieved)
- a plot showing the first and second statistical moments of the mechanically sieved samples in the core
- a plot of percent sand in the sample
- a plot of cumulative weight percentage by size class (gravel, sand, silt, clay).

Vibracore: VC01 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.06	0.96	1.42	2.06	2.58	3.57	2.70	3.10	3.21	3.99	2.27	0.78	0.43
1	9.69	2.32	1.15	1.52	2.08	2.69	2.63	2.58	2.65	5.00	4.16	0.66	0.08
2	8.93	1.94	1.16	1.01	0.96	0.99	0.78	1.23	2.17	3.44	1.47	0.54	0.24
3	0.00	1.08	1.75	2.52	2.70	2.97	2.56	3.44	3.46	3.37	1.50	1.02	0.56
4	2.71	2.65	2.68	3.91	3.24	3.00	2.65	2.96	3.67	3.30	0.60	0.32	0.12
5	0.46	4.41	3.63	5.79	5.33	3.56	2.39	2.53	3.12	2.96	0.63	0.38	0.27
6	0.59	4.43	4.17	4.52	3.61	3.08	1.70	1.80	2.22	2.05	0.50	0.19	0.01
7	1.61	4.82	3.10	2.78	2.91	3.38	3.22	4.61	4.69	3.47	0.78	0.33	0.30
8	0.69	1.71	1.46	1.63	1.64	2.26	2.28	2.91	4.64	5.32	1.96	0.53	0.08
9	0.30	3.22	2.46	2.29	1.86	2.03	1.51	2.33	4.27	5.37	1.86	0.71	0.04
10	1.84	5.51	3.49	3.79	3.46	3.40	2.77	2.38	1.93	1.48	0.50	0.33	0.30
11	5.94	6.96	3.40	2.69	2.33	2.41	1.74	2.15	1.83	1.60	0.62	0.41	0.28

Vibracore: VC01 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

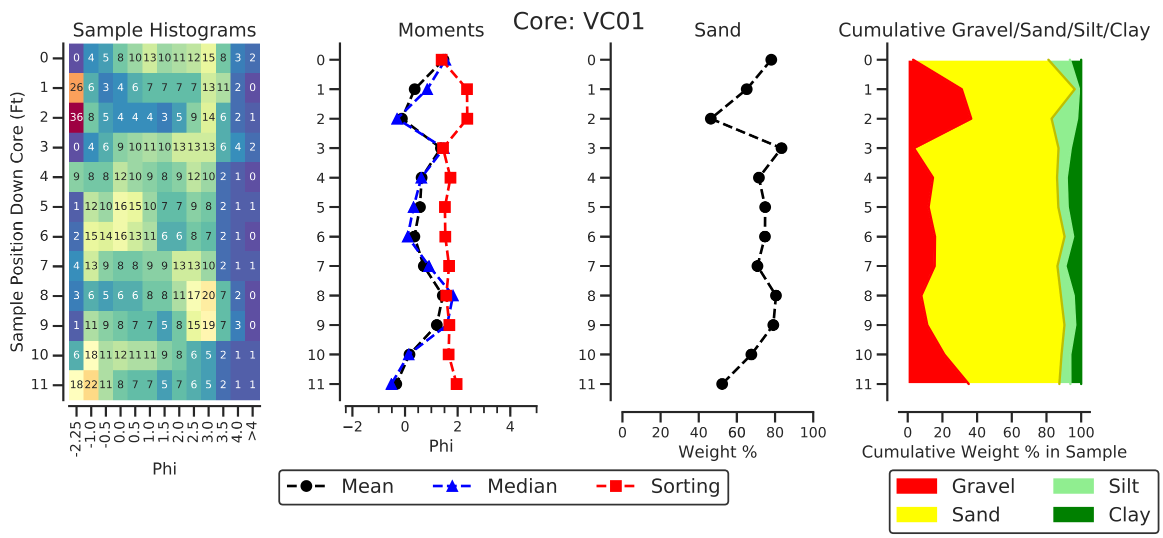
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	300	1.0211	1.0614	1.5069	1.3042
1	500	1.0743	1.0529	1.2283	1.1717
2	600	1.0358	1.0729	1.2965	1.1963
3	500	1.0285	1.0534	1.2645	1.2262
4	500	1.0253	1.0240	1.3251	1.2469
5	500	1.0270	1.0822	1.3297	1.3081
6	500	1.0933	1.0633	1.3150	1.2222
7	600	1.0342	1.0871	1.3130	1.3123
8	500	1.0757	1.0627	1.3155	1.2156
9	400	1.0500	1.0691	1.2985	1.2224
10	600	1.0548	1.0558	1.2762	1.2287
11	700	1.0646	1.0524	1.2884	1.2175

Vibracore: VC01 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	1.02	25.68	6.2170	2.1420	4.0750	32.9170	3.098703	78.014400	12.379621	6.507276
1	12.01	25.12	1.4300	0.4700	0.9600	38.5600	31.146266	65.145228	2.489627	1.218880
2	10.87	13.75	5.0610	0.7020	4.3590	29.6810	36.622755	46.325932	14.686163	2.365149
3	1.08	25.29	3.9600	1.8200	2.1400	30.3300	3.560831	83.382789	7.055720	6.000659
4	5.36	26.33	5.1150	3.0725	2.0425	36.8050	14.563239	71.539193	5.549518	8.348051
5	4.87	30.32	5.3375	3.1475	2.1900	40.5275	12.016532	74.813398	5.403738	7.766332
6	5.02	23.84	3.0525	1.4725	1.5800	31.9125	15.730513	74.704269	4.951038	4.614179
7	6.43	29.27	5.6640	3.7560	1.9080	41.3640	15.544918	70.762015	4.612707	9.080360
8	2.40	24.63	3.5750	1.3225	2.2525	30.6050	7.841856	80.477046	7.359909	4.321189
9	3.52	24.69	3.0100	1.0660	1.9440	31.2200	11.274824	79.083921	6.226778	3.414478
10	7.35	23.53	3.9420	2.1870	1.7550	34.8220	21.107346	67.572224	5.039917	6.280512
11	12.90	19.18	4.6130	2.2785	2.3345	36.6930	35.156569	52.271550	6.362249	6.209631

Vibracore: VC01 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.442	1.535	2.586	1.463	1.392	-0.093	0.832
1.0	-2.290	0.843	2.560	0.367	2.356	-0.236	0.543
2.0	-2.554	-0.302	2.379	-0.119	2.366	0.114	0.536
3.0	0.256	1.478	2.459	1.363	1.444	-0.086	0.844
4.0	-0.516	0.619	2.008	0.630	1.727	-0.084	0.906
5.0	-0.468	0.323	1.703	0.568	1.516	0.157	0.905
6.0	-0.737	0.100	1.368	0.355	1.530	0.183	0.940
7.0	-0.585	0.911	2.061	0.714	1.675	-0.187	0.797
8.0	0.393	1.824	2.605	1.435	1.566	-0.390	0.940
9.0	-0.264	1.598	2.585	1.208	1.684	-0.326	0.739
10.0	-0.936	0.139	1.342	0.170	1.657	0.030	0.946
11.0	-1.864	-0.518	1.155	-0.333	1.960	0.147	0.798



Vibracore: VC03 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.47	0.69	0.48	0.45	0.37	0.45	0.43	0.67	1.65	3.23	1.86	0.28	0.02
1	0.51	0.60	0.54	0.56	0.67	0.85	1.00	1.55	3.73	12.18	9.50	1.43	0.10
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC03 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

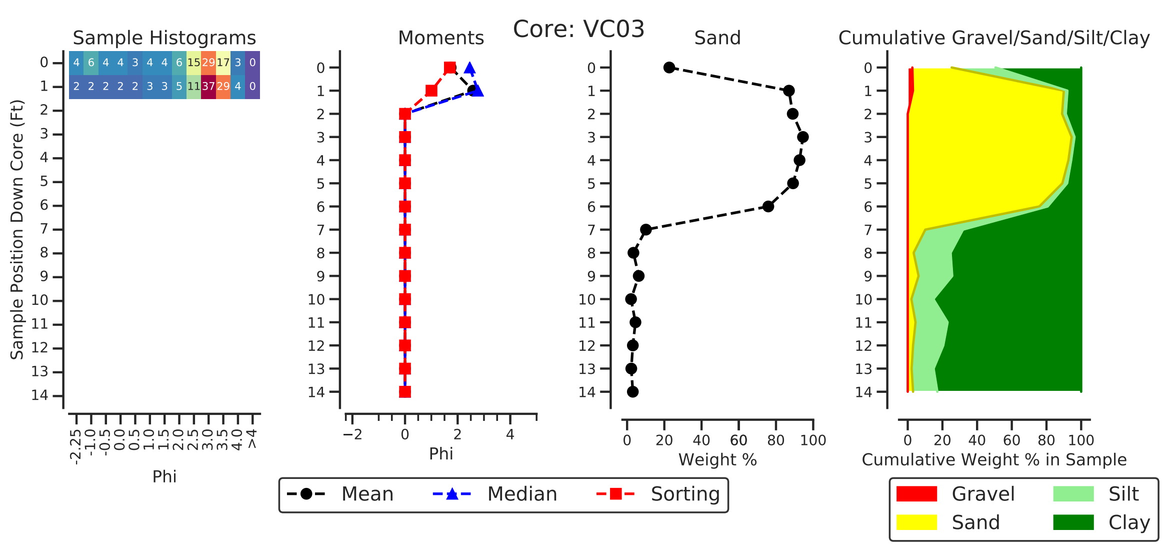
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	1700	2.0533	2.0594	2.5357	2.4125
1	500	1.0529	1.0874	1.2964	1.3040
2	500	1.0176	0.9628	1.2690	1.1849
3	500	1.0194	1.0228	1.1947	1.1751
4	500	1.0218	1.0135	1.2289	1.1974
5	500	1.0178	0.9946	1.2294	1.1779
6	700	1.0396	1.0079	1.3912	1.3094
7	1000	0.9755	0.9944	1.3933	1.3354
8	800	1.0116	0.9970	1.5166	1.4126
9	1000	0.9964	0.9917	1.3847	1.3203
10	900	1.0224	1.0038	1.5548	1.4803
11	1020	1.0219	1.0256	1.3346	1.2971
12	1000	1.0102	1.0247	1.3618	1.3311
13	800	1.0169	0.9894	1.3999	1.3357
14	1000	0.9995	1.0216	1.3389	1.3264

Vibracore: VC03 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	1.16	9.87	32.5240	21.5135	11.0105	43.5540	2.66336	22.661524	25.280112	49.395004
1	1.11	32.01	3.6875	2.9150	0.7725	36.8075	3.01569	86.965972	2.098757	7.919582
2	0.00	30.61	3.7850	3.0525	0.7325	34.3950	0.00000	88.995494	2.129670	8.874836
3	0.00	32.32	1.8825	1.3075	0.5750	34.2025	0.00000	94.496016	1.681164	3.822820
4	0.00	33.81	2.6775	2.0975	0.5800	36.4875	0.00000	92.661871	1.589585	5.748544
5	0.00	22.95	2.7900	2.0825	0.7075	25.7400	0.00000	89.160839	2.748640	8.090521
6	0.00	27.70	8.8060	7.0525	1.7535	36.5060	0.00000	75.877938	4.803320	19.318742
7	0.00	1.79	15.8900	12.0500	3.8400	17.6800	0.00000	10.124434	21.719457	68.156109
8	0.00	0.57	16.2000	12.6240	3.5760	16.7700	0.00000	3.398927	21.323792	75.277281
9	0.00	0.96	14.4150	11.4300	2.9850	15.3750	0.00000	6.243902	19.414634	74.341463
10	0.00	0.42	19.4580	16.9425	2.5155	19.8780	0.00000	2.112889	12.654694	85.232418
11	0.00	0.51	10.8477	8.7465	2.1012	11.3577	0.00000	4.490346	18.500225	77.009430
12	0.00	0.40	12.5800	10.3200	2.2600	12.9800	0.00000	3.081664	17.411402	79.506934
13	0.00	0.26	11.3200	9.8520	1.4680	11.5800	0.00000	2.245250	12.677029	85.077720
14	0.00	0.38	11.9700	10.2400	1.7300	12.3500	0.00000	3.076923	14.008097	82.914980

Vibracore: VC03 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.836	2.459	2.907	1.735	1.704	-0.638	1.095
1.0	2.271	2.771	3.143	2.587	1.006	-0.490	1.872
2.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Vibracore: VC04 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.18	0.25	0.56	0.79	1.90	3.33	6.70	9.66	9.45	1.31	0.20	0.03
2	0.00	0.09	0.12	0.29	0.73	2.93	5.43	8.55	9.83	7.77	0.98	0.18	0.02
3	0.00	0.13	0.19	0.29	0.50	1.16	2.96	6.00	8.55	11.22	2.42	0.35	0.06
4	0.40	0.52	0.23	0.32	0.54	1.00	1.62	4.06	5.78	10.05	2.66	0.41	0.05
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.03	0.08	0.13	0.18	0.94	6.30	16.03	8.44	2.65	0.47	0.22	0.04
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	14.18	1.50	0.77	0.82	0.91	1.54	2.87	3.99	2.34	0.95	0.46	0.46	0.34

Vibracore: VC04 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

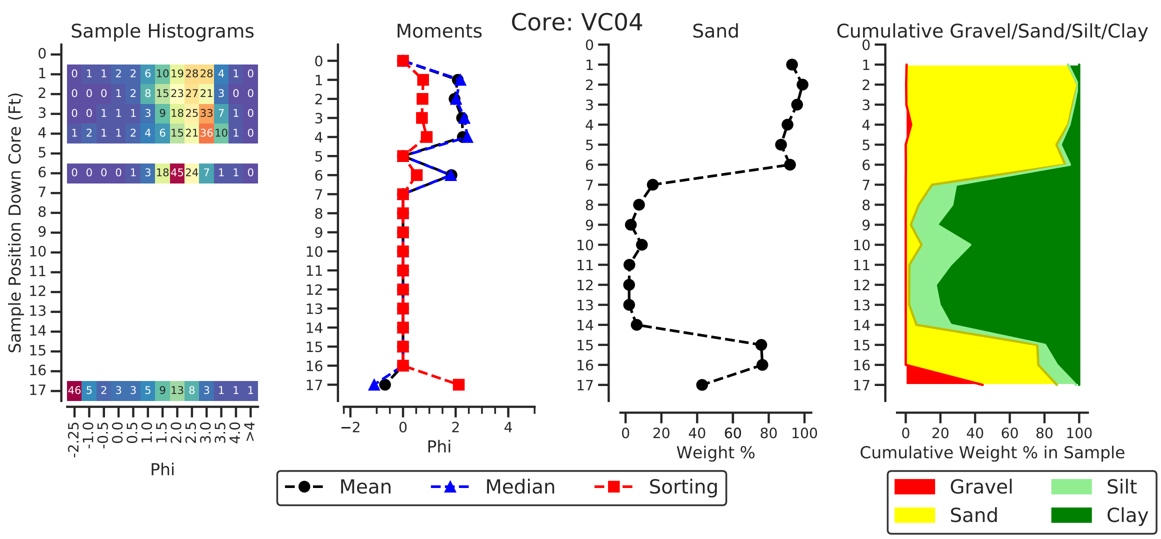
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	0.0	0.0000	0.0000	0.0000	0.0000
1	500.0	1.0430	1.0548	1.2369	1.2472
2	600.0	1.0734	1.0336	1.1833	1.1417
3	500.0	1.0252	1.0363	1.1756	1.1780
4	500.0	1.0464	1.0566	1.2195	1.2231
5	500.0	1.0169	1.0050	1.3212	1.2726
6	600.0	1.0428	1.0267	1.2446	1.1953
7	1000.0	1.0118	1.0180	1.3940	1.3545
8	800.0	1.0116	1.0149	1.5301	1.4462
9	1000.0	0.9939	0.9959	1.4177	1.3695
10	800.0	1.0200	1.0258	1.5387	1.4153
11	900.0	1.0346	1.0041	1.5939	1.4524
12	700.0	1.0232	1.0446	1.7339	1.6604
13	1000.0	1.0041	1.0324	1.5074	1.4636
14	1000.0	1.0044	0.9577	1.5273	1.3919
15	900.0	1.0050	0.9982	1.2744	1.2365
16	500.0	1.0621	1.0015	1.5088	1.2904
17	600.0	1.0660	1.0510	1.3059	1.1719

Vibracore: VC04 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	0.00	0.00	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
1	0.18	34.15	2.3775	2.3100	0.0675	36.7075	0.490363	93.032759	0.183886	6.292992
2	0.09	36.81	0.3170	0.2430	0.0740	37.2170	0.241825	98.906414	0.198834	0.652927
3	0.13	33.64	1.3200	1.0425	0.2775	35.0900	0.370476	95.867769	0.790824	2.970932
4	0.92	26.67	1.8775	1.6625	0.2150	29.4675	3.122084	90.506490	0.729617	5.641809
5	0.00	33.81	5.1075	4.1900	0.9175	38.9175	0.000000	86.876084	2.357551	10.766365
6	0.03	35.44	3.0940	2.0580	1.0360	38.5640	0.077793	91.899181	2.686443	5.336583
7	0.00	2.53	14.1100	11.8250	2.2850	16.6400	0.000000	15.204327	13.731971	71.063702
8	0.00	1.36	16.7400	13.2520	3.4880	18.1000	0.000000	7.513812	19.270718	73.215470
9	0.00	0.49	16.1900	13.6800	2.5100	16.6800	0.000000	2.937650	15.047962	82.014388
10	0.00	1.68	16.7480	11.5800	5.1680	18.4280	0.000000	9.116562	28.044280	62.839158
11	0.00	0.45	20.6685	15.6735	4.9950	21.1185	0.000000	2.130833	23.652248	74.216919
12	0.00	0.43	21.3745	18.0530	3.3215	21.8045	0.000000	1.972070	15.233094	82.794836
13	0.00	0.41	20.1650	16.5600	3.6050	20.5750	0.000000	1.992710	17.521264	80.486027
14	0.00	1.40	21.1450	16.7100	4.4350	22.5450	0.000000	6.209803	19.671768	74.118430
15	0.00	23.93	7.6230	6.2235	1.3995	31.5530	0.000000	75.840649	4.435394	19.723957
16	0.00	28.15	8.6675	4.7225	3.9450	36.8175	0.000000	76.458206	10.715013	12.826781
17	15.68	15.11	4.5370	0.6270	3.9100	35.3270	44.385314	42.771818	11.068022	1.774846

Vibracore: VC04 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.0	1.618	2.180	2.627	2.081	0.763	-0.277	1.028
2.0	1.467	2.016	2.486	1.958	0.740	-0.157	0.946
3.0	1.769	2.332	2.749	2.244	0.719	-0.233	1.039
4.0	1.781	2.444	2.811	2.272	0.900	-0.418	1.379
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	1.538	1.815	2.174	1.841	0.523	0.096	1.141
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	-2.701	-1.096	1.595	-0.683	2.118	0.286	0.571


Core: VC04
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC06 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	1.09	1.71	0.55	0.39	0.43	0.78	1.27	2.88	6.73	13.79	6.27	0.89	0.03
1	0.24	1.55	0.88	0.72	0.52	0.62	1.09	3.10	7.94	15.28	3.64	0.62	0.06
2	0.94	2.08	0.91	1.03	0.82	1.12	1.57	2.23	5.05	14.33	4.70	0.94	0.12
3	4.49	2.29	1.66	2.80	4.20	3.99	3.47	4.66	3.39	4.11	1.38	0.46	0.05
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC06 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

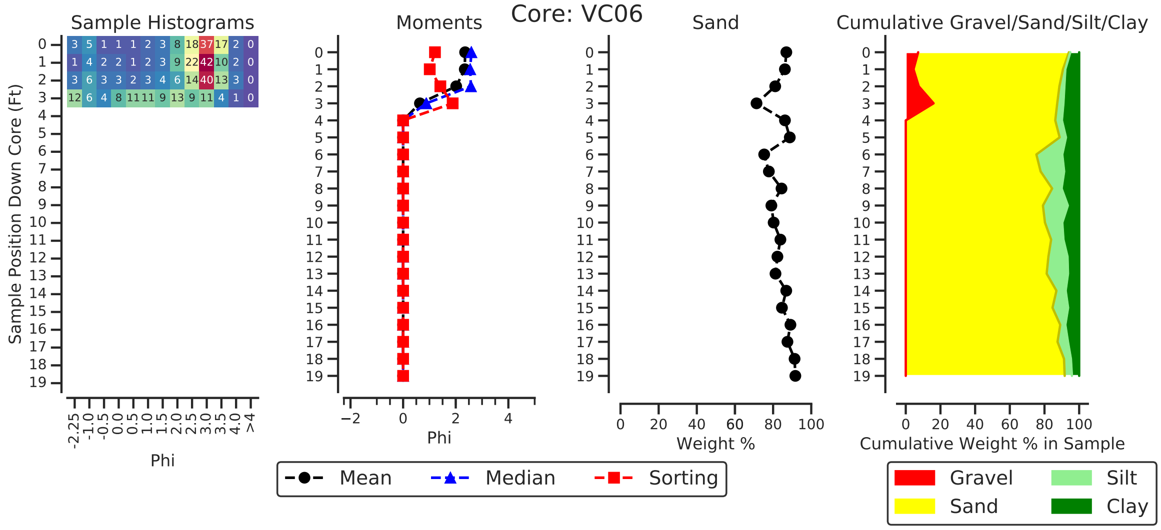
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0023	0.9977	1.1934	1.1776
1	500	0.9987	1.0182	1.2454	1.2457
2	500	0.9950	0.9948	1.2741	1.2325
3	500	1.0068	1.0005	1.3185	1.2541
4	500	0.9903	1.0009	1.2933	1.2475
5	500	1.0100	1.0150	1.2810	1.2305
6	500	1.0179	1.0191	1.4688	1.2576
7	500	1.0066	1.0177	1.4277	1.2429
8	500	1.0021	1.0227	1.3229	1.2663
9	700	1.0028	0.9997	1.3004	1.1615
10	500	1.0068	0.9968	1.3636	1.2235
11	500	1.0150	1.0162	1.3406	1.2429
12	500	1.0205	1.0098	1.3560	1.1989
13	500	1.0071	1.0374	1.3587	1.2239
14	500	1.0131	0.9978	1.2873	1.2013
15	500	1.0123	1.0424	1.3365	1.2356
16	600	1.0086	1.0223	1.2291	1.2104
17	480	1.0291	1.0003	1.3006	1.1891
18	500	1.0194	0.9878	1.2511	1.1596
19	500	1.0446	0.9928	1.2674	1.1543

Vibracore: VC06 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	2.80	33.98	2.3075	1.9975	0.3100	39.0875	7.163415	86.933163	0.793092	5.110329
1	1.79	34.41	3.7275	3.1875	0.5400	39.9275	4.483126	86.181203	1.352451	7.983220
2	3.02	32.70	4.5975	3.4425	1.1550	40.3175	7.490544	81.106219	2.864761	8.538476
3	6.78	30.12	5.3425	3.8400	1.5025	42.2425	16.050186	71.302598	3.556844	9.090371
4	0.00	31.72	5.0750	3.6650	1.4100	36.7950	0.000000	86.207365	3.832042	9.960592
5	0.00	33.69	4.2750	2.8875	1.3875	37.9650	0.000000	88.739629	3.654682	7.605689
6	0.00	26.77	8.7725	3.4625	5.3100	35.5425	0.000000	75.318281	14.939861	9.741858
7	0.00	28.09	8.0275	3.1300	4.8975	36.1175	0.000000	77.773932	13.559909	8.666159
8	0.00	29.89	5.5200	3.5900	1.9300	35.4100	0.000000	84.411183	5.450438	10.138379
9	0.00	26.17	6.9160	2.1630	4.7530	33.0860	0.000000	79.096899	14.365593	6.537508
10	0.00	26.13	6.4200	3.1675	3.2525	32.5500	0.000000	80.276498	9.992320	9.731183
11	0.00	29.23	5.6400	3.1675	2.4725	34.8700	0.000000	83.825638	7.090622	9.083740
12	0.00	27.30	5.8875	2.2275	3.6600	33.1875	0.000000	82.259887	11.028249	6.711864
13	0.00	27.26	6.2900	2.1625	4.1275	33.5500	0.000000	81.251863	12.302534	6.445604
14	0.00	28.86	4.3550	2.5875	1.7675	33.2150	0.000000	86.888454	5.321391	7.790155
15	0.00	30.86	5.6050	2.3300	3.2750	36.4650	0.000000	84.629096	8.981215	6.389689
16	0.00	29.50	3.6150	2.6430	0.9720	33.1150	0.000000	89.083497	2.935226	7.981277
17	0.00	28.84	4.1160	2.1312	1.9848	32.9560	0.000000	87.510620	6.022576	6.466804
18	0.00	34.37	3.2925	1.7950	1.4975	37.6625	0.000000	91.257883	3.976104	4.766014
19	0.00	33.72	3.0700	1.5375	1.5325	36.7900	0.000000	91.655341	4.165534	4.179125

Vibracore: VC06 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	2.008	2.593	2.927	2.356	1.210	-0.543	2.287
1.0	2.022	2.548	2.845	2.343	1.012	-0.532	2.157
2.0	1.610	2.576	2.888	2.017	1.415	-0.667	1.655
3.0	-0.358	0.880	2.022	0.639	1.883	-0.226	1.008
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Core: VC06
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC08 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	4.78	3.58	2.02	1.89	2.15	2.88	2.20	2.82	4.63	8.27	3.34	0.39	0.07
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	2.97	8.35	4.77	4.01	2.83	3.22	2.66	2.53	1.47	0.90	0.31	0.12	0.11
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	1.21	2.26	1.71	1.97	2.11	2.34	1.98	2.95	4.21	6.40	2.70	1.00	0.08
12	1.00	2.86	1.19	1.12	0.96	1.25	1.65	1.97	3.85	12.86	2.11	0.38	0.07
13	5.02	3.38	2.05	1.69	1.69	2.01	1.86	2.33	2.83	5.94	1.00	0.24	0.09
14	0.54	1.91	1.40	1.23	1.24	1.72	1.97	3.40	5.36	7.87	0.94	0.24	0.07
15	1.42	3.83	2.16	2.12	1.44	1.29	1.21	2.04	4.25	8.92	1.17	0.26	0.08
16	6.15	2.59	1.31	1.34	1.50	3.00	2.59	1.61	2.09	4.96	0.74	0.26	0.07
17	3.17	3.67	1.99	2.12	2.22	2.88	2.09	2.31	3.40	4.32	1.14	0.40	0.07
18	1.40	4.63	3.44	3.44	2.45	2.14	1.56	1.46	3.40	5.36	1.66	0.56	0.22
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC08 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

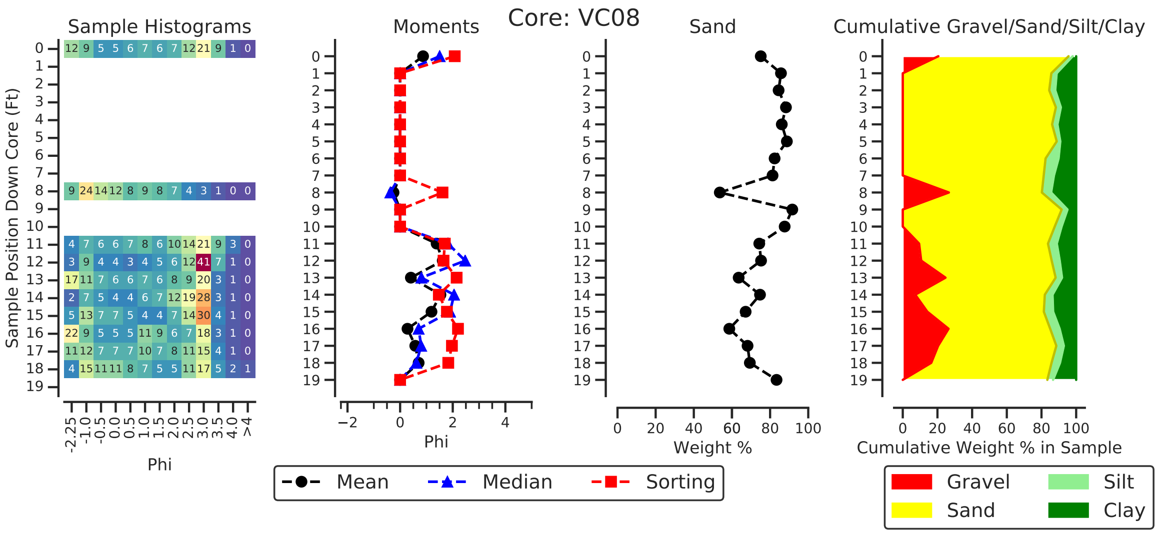
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0491	1.0764	1.2177	1.2090
1	500	1.0057	0.9913	1.3064	1.2491
2	500	1.0059	1.0486	1.3610	1.3467
3	500	1.0209	1.0449	1.2980	1.2786
4	500	1.0323	1.0306	1.3357	1.2890
5	500	1.0095	1.0261	1.2809	1.2662
6	500	0.9986	1.0160	1.3460	1.2583
7	500	0.9892	0.9716	1.3642	1.2599
8	600	1.0194	1.0223	1.3963	1.3273
9	500	1.0188	1.0230	1.2427	1.1970
10	500	1.0068	1.0548	1.2907	1.2798
11	500	1.0131	0.9902	1.3494	1.2548
12	500	1.0072	1.0198	1.3097	1.2578
13	600	0.9859	1.0012	1.2173	1.1938
14	600	1.0165	1.0350	1.3189	1.2893
15	500	1.0235	1.0153	1.3963	1.3120
16	500	1.0097	0.9974	1.3053	1.2237
17	500	1.0222	1.0071	1.2728	1.2026
18	500	0.9825	0.9858	1.2822	1.2228
19	600	1.0065	1.0216	1.3341	1.3042

Vibracore: VC08 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	8.36	30.59	1.7850	0.8150	0.9700	40.7350	20.522892	75.095127	2.381245	2.000736
1	0.00	30.05	5.0175	3.9450	1.0725	35.0675	0.000000	85.691880	3.058387	11.249733
2	0.00	34.65	6.3775	4.9525	1.4250	41.0275	0.000000	84.455548	3.473280	12.071172
3	0.00	33.43	4.4275	3.3425	1.0850	37.8575	0.000000	88.304827	2.866011	8.829162
4	0.00	31.55	5.0850	3.9600	1.1250	36.6350	0.000000	86.119831	3.070834	10.809335
5	0.00	33.94	4.2850	3.5025	0.7825	38.2250	0.000000	88.790059	2.047090	9.162852
6	0.00	28.88	6.1850	3.5575	2.6275	35.0650	0.000000	82.361329	7.493227	10.145444
7	0.00	29.85	6.8750	4.7075	2.1675	36.7250	0.000000	81.279782	5.901974	12.818244
8	11.32	22.82	8.4170	6.1500	2.2670	42.5570	26.599619	53.622201	5.326973	14.451207
9	0.00	33.89	3.0975	1.8500	1.2475	36.9875	0.000000	91.625549	3.372761	5.001690
10	0.00	32.58	4.5975	3.1250	1.4725	37.1775	0.000000	87.633649	3.960729	8.405622
11	3.47	27.37	5.9875	4.1150	1.8725	36.8275	9.422307	74.319462	5.084516	11.173715
12	3.86	27.34	5.1325	3.4500	1.6825	36.3325	10.624097	75.249432	4.630840	9.495631
13	8.40	21.64	4.0320	2.7780	1.2540	34.0720	24.653675	63.512562	3.680441	8.153322
14	2.45	25.37	6.1420	4.6290	1.5130	33.9620	7.213945	74.701137	4.454979	13.629939
15	5.25	24.86	6.9000	4.9175	1.9825	37.0100	14.185355	67.171035	5.356660	13.286949
16	8.74	19.40	4.9600	3.1575	1.8025	33.1000	26.404834	58.610272	5.445619	9.539275
17	6.84	22.87	3.8350	2.3875	1.4475	33.5450	20.390520	68.177076	4.315099	7.117305
18	6.03	25.47	5.2125	3.4250	1.7875	36.7125	16.424923	69.376915	4.868914	9.329248
19	0.00	34.24	6.8280	5.4780	1.3500	41.0680	0.000000	83.373916	3.287231	13.338853

Vibracore: VC08 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	-0.655	1.502	2.640	0.872	2.075	-0.416	0.761
1.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	-1.413	-0.371	0.928	-0.251	1.611	0.100	0.889
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.137	1.819	2.691	1.387	1.699	-0.395	0.879
12.0	0.775	2.472	2.796	1.619	1.650	-0.728	1.063
13.0	-1.321	0.807	2.454	0.408	2.148	-0.253	0.644
14.0	0.690	2.050	2.636	1.532	1.471	-0.554	0.986
15.0	-0.468	1.898	2.662	1.192	1.779	-0.557	0.684
16.0	-1.814	0.703	2.255	0.280	2.199	-0.245	0.603
17.0	-0.848	0.799	2.277	0.576	1.969	-0.191	0.765
18.0	-0.724	0.617	2.481	0.704	1.830	0.016	0.698
19.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000


Core: VC08
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC09 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.12	1.19	0.73	1.00	1.32	2.19	2.22	3.52	4.79	11.23	7.34	1.14	0.14
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	1.45	1.58	1.63	1.97	2.12	2.93	3.56	6.66	8.08	3.70	0.83	0.34	0.07
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	8.54	4.11	3.22	2.87	2.36	2.56	2.51	2.64	2.55	4.15	0.79	0.24	0.06
18	3.73	4.59	2.24	1.73	1.86	2.02	1.51	2.04	3.02	10.14	1.94	0.30	0.12

Vibracore: VC09 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

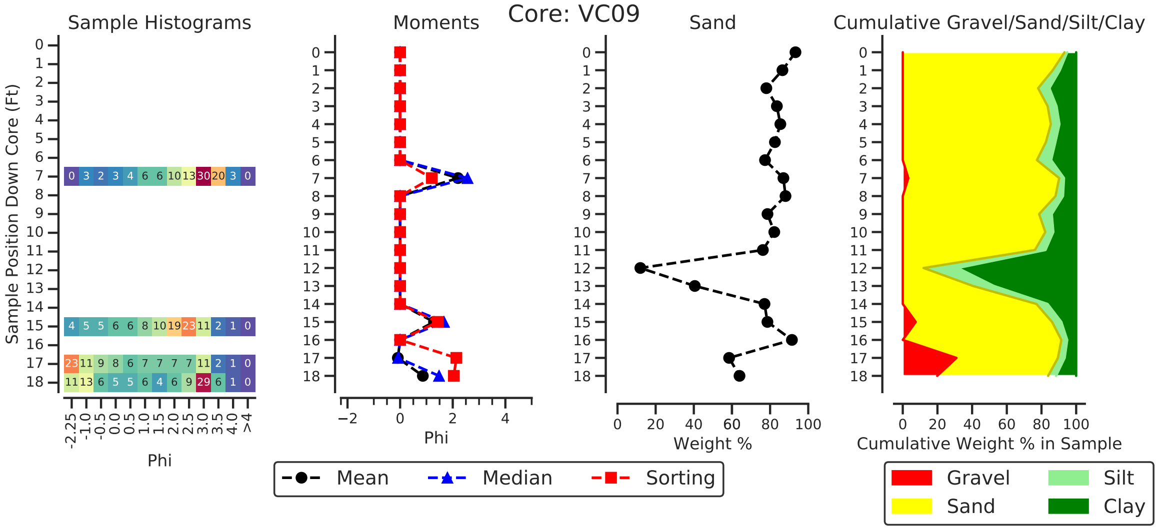
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0212	1.0071	1.2176	1.1813
1	500	1.0273	1.0167	1.3142	1.2466
2	500	1.0545	1.0343	1.4457	1.3388
3	500	0.9957	1.0425	1.3217	1.2979
4	500	1.0265	1.0483	1.3382	1.2877
5	500	1.0004	1.0325	1.3283	1.2886
6	500	1.0011	0.9880	1.4328	1.2993
7	500	1.0213	1.0233	1.2758	1.2376
8	500	1.0063	1.0143	1.2836	1.2271
9	500	1.0027	1.0178	1.4242	1.3293
10	600	1.0000	1.0024	1.3136	1.2602
11	500	1.0347	1.0294	1.4605	1.3717
12	1000	1.0075	1.0004	1.4455	1.3625
13	500	1.0062	1.0073	1.6565	1.5458
14	500	1.0141	1.0291	1.4211	1.3498
15	500	1.0112	1.0040	1.3339	1.2423
16	500	1.0201	1.0486	1.2496	1.2266
17	500	1.0466	1.0036	1.3161	1.2117
18	600	1.0207	0.9931	1.3428	1.2552

Vibracore: VC09 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	0.00	33.57	2.4100	1.8550	0.5550	35.9800	0.000000	93.301834	1.542524	5.155642
1	0.00	29.84	4.6725	3.2475	1.4250	34.5125	0.000000	86.461427	4.128939	9.409634
2	0.00	25.85	7.2800	5.1125	2.1675	33.1300	0.000000	78.025958	6.542409	15.431633
3	0.00	28.69	5.6500	3.8850	1.7650	34.3400	0.000000	83.546884	5.139779	11.313337
4	0.00	30.89	5.2925	3.4850	1.8075	36.1825	0.000000	85.372763	4.995509	9.631728
5	0.00	26.90	5.6975	3.9025	1.7950	32.5975	0.000000	82.521666	5.506557	11.971777
6	0.00	28.30	8.2925	5.2825	3.0100	36.5925	0.000000	77.338252	8.225729	14.436018
7	1.31	35.48	4.0025	2.8575	1.1450	40.7925	3.211375	86.976773	2.806889	7.004964
8	0.00	32.74	4.4325	2.8200	1.6125	37.1725	0.000000	88.075863	4.337884	7.586253
9	0.00	29.56	8.0375	5.2875	2.7500	37.5975	0.000000	78.622249	7.314316	14.063435
10	0.00	29.57	6.4080	4.7340	1.6740	35.9780	0.000000	82.189116	4.652843	13.158041
11	0.00	26.08	8.1450	6.0575	2.0875	34.2250	0.000000	76.201607	6.099343	17.699050
12	0.00	2.30	16.9000	13.1050	3.7950	19.2000	0.000000	11.979167	19.765625	68.255208
13	0.00	9.37	13.7575	10.9625	2.7950	23.1275	0.000000	40.514539	12.085180	47.400281
14	0.00	25.79	7.6750	5.5175	2.1575	33.4650	0.000000	77.065591	6.447034	16.487375
15	3.03	31.82	5.6375	3.4575	2.1800	40.4875	7.483791	78.592158	5.384378	8.539673
16	0.00	34.59	3.2375	1.9500	1.2875	37.8275	0.000000	91.441412	3.403608	5.154980
17	12.65	23.89	4.2975	2.7025	1.5950	40.8375	30.976431	58.500153	3.905724	6.617692
18	8.32	26.80	6.7830	4.8630	1.9200	41.9030	19.855380	63.957235	4.582011	11.605374

Vibracore: VC09 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	1.566	2.562	2.973	2.200	1.203	-0.513	1.193
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.495	1.667	2.265	1.287	1.431	-0.453	1.146
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	-2.064	-0.077	1.742	-0.087	2.137	-0.001	0.640
18.0	-0.891	1.480	2.682	0.863	2.041	-0.421	0.680



Core: VC09
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC10 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	2.74	2.74	1.01	1.16	1.30	1.89	1.97	3.16	3.92	3.33	1.46	1.07	0.30
1	1.16	1.81	1.14	1.22	1.39	2.20	2.29	3.74	4.69	4.02	1.72	1.24	0.36
2	2.16	1.63	0.98	1.08	1.28	2.14	2.35	3.90	4.86	4.16	1.58	1.12	0.32
3	3.46	2.66	1.04	1.31	1.40	2.07	1.99	3.29	4.08	3.33	1.41	1.03	0.30
4	2.61	2.84	1.27	1.61	1.76	2.59	2.45	4.07	5.19	4.12	1.57	1.11	0.28
5	3.09	2.35	1.44	1.58	1.78	2.55	2.54	4.10	5.23	4.11	1.55	1.23	0.33
6	1.94	2.35	1.18	1.23	1.54	2.34	2.26	4.10	5.20	4.01	1.37	1.04	0.26
7	3.47	1.99	1.08	1.34	1.60	2.46	3.14	4.06	4.95	4.21	1.38	1.08	0.28
8	5.09	1.50	1.08	1.16	1.48	2.36	2.44	3.72	4.82	3.66	1.29	0.95	0.27
9	2.69	1.31	1.10	1.35	1.61	2.35	2.25	3.71	4.64	3.71	1.20	0.93	0.32
10	4.66	1.23	0.89	1.12	1.54	2.57	2.54	3.97	4.81	3.80	1.20	0.97	0.36
11	1.62	1.27	1.02	1.41	1.82	2.95	3.02	4.82	5.80	4.60	1.39	1.07	0.49
12	3.44	1.70	0.84	0.96	1.27	2.24	2.23	3.85	4.97	4.15	1.39	1.09	0.42

Vibracore: VC10 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

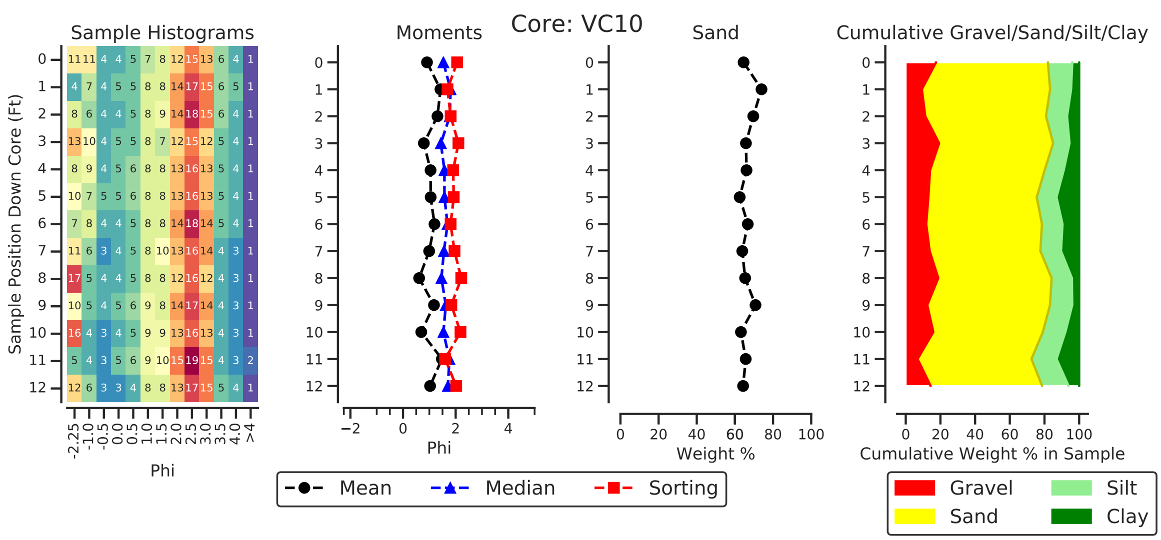
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	400	1.0613	1.0641	1.4287	1.2264
1	400	1.0436	1.0555	1.3938	1.2303
2	300	1.0519	1.1024	1.5598	1.3597
3	400	1.0674	1.0863	1.3913	1.2753
4	700	1.0737	1.0306	1.3873	1.2301
5	600	1.0316	1.0452	1.4612	1.3277
6	500	1.0332	1.0318	1.4350	1.2717
7	500	1.0639	1.0534	1.5071	1.3196
8	500	1.0380	1.0394	1.3505	1.1983
9	500	1.0620	1.0536	1.3662	1.2054
10	500	1.0455	1.0595	1.4416	1.2778
11	600	1.0510	1.0656	1.5243	1.3507
12	500	1.0099	1.0779	1.3983	1.2653

Vibracore: VC10 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	5.48	20.27	5.6480	1.2460	4.4020	31.3980	17.453341	64.558252	14.020001	3.968406
1	2.97	23.65	5.3640	1.4960	3.8680	31.9840	9.285893	73.943222	12.093547	4.677339
2	3.79	23.45	6.4385	2.3595	4.0790	33.6785	11.253470	69.628992	12.111585	7.005953
3	6.12	20.95	4.7780	1.7800	2.9980	31.8480	19.216277	65.781211	9.413464	5.589048
4	5.45	25.74	7.7560	3.4825	4.2735	38.9460	13.993735	66.091511	10.972886	8.941868
5	5.44	26.11	10.2180	5.4750	4.7430	41.7680	13.024325	62.511971	11.355583	13.108121
6	4.29	24.27	7.8050	3.4975	4.3075	36.3650	11.797058	66.739997	11.845181	9.617764
7	5.46	25.30	8.8600	4.1550	4.7050	39.6200	13.780919	63.856638	11.875315	10.487128
8	6.59	22.96	5.5825	1.4725	4.1100	35.1325	18.757561	65.352594	11.698570	4.191276
9	4.00	22.85	5.4250	1.2950	4.1300	32.2750	12.393493	70.797831	12.796282	4.012393
10	5.89	23.41	7.7625	2.9575	4.8050	37.0625	15.892074	63.163575	12.964587	7.979764
11	2.89	27.90	11.6890	5.5530	6.1360	42.4790	6.803362	65.679512	14.444784	13.072342
12	5.14	22.99	7.6300	2.1850	5.4450	35.7600	14.373602	64.289709	15.226510	6.110179

Vibracore: VC10 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	-0.490	1.534	2.455	0.911	2.055	-0.396	0.878
1.0	0.506	1.805	2.574	1.422	1.689	-0.361	1.134
2.0	0.406	1.777	2.535	1.309	1.810	-0.415	1.182
3.0	-0.653	1.438	2.405	0.791	2.104	-0.389	0.850
4.0	-0.144	1.574	2.424	1.046	1.905	-0.395	0.972
5.0	-0.155	1.574	2.428	1.051	1.927	-0.392	0.987
6.0	0.164	1.691	2.450	1.195	1.808	-0.410	1.068
7.0	-0.045	1.554	2.418	0.993	1.956	-0.407	1.037
8.0	-0.600	1.459	2.367	0.612	2.213	-0.449	0.877
9.0	0.106	1.625	2.432	1.176	1.836	-0.393	1.092
10.0	-0.217	1.535	2.387	0.693	2.183	-0.461	1.002
11.0	0.615	1.762	2.477	1.476	1.599	-0.348	1.273
12.0	0.078	1.707	2.491	1.028	2.021	-0.454	1.082



Vibracore: VC13 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.00	0.02	0.28	0.11	0.14	0.26	0.64	1.03	3.25	8.51	15.89	4.31	0.76	0.26
0.75	0.00	0.03	0.11	0.21	0.42	1.21	2.41	6.18	11.18	13.71	2.96	0.34	0.06
1.00	0.00	0.15	0.14	0.31	0.50	1.20	2.59	5.72	10.04	11.73	2.17	0.27	0.00
2.00	0.00	0.51	0.28	0.31	0.44	1.11	1.84	5.22	10.59	13.43	2.85	0.33	0.02
3.00	0.28	0.35	0.34	0.34	0.48	1.01	1.16	2.52	6.12	15.10	4.36	0.45	0.03
4.00	0.98	0.21	0.27	0.25	0.35	0.62	1.02	1.78	5.07	17.83	7.83	0.69	0.06
5.00	2.05	9.71	2.40	0.58	0.35	0.42	0.68	1.60	4.46	9.96	2.13	0.52	0.07
6.00	0.00	0.39	0.24	0.26	0.29	0.58	1.10	3.37	7.51	17.49	3.34	0.86	0.25
7.00	0.00	0.70	0.39	0.48	0.57	1.19	1.39	2.80	6.06	13.11	2.78	0.76	0.20
8.00	0.00	0.30	0.25	0.41	0.45	1.01	1.17	2.93	7.30	14.16	2.70	0.72	0.23
9.00	0.00	1.34	0.61	0.48	0.73	1.24	1.72	3.46	8.26	14.62	3.25	0.71	0.19
10.00	0.00	0.40	0.32	0.42	0.62	1.09	1.17	3.06	8.45	15.09	3.55	0.74	0.23
11.00	0.00	0.13	0.18	0.21	0.26	0.42	0.61	2.72	9.78	14.32	2.78	0.60	0.21
12.00	0.00	0.30	0.24	0.24	0.45	0.70	0.75	2.42	9.33	13.23	1.94	0.29	0.10
13.00	0.00	0.63	0.41	0.41	0.52	0.96	1.50	2.37	10.64	16.21	2.60	0.37	0.08
14.00	0.00	0.20	0.35	0.42	0.67	1.04	1.12	2.63	9.43	16.59	3.02	0.48	0.07
15.00	0.01	0.28	0.36	0.50	0.49	0.93	1.21	2.89	9.95	16.57	3.72	0.54	0.07
16.00	0.00	0.51	0.54	0.58	0.74	1.40	2.40	4.89	11.04	13.39	2.33	0.54	0.11
17.00	0.00	0.35	0.35	0.29	0.38	0.70	1.16	5.63	15.71	14.52	2.03	0.49	0.09

Vibracore: VC13 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

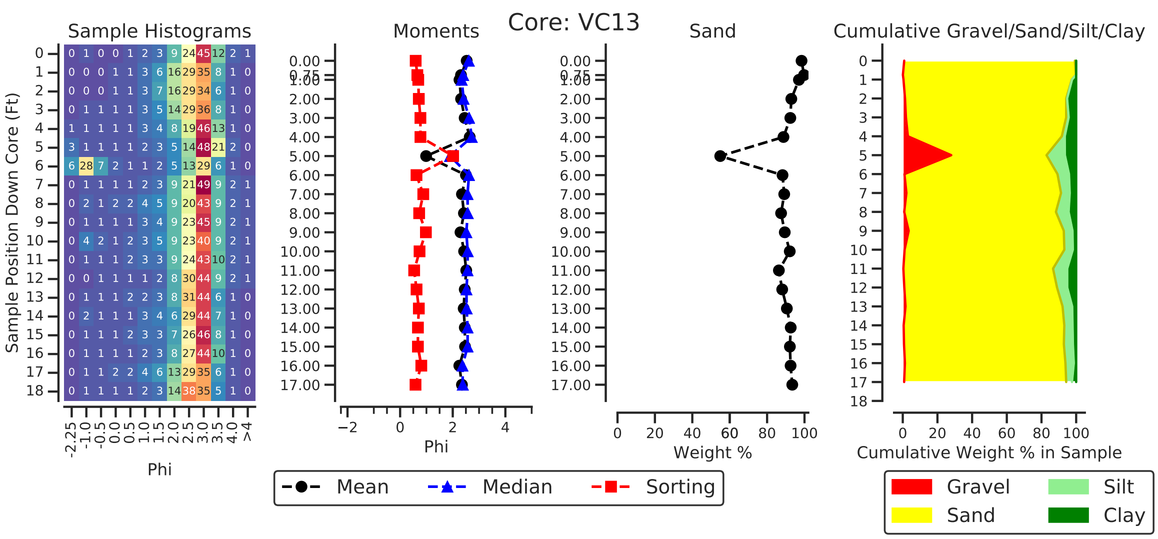
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.00	500	1.0181	1.0395	1.1140	1.1259
0.75	600	0.9705	1.0226	1.0493	1.0983
1.00	500	1.0304	1.0286	1.1672	1.1628
2.00	500	1.0107	1.0240	1.1999	1.2059
3.00	500	0.9795	1.0429	1.1577	1.2027
4.00	500	1.0247	1.0451	1.2557	1.2511
5.00	500	1.0081	1.0131	1.3929	1.2227
6.00	500	0.9847	1.0371	1.2457	1.2029
7.00	500	1.0044	0.9988	1.2121	1.1482
8.00	500	0.9904	1.0485	1.2472	1.2105
9.00	500	1.0062	1.0306	1.2106	1.1639
10.00	600	0.9849	1.0118	1.1624	1.1361
11.00	600	1.0314	1.0132	1.2887	1.1769
12.00	500	1.0174	0.9898	1.2617	1.1592
13.00	500	1.0449	1.0379	1.2664	1.1745
14.00	500	1.0050	1.0199	1.2079	1.1521
15.00	500	1.0052	1.0186	1.2168	1.1491
16.00	500	1.0169	1.0010	1.2137	1.1234
17.00	500	1.0379	1.0141	1.2358	1.1570

Vibracore: VC13 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.00	0.30	34.90	0.2600	0.0000	0.2600	35.4600	0.846024	98.420756	0.733221	0.000000
0.75	0.03	38.73	0.0600	0.0000	0.0600	38.8200	0.077280	99.768161	0.154560	0.000000
1.00	0.15	34.67	0.9200	0.8550	0.0650	35.7400	0.419698	97.006156	0.181869	2.392278
2.00	0.51	36.40	2.2500	2.0475	0.2025	39.1600	1.302349	92.951992	0.517109	5.228550
3.00	0.63	31.88	1.9850	1.4950	0.4900	34.4950	1.826352	92.419191	1.420496	4.333961
4.00	1.19	35.71	3.3350	2.6500	0.6850	40.2350	2.957624	88.753573	1.702498	6.586305
5.00	11.76	23.10	7.1900	2.7400	4.4500	42.0500	27.966706	54.934602	10.582640	6.516052
6.00	0.39	35.04	4.2750	1.6450	2.6300	39.7050	0.982244	88.250850	6.623851	4.143055
7.00	0.70	29.53	2.8925	1.2350	1.6575	33.1225	2.113367	89.153898	5.004151	3.728583
8.00	0.30	31.10	4.1500	1.5500	2.6000	35.5500	0.843882	87.482419	7.313643	4.360056
9.00	1.34	35.08	2.8000	0.8325	1.9675	39.2200	3.416624	89.444161	5.016573	2.122642
10.00	0.40	34.51	2.5550	0.7290	1.8260	37.4650	1.067663	92.112638	4.873882	1.945816
11.00	0.13	31.88	4.9290	1.9110	3.0180	36.9390	0.351932	86.304448	8.170227	5.173394
12.00	0.30	29.59	3.7075	1.7350	1.9725	33.5975	0.892924	88.072029	5.870973	5.164075
13.00	0.63	35.99	3.1175	0.9150	2.2025	39.7375	1.585404	90.569361	5.542623	2.302611
14.00	0.20	35.75	2.6425	0.8050	1.8375	38.5925	0.518235	92.634579	4.761288	2.085898
15.00	0.29	37.16	2.8600	0.7625	2.0975	40.3100	0.719424	92.185562	5.203423	1.891590
16.00	0.51	37.85	2.5300	0.5600	1.9700	40.8900	1.247249	92.565419	4.817804	1.369528
17.00	0.35	41.26	2.5375	1.0725	1.4650	44.1475	0.792797	93.459426	3.318421	2.429356

Vibracore: VC13 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.00	2.184	2.610	2.889	2.530	0.591	-0.264	1.311
0.75	1.930	2.395	2.769	2.313	0.654	-0.224	1.102
1.00	1.833	2.339	2.733	2.255	0.689	-0.253	1.090
2.00	1.954	2.413	2.775	2.316	0.710	-0.298	1.297
3.00	2.135	2.622	2.891	2.452	0.771	-0.460	1.647
4.00	2.371	2.722	2.981	2.645	0.772	-0.383	2.172
5.00	-1.390	1.898	2.698	0.987	2.015	-0.557	0.564
6.00	2.179	2.617	2.872	2.501	0.622	-0.339	1.412
7.00	2.007	2.562	2.852	2.349	0.880	-0.481	1.673
8.00	2.095	2.570	2.850	2.424	0.724	-0.393	1.519
9.00	1.938	2.516	2.829	2.294	0.979	-0.507	1.819
10.00	2.101	2.568	2.859	2.431	0.738	-0.387	1.563
11.00	2.180	2.563	2.844	2.513	0.534	-0.189	1.246
12.00	2.128	2.521	2.805	2.455	0.624	-0.327	1.526
13.00	2.112	2.528	2.811	2.415	0.711	-0.406	1.679
14.00	2.137	2.565	2.836	2.457	0.677	-0.384	1.592
15.00	2.136	2.565	2.848	2.467	0.676	-0.355	1.556
16.00	1.853	2.370	2.752	2.249	0.805	-0.348	1.381
17.00	2.050	2.382	2.731	2.349	0.585	-0.195	1.278


Core: VC13
Sample Histograms
Sample Position Down Core (Ft)
Phi
Moments
Phi
Sand
Weight %
Cumulative Gravel/Sand/Silt/Clay
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC15 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.0	0.91	1.31	1.14	1.08	1.73	4.33	5.61	8.68	11.53	6.02	0.62	0.08	0.00
1.0	0.49	1.23	0.99	1.08	2.09	5.64	4.88	7.21	8.31	3.81	0.35	0.02	0.00
2.0	0.25	0.19	0.31	0.45	0.52	1.34	3.28	7.85	13.13	8.56	0.95	0.08	0.00
3.0	0.00	0.25	0.46	0.40	0.48	0.94	1.71	6.33	14.62	10.88	1.42	0.11	0.00
4.0	0.00	0.28	0.47	0.55	0.67	1.11	1.43	5.42	13.75	10.18	1.05	0.15	0.00
5.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.0	8.07	9.46	3.81	2.24	2.15	2.63	1.40	1.55	2.72	2.55	0.56	0.12	0.00
7.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.0	1.03	1.34	1.60	1.73	2.33	3.60	5.30	8.20	7.78	5.06	1.18	0.38	0.00
10.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0	0.57	1.55	2.00	3.43	4.57	6.39	8.27	7.33	3.15	1.62	0.28	0.11	0.00
12.0	0.47	4.12	3.18	3.93	5.63	7.70	4.60	2.69	2.63	1.51	0.17	0.05	0.00
13.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.0	0.00	0.06	0.20	0.25	0.18	0.12	0.13	3.66	19.51	11.75	0.85	0.33	0.08
16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0	0.00	0.00	0.04	0.06	0.07	0.12	0.20	2.41	17.79	13.24	0.84	0.25	0.08

Vibracore: VC15 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

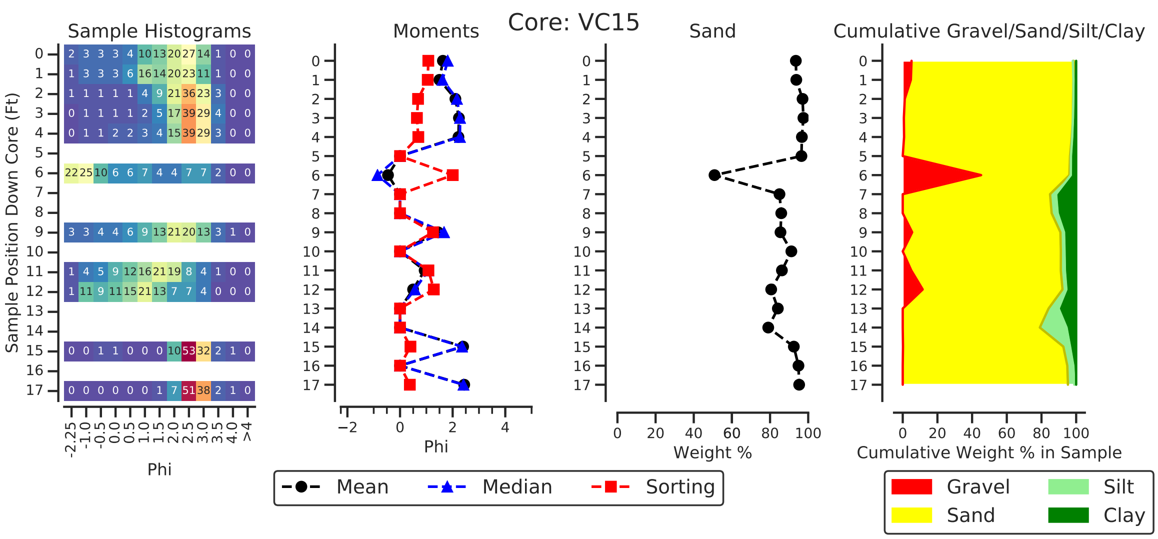
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.0	500	1.0174	1.0210	1.1418	1.1550
1.0	500	1.0404	1.0312	1.1632	1.1542
2.0	500	1.0333	1.0310	1.1605	1.1553
3.0	500	1.0032	0.9668	1.1319	1.0954
4.0	500	1.0200	1.0176	1.1566	1.1502
5.0	500	1.0049	0.9957	1.1559	1.1388
6.0	500	0.9936	1.0126	1.1543	1.1604
7.0	500	1.0063	1.0040	1.3345	1.2793
8.0	500	1.0280	1.0236	1.3436	1.2860
9.0	500	0.9976	0.9883	1.2556	1.2098
10.0	500	1.0021	1.0002	1.2337	1.2000
11.0	500	1.0097	0.9998	1.2626	1.2120
12.0	500	1.0040	0.9887	1.2295	1.1785
13.0	500	1.0075	1.0165	1.3426	1.2662
14.0	500	1.0361	0.9889	1.4387	1.1690
15.0	500	0.9986	1.0459	1.2137	1.2024
16.0	500	0.9653	1.0158	1.1385	1.1392
17.0	500	1.0220	1.0176	1.1887	1.1329

Vibracore: VC15 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.0	2.22	40.82	0.6100	0.8500	-0.2400	43.6500	5.085911	93.516609	-0.549828	1.947308
1.0	1.72	34.38	0.5700	0.5750	-0.0050	36.6700	4.690483	93.755113	-0.013635	1.568039
2.0	0.44	36.47	0.6800	0.6075	0.0725	37.5900	1.170524	97.020484	0.192870	1.616121
3.0	0.25	37.35	0.7175	0.7150	0.0025	38.3175	0.652443	97.475044	0.006524	1.865988
4.0	0.28	34.78	0.9150	0.8150	0.1000	35.9750	0.778318	96.678249	0.277971	2.265462
5.0	0.00	34.59	1.2750	1.0775	0.1975	35.8650	0.000000	96.445002	0.550676	3.004322
6.0	17.53	19.73	1.5175	1.1950	0.3225	38.7775	45.206628	50.880021	0.831668	3.081684
7.0	0.00	32.17	5.7050	4.3825	1.3225	37.8750	0.000000	84.937294	3.491749	11.570957
8.0	0.00	32.74	5.3900	4.0600	1.3300	38.1300	0.000000	85.864149	3.488067	10.647784
9.0	2.37	37.16	3.9500	3.0375	0.9125	43.4800	5.450782	85.464581	2.098666	6.985971
10.0	0.00	33.95	3.2900	2.4950	0.7950	37.2400	0.000000	91.165414	2.134801	6.699785
11.0	2.12	37.15	3.8225	2.8050	1.0175	43.0925	4.919650	86.209897	2.361200	6.509253
12.0	4.59	32.09	3.1375	2.2450	0.8925	39.8175	11.527595	80.592704	2.241477	5.638224
13.0	0.00	31.05	5.8775	3.7425	2.1350	36.9275	0.000000	84.083677	5.781599	10.134723
14.0	0.00	28.54	7.5650	2.0025	5.5625	36.1050	0.000000	79.047223	15.406453	5.546323
15.0	0.06	36.98	2.9575	1.4125	1.5450	39.9975	0.150009	92.455778	3.862741	3.531471
16.0	0.00	33.99	1.8300	0.5850	1.2450	35.8200	0.000000	94.891122	3.475712	1.633166
17.0	0.00	35.02	1.7475	0.3825	1.3650	36.7675	0.000000	95.247161	3.712518	1.040321

Vibracore: VC15 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	1.023	1.812	2.325	1.629	1.075	-0.373	1.241
1.0	0.779	1.614	2.208	1.498	1.053	-0.273	1.081
2.0	1.684	2.162	2.521	2.104	0.685	-0.240	1.178
3.0	1.908	2.281	2.638	2.238	0.642	-0.254	1.308
4.0	1.893	2.276	2.628	2.220	0.695	-0.307	1.469
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	-2.085	-0.856	0.921	-0.457	2.004	0.259	0.789
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.757	1.673	2.290	1.445	1.254	-0.345	1.157
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.248	1.068	1.682	0.935	1.079	-0.197	1.040
12.0	-0.322	0.566	1.270	0.496	1.284	-0.098	1.111
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	2.120	2.358	2.659	2.398	0.396	0.035	1.026
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	2.165	2.412	2.713	2.440	0.373	0.021	0.909


Core: VC15
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC16 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.00	0.37	0.54	0.49	0.58	0.91	1.42	2.14	6.64	11.72	8.23	0.91	0.44	0.15
0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.00	0.07	0.62	0.29	0.20	0.26	0.38	0.55	1.23	2.87	10.44	8.48	1.91	0.76
18.00	0.00	0.07	0.10	0.17	0.22	0.32	0.40	0.95	1.88	11.75	13.30	3.09	1.26

Vibracore: VC16 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

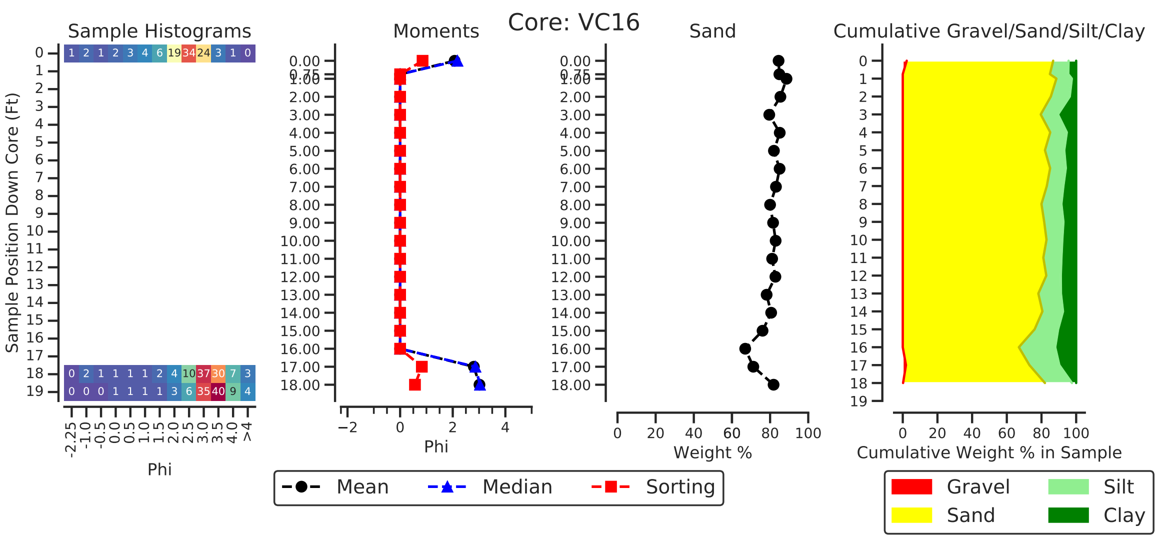
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.00	500	1.0360	1.0499	1.3403	1.2192
0.75	500	0.9986	1.0340	1.3280	1.2028
1.00	500	1.0143	1.0463	1.2855	1.1839
2.00	500	1.0265	1.0040	1.3337	1.1566
3.00	500	0.9963	1.0066	1.4345	1.2803
4.00	500	1.0131	1.0107	1.3318	1.1899
5.00	500	1.0208	1.0144	1.3957	1.2195
6.00	500	1.0388	0.9883	1.3509	1.1727
7.00	500	1.0139	1.0036	1.3724	1.2164
8.00	500	1.0074	1.0341	1.3982	1.2581
9.00	500	1.0337	1.0115	1.4116	1.2225
10.00	500	1.0446	1.0410	1.3731	1.2480
11.00	500	1.0181	1.0358	1.3955	1.2603
12.00	500	0.9663	1.0517	1.3054	1.2750
13.00	500	0.9996	1.0029	1.4331	1.2373
14.00	500	1.0041	1.0243	1.3726	1.2291
15.00	500	0.9922	0.9984	1.4304	1.2456
16.00	500	1.0651	1.0062	1.6533	1.2849
17.00	500	1.0584	1.0749	1.5310	1.3203
18.00	500	1.0553	0.9990	1.3881	1.1371

Vibracore: VC16 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.00	0.91	33.48	5.2575	1.7325	3.5250	39.6475	2.295227	84.444164	8.890851	4.369758
0.75	0.00	32.14	5.7350	1.7200	4.0150	37.8750	0.000000	84.858086	10.600660	4.541254
1.00	0.00	33.27	4.2800	0.9400	3.3400	37.5500	0.000000	88.601864	8.894807	2.503329
2.00	0.00	30.30	5.1800	1.3150	3.8650	35.4800	0.000000	85.400225	10.893461	3.706313
3.00	0.00	32.91	8.4550	4.3425	4.1125	41.3650	0.000000	79.560015	9.941980	10.498006
4.00	0.00	31.10	5.4675	1.9800	3.4875	36.5675	0.000000	85.048199	9.537157	5.414644
5.00	0.00	31.31	6.8725	2.6275	4.2450	38.1825	0.000000	82.000917	11.117659	6.881425
6.00	0.00	30.01	5.3025	2.1100	3.1925	35.3125	0.000000	84.984071	9.040708	5.975221
7.00	0.00	31.71	6.4625	2.8200	3.6425	38.1725	0.000000	83.070273	9.542210	7.387517
8.00	0.00	29.06	7.2700	3.1000	4.1700	36.3300	0.000000	79.988990	11.478117	8.532893
9.00	0.00	30.73	6.9475	2.7750	4.1725	37.6775	0.000000	81.560613	11.074249	7.365138
10.00	0.00	27.70	5.7125	2.6750	3.0375	33.4125	0.000000	82.903105	9.090909	8.005986
11.00	0.00	29.69	6.9350	3.1125	3.8225	36.6250	0.000000	81.064846	10.436860	8.498294
12.00	0.00	28.73	5.9775	3.0825	2.8950	34.7075	0.000000	82.777498	8.341137	8.881366
13.00	0.00	29.87	8.3375	3.3600	4.9775	38.2075	0.000000	78.178368	13.027547	8.794085
14.00	0.00	27.80	6.7125	2.6200	4.0925	34.5125	0.000000	80.550525	11.858022	7.591452
15.00	0.00	26.83	8.4550	3.6800	4.7750	35.2850	0.000000	76.037976	13.532663	10.429361
16.00	0.00	24.72	12.2050	4.4675	7.7375	36.9250	0.000000	66.946513	20.954638	12.098849
17.00	0.69	26.61	10.0750	3.6350	6.4400	37.3750	1.846154	71.197324	17.230769	9.725753
18.00	0.07	32.18	7.0800	0.9525	6.1275	39.3300	0.177981	81.820493	15.579710	2.421815

Vibracore: VC16 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.00	1.665	2.178	2.567	2.072	0.853	-0.356	1.456
0.75	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.00	2.526	2.862	3.244	2.803	0.825	-0.286	1.942
18.00	2.682	3.034	3.349	3.016	0.564	-0.125	1.367


Core: VC16
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC17 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.0	2.72	1.02	0.84	1.65	3.21	7.48	7.42	8.19	6.06	2.14	0.32	0.06	0.02
0.5	0.17	1.15	0.82	1.25	2.42	5.54	7.74	7.82	6.00	2.64	0.40	0.06	0.00
1.0	0.00	1.36	1.18	1.63	3.15	6.74	7.28	9.75	8.29	3.37	0.47	0.08	0.01
2.0	0.66	4.40	5.07	6.08	7.21	7.53	3.01	2.97	1.58	0.80	0.23	0.06	0.00
3.0	0.04	1.19	2.18	3.45	3.78	4.14	2.58	3.38	5.13	8.68	5.59	0.84	0.11
4.0	0.23	0.53	0.91	1.40	1.68	2.08	2.54	3.81	5.73	11.08	8.23	1.15	0.11
5.0	0.00	0.48	0.63	0.80	1.11	1.34	1.07	1.57	3.80	11.43	11.13	1.72	0.19
6.0	0.00	0.38	0.37	0.41	0.46	0.68	0.72	1.13	2.75	10.57	14.83	2.43	0.27
7.0	0.00	0.13	0.17	0.19	0.20	0.29	0.29	0.51	1.20	9.99	19.09	3.07	0.36
8.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC17 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.0	500	1.0538	1.0059	1.1298	1.0782
0.5	500	1.0454	1.0254	1.1341	1.1114
1.0	500	1.0365	1.0239	1.2293	1.2113
2.0	500	1.0579	1.0595	1.1744	1.1707
3.0	600	1.0129	0.9857	1.2167	1.1694
4.0	500	1.0551	1.0831	1.2336	1.2415
5.0	500	0.9993	1.0208	1.2354	1.2349
6.0	500	1.0245	0.9768	1.3331	1.2386
7.0	500	0.9845	0.9963	1.2970	1.2750
8.0	500	0.9939	1.0155	1.3645	1.3353
9.0	500	0.9899	1.0525	1.4098	1.4094
10.0	500	0.9871	0.9705	1.4030	1.3237
11.0	500	0.9907	1.0617	1.4250	1.4382
12.0	500	0.9903	0.9788	1.3688	1.3075
13.0	500	1.0534	1.0008	1.3824	1.2750
14.0	500	1.0212	1.0171	1.4250	1.3520
15.0	500	1.0097	1.0324	1.3170	1.3055
16.0	500	1.0175	1.0109	1.3725	1.2937
17.0	600	1.0389	1.0290	1.3634	1.2914
18.0	500	1.0177	1.0420	1.4194	1.3581

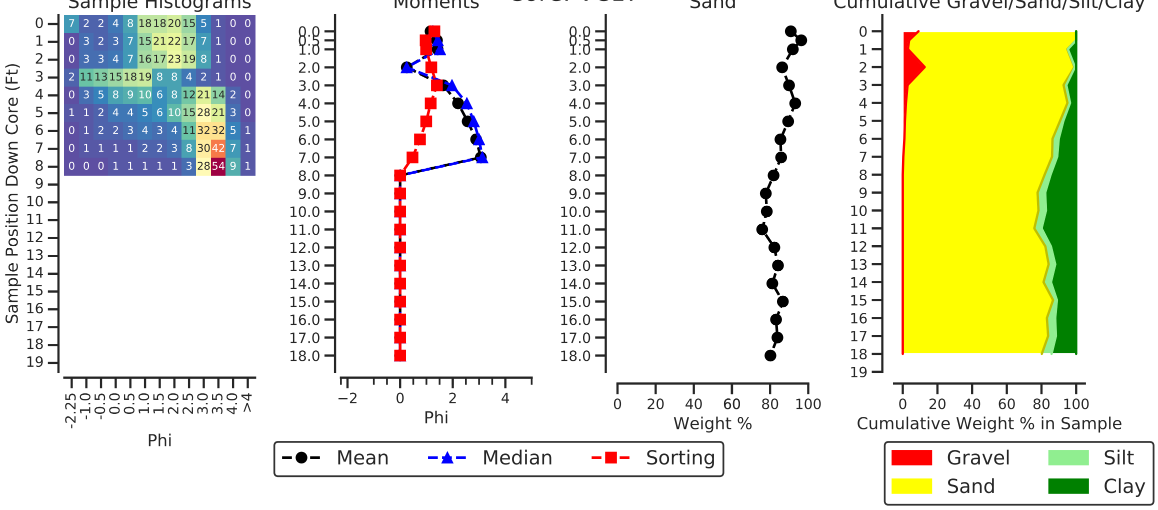
Vibracore: VC17 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.0	3.74	37.37	0.0200	0.0000	0.0200	41.1300	9.093119	90.858254	0.048626	0.000000
0.5	1.32	34.69	0.0000	0.0000	0.0000	36.0100	3.665648	96.334352	0.000000	0.000000
1.0	1.36	41.94	2.3300	2.1850	0.1450	45.6300	2.980495	91.913215	0.317773	4.788516
2.0	5.06	34.54	0.4125	0.2800	0.1325	40.0125	12.646048	86.323024	0.331147	0.699781
3.0	1.23	39.75	3.2240	2.5110	0.7130	44.2040	2.782554	89.923989	1.612976	5.680481
4.0	0.76	38.61	2.0725	1.4600	0.6125	41.4425	1.833866	93.165229	1.477951	3.522953
5.0	0.48	34.60	3.5925	2.8525	0.7400	38.6725	1.241192	89.469261	1.913504	7.376042
6.0	0.38	34.35	5.4850	4.0450	1.4400	40.2150	0.944921	85.415890	3.580753	10.058436
7.0	0.13	35.00	5.6725	4.4675	1.2050	40.8025	0.318608	85.779058	2.953250	10.949084
8.0	0.00	30.45	6.7650	5.4950	1.2700	37.2150	0.000000	81.821846	3.412602	14.765552
9.0	0.00	27.95	7.9975	6.4225	1.5750	35.9475	0.000000	77.752278	4.381390	17.866333
10.0	0.00	28.44	7.8975	6.3300	1.5675	36.3375	0.000000	78.266254	4.313725	17.420021
11.0	0.00	26.26	8.3575	6.9125	1.4450	34.6175	0.000000	75.857586	4.174189	19.968224
12.0	0.00	32.22	6.9625	5.7175	1.2450	39.1825	0.000000	82.230588	3.177439	14.591973
13.0	0.00	30.35	5.7250	4.3550	1.3700	36.0750	0.000000	84.130284	3.797644	12.072072
14.0	0.00	32.74	7.5950	5.8725	1.7225	40.3350	0.000000	81.170200	4.270485	14.559316
15.0	0.00	33.74	5.1825	4.3275	0.8550	38.9225	0.000000	86.685079	2.196673	11.118248
16.0	0.00	31.40	6.3750	4.5700	1.8050	37.7750	0.000000	83.123759	4.778293	12.097948
17.0	0.00	34.94	6.7350	4.8720	1.8630	41.6750	0.000000	83.839232	4.470306	11.690462
18.0	0.00	30.50	7.5425	5.4025	2.1400	38.0425	0.000000	80.173490	5.625288	14.201222

Vibracore: VC17 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.556	1.246	1.897	1.156	1.302	-0.296	1.561
0.5	0.788	1.430	2.008	1.399	0.970	-0.145	1.160
1.0	0.760	1.516	2.084	1.424	0.989	-0.209	1.059
2.0	-0.523	0.249	0.917	0.253	1.185	-0.016	1.165
3.0	0.451	1.971	2.785	1.643	1.398	-0.323	0.740
4.0	1.566	2.537	2.983	2.202	1.162	-0.478	1.113
5.0	2.239	2.799	3.190	2.566	0.992	-0.493	1.567
6.0	2.588	3.001	3.296	2.889	0.754	-0.424	1.794
7.0	2.795	3.125	3.357	3.067	0.470	-0.245	1.294
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Core: VC17


Sample Histograms
Sample Position Down Core (Ft)
Phi
Moments
Phi
Sand
Weight %
Cumulative Gravel/Sand/Silt/Clay
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC18 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.02	2.25	0.41	0.20	0.30	0.36	0.61	1.00	3.36	8.86	16.62	4.79	0.53	0.07
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	0.00	0.12	0.12	0.14	0.15	0.17	0.26	0.55	2.99	17.67	8.51	1.50	0.31
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC18 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

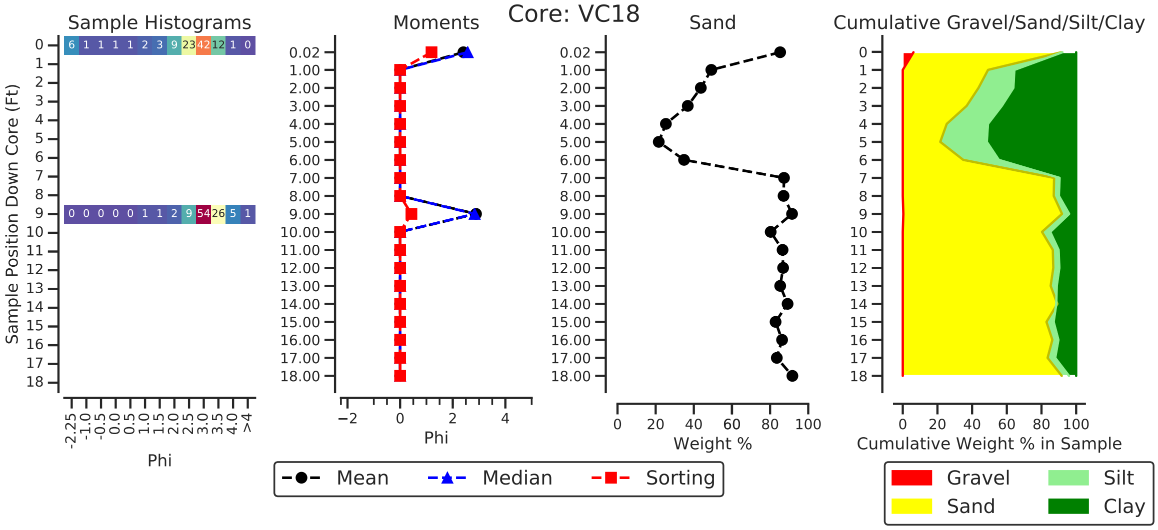
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.02	500	0.9958	1.0896	1.2397	1.3258
1.00	700	0.9724	0.9969	1.4473	1.3599
2.00	900	1.0249	1.0161	1.4854	1.3479
3.00	900	1.0233	0.9744	1.4811	1.3174
4.00	900	1.0182	1.0369	1.5374	1.4226
5.00	900	1.0177	1.0264	1.5439	1.4066
6.00	900	1.0125	1.0026	1.5560	1.4065
7.00	500	1.0112	1.0183	1.3077	1.2659
8.00	600	1.0216	1.0226	1.2791	1.2439
9.00	500	1.0446	1.0447	1.2465	1.2013
10.00	500	1.0286	1.0249	1.4082	1.3371
11.00	500	1.0647	1.0206	1.3583	1.2664
12.00	500	1.0154	0.9790	1.3088	1.2213
13.00	500	0.9979	1.0063	1.3344	1.2863
14.00	500	0.9951	1.0422	1.2583	1.3148
15.00	500	0.9845	1.0346	1.3523	1.3376
16.00	600	1.0163	1.0307	1.2923	1.2621
17.00	600	1.0037	0.9842	1.3250	1.2466
18.00	700	0.9780	0.9825	1.1611	1.1237

Vibracore: VC18 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.02	2.66	36.63	3.6675	3.4050	0.2625	42.9575	6.192167	85.270325	0.611069	7.926439
1.00	0.00	12.70	13.1215	9.2050	3.9165	25.8215	0.000000	49.183820	15.167593	35.648587
2.00	0.00	12.58	16.2225	10.4310	5.7915	28.8025	0.000000	43.676764	20.107630	36.215606
3.00	0.00	9.39	16.1010	10.9350	5.1660	25.4910	0.000000	36.836531	20.265976	42.897493
4.00	0.00	6.41	18.8640	12.8565	6.0075	25.2740	0.000000	25.362032	23.769486	50.868481
5.00	0.00	5.29	19.1790	12.6090	6.5700	24.4690	0.000000	21.619192	26.850300	51.530508
6.00	0.00	10.69	19.9575	13.6755	6.2820	30.6475	0.000000	34.880496	20.497594	44.621910
7.00	0.00	33.70	4.9125	3.6900	1.2225	38.6125	0.000000	87.277436	3.166073	9.556491
8.00	0.00	31.76	4.7250	3.6390	1.0860	36.4850	0.000000	87.049472	2.976566	9.973962
9.00	0.12	32.06	2.8575	1.4150	1.4425	35.0375	0.342490	91.501962	4.117017	4.038530
10.00	0.00	28.49	6.9900	5.3050	1.6850	35.4800	0.000000	80.298760	4.749154	14.952086
11.00	0.00	31.10	4.8400	3.6450	1.1950	35.9400	0.000000	86.533111	3.324986	10.141903
12.00	0.00	31.82	4.8350	3.5575	1.2775	36.6550	0.000000	86.809439	3.485200	9.705361
13.00	0.00	34.26	5.9125	4.5000	1.4125	40.1725	0.000000	85.282220	3.516087	11.201693
14.00	0.00	33.57	4.0800	4.3150	-0.2350	37.6500	0.000000	89.163347	-0.624170	11.460823
15.00	0.00	32.38	6.6950	5.0750	1.6200	39.0750	0.000000	82.866283	4.145873	12.987844
16.00	0.00	33.19	5.2800	3.9420	1.3380	38.4700	0.000000	86.275019	3.478035	10.246946
17.00	0.00	33.63	6.6390	4.8720	1.7670	40.2690	0.000000	83.513373	4.387991	12.098637
18.00	0.00	32.06	2.9085	1.4420	1.4665	34.9685	0.000000	91.682514	4.193774	4.123711

Vibracore: VC18 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.02	2.076	2.570	2.866	2.406	1.193	-0.552	2.974
1.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.00	2.603	2.832	3.129	2.884	0.429	0.074	1.202
10.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000


Core: VC18
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC19 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.0	0.67	1.51	0.86	1.29	1.76	4.44	5.12	4.21	3.12	2.90	5.81	0.82	0.11
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.0	0.00	0.01	0.05	0.05	0.08	0.14	0.17	0.37	0.92	11.52	16.03	2.13	0.24
4.0	0.07	0.23	0.17	0.17	0.16	0.22	0.31	0.51	1.46	13.49	17.56	2.72	0.42
5.0	0.00	0.29	0.14	0.11	0.08	0.06	0.10	0.33	1.52	17.90	14.84	1.97	0.29
6.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	1.48	15.37	14.31	1.65	0.16
7.0	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.20	3.88	17.73	12.71	1.65	0.26
8.0	0.00	0.00	0.08	0.07	0.06	0.09	0.12	0.35	3.27	19.95	10.42	1.74	0.30
9.0	0.00	0.11	0.03	0.05	0.03	0.02	0.10	0.41	4.41	20.31	11.63	1.88	0.26
10.0	0.00	0.07	0.08	0.12	0.17	0.27	0.32	1.06	7.84	17.96	7.22	0.94	0.13
11.0	0.00	0.00	0.00	0.00	0.00	0.09	0.31	1.11	8.44	21.14	6.02	0.57	0.09
12.0	0.00	0.11	0.01	0.08	0.11	0.11	0.17	0.61	5.16	23.81	9.27	1.26	0.24
13.0	0.00	0.00	0.00	0.00	0.00	0.09	0.19	0.53	3.65	22.58	8.57	0.85	0.09
14.0	0.00	0.18	0.17	0.23	0.17	0.23	0.36	1.11	6.88	22.12	6.04	0.60	0.07
15.0	0.00	0.00	0.01	0.05	0.01	0.03	0.07	0.39	4.63	23.07	6.51	0.52	0.09
16.0	0.00	0.00	0.00	0.00	0.06	0.11	0.20	1.00	6.25	24.89	8.76	0.83	0.13
17.0	0.00	0.00	0.00	0.00	0.03	0.04	0.14	0.61	4.42	21.02	6.35	0.90	0.33

Vibracore: VC19 Wet (pipetted $< 63 \mu m$) Weight Fraction (g)

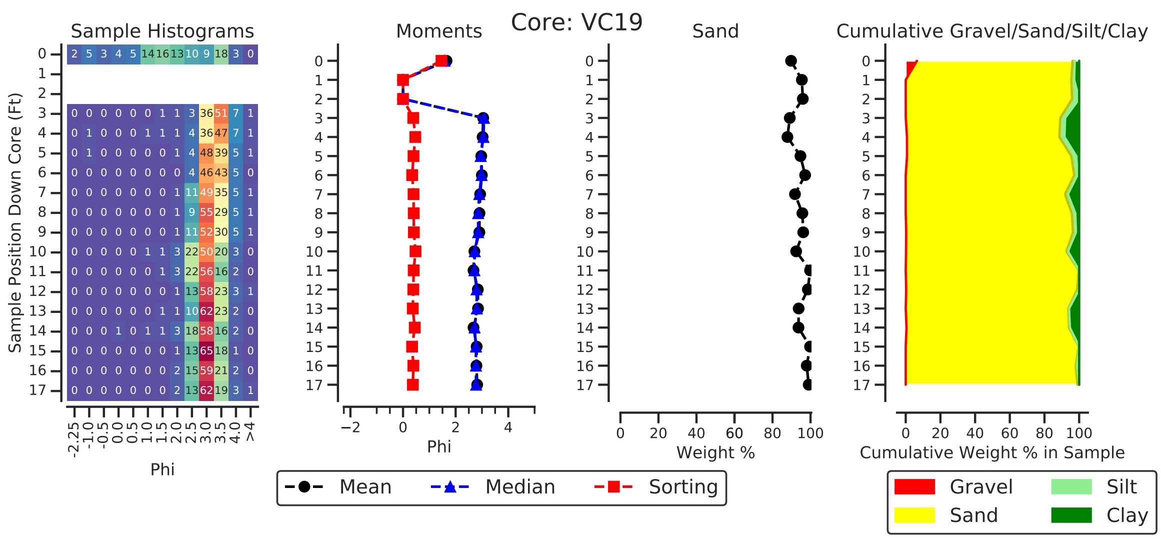
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.0	500	1.0375	1.0703	1.1844	1.2049
1.0	500	0.9999	0.9830	1.1629	1.1226
2.0	500	1.0161	1.2067	1.1698	1.1627
3.0	500	1.0639	1.0270	1.3081	1.2415
4.0	500	1.0156	1.0520	1.2904	1.2940
5.0	600	1.0374	1.0577	1.1872	1.1793
6.0	500	1.0316	1.0536	1.1637	1.1674
7.0	500	1.0153	1.0364	1.2339	1.2389
8.0	500	1.0535	1.0496	1.2063	1.1829
9.0	500	1.0328	1.0376	1.1801	1.1678
10.0	700	1.0275	1.0592	1.2059	1.2310
11.0	500	1.0678	1.0258	1.1434	1.0988
12.0	500	1.0684	1.0508	1.1776	1.1520
13.0	500	1.0660	1.0647	1.2595	1.2552
14.0	500	1.0274	1.1012	1.2201	1.2880
15.0	500	1.0768	1.0595	1.1708	1.1495
16.0	500	1.0425	1.0578	1.1715	1.1789
17.0	500	1.0949	1.0553	1.1820	1.1282

Vibracore: VC19 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.0	2.18	30.33	1.2825	0.8650	0.4175	33.7925	6.451136	89.753644	1.235481	2.559740
1.0	0.00	32.92	1.5750	0.9900	0.5850	34.4950	0.000000	95.434121	1.695898	2.869981
2.0	0.00	31.70	1.3425	0.0000	1.3425	33.0425	0.000000	95.937051	4.062949	0.000000
3.0	0.01	31.46	3.8450	2.8625	0.9825	35.3150	0.028317	89.083959	2.782104	8.105621
4.0	0.30	36.77	4.7900	3.5500	1.2400	41.8600	0.716675	87.840420	2.962255	8.480650
5.0	0.29	37.05	1.7840	0.6480	1.1360	39.1240	0.741233	94.698906	2.903589	1.656272
6.0	0.00	32.91	0.9625	0.3450	0.6175	33.8725	0.000000	97.158462	1.823013	1.018525
7.0	0.00	36.19	3.2250	2.5625	0.6625	39.4150	0.000000	91.817836	1.680832	6.501332
8.0	0.00	36.15	1.6200	0.8325	0.7875	37.7700	0.000000	95.710882	2.084988	2.204130
9.0	0.11	38.87	1.4425	0.7550	0.6875	40.4225	0.272126	96.159317	1.700785	1.867772
10.0	0.07	35.98	2.8740	2.5130	0.3610	38.9240	0.179838	92.436543	0.927448	6.456171
11.0	0.00	37.68	0.0900	0.0000	0.0900	37.7700	0.000000	99.761716	0.238284	0.000000
12.0	0.11	40.59	0.4700	0.0300	0.4400	41.1700	0.267185	98.591207	1.068739	0.072869
13.0	0.00	36.46	2.4275	2.2625	0.1650	38.8875	0.000000	93.757634	0.424301	5.818065
14.0	0.18	37.91	2.3875	2.1700	0.2175	40.4775	0.444691	93.656970	0.537336	5.361003
15.0	0.00	35.29	0.0900	0.0000	0.0900	35.3800	0.000000	99.745619	0.254381	0.000000
16.0	0.00	42.10	0.8550	0.5275	0.3275	42.9550	0.000000	98.009545	0.762426	1.228029
17.0	0.00	33.51	0.3300	0.0000	0.3300	33.8400	0.000000	99.024823	0.975177	0.000000

Vibracore: VC19 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.733	1.578	2.756	1.654	1.461	-0.080	0.991
1.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0	2.766	3.079	3.327	3.046	0.389	-0.097	0.946
4.0	2.725	3.056	3.323	3.025	0.466	-0.163	1.179
5.0	2.689	2.952	3.259	2.973	0.398	0.021	0.965
6.0	2.718	2.986	3.274	2.995	0.348	0.055	0.770
7.0	2.641	2.898	3.217	2.931	0.399	0.039	0.939
8.0	2.627	2.856	3.161	2.906	0.406	0.102	1.075
9.0	2.614	2.856	3.170	2.902	0.412	0.077	1.039
10.0	2.444	2.727	2.979	2.712	0.474	-0.068	1.212
11.0	2.470	2.711	2.935	2.678	0.404	-0.065	1.213
12.0	2.581	2.796	3.029	2.843	0.391	0.082	1.270
13.0	2.604	2.806	3.022	2.850	0.369	0.088	1.283
14.0	2.505	2.720	2.936	2.679	0.445	-0.166	1.561
15.0	2.579	2.771	2.963	2.798	0.344	0.066	1.366
16.0	2.559	2.771	2.983	2.790	0.393	0.021	1.329
17.0	2.577	2.778	2.979	2.818	0.374	0.092	1.392


Core: VC19
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC23 Dry Mechanical Sieve Weight Fraction (g) by Screen

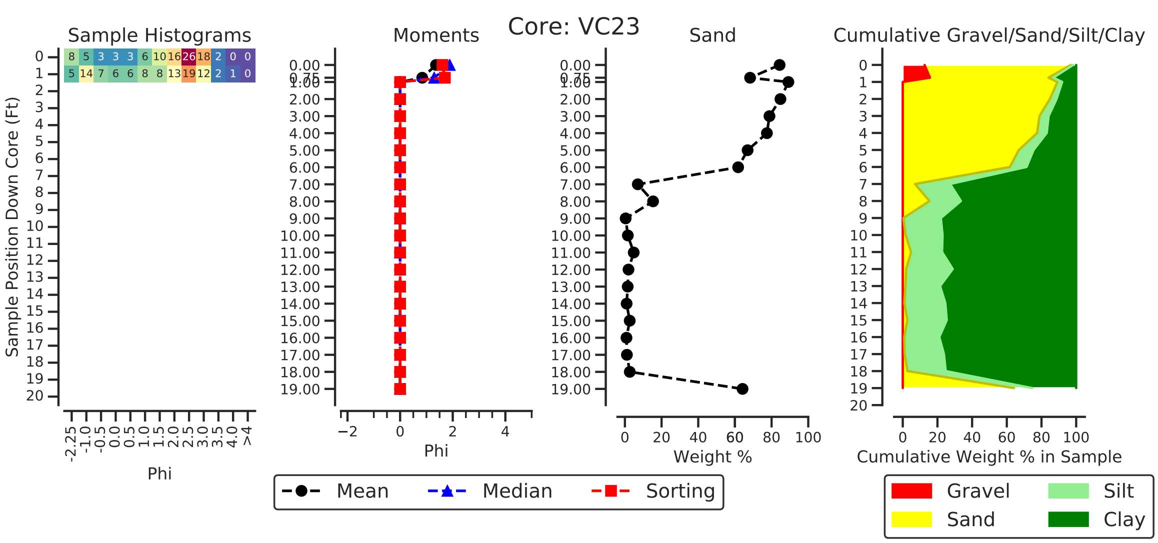
Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.00	3.12	1.80	1.00	1.04	1.30	2.32	3.83	5.93	9.73	6.93	0.78	0.13	0.04
0.75	1.60	4.77	2.38	2.20	1.98	2.61	2.64	4.42	6.64	4.08	0.54	0.19	0.15
1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC23 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.00	500	1.0638	1.0433	1.2095	1.1708
0.75	500	1.0356	1.0618	1.3894	1.3760
1.00	500	1.0220	1.0378	1.2900	1.2627
2.00	500	1.0125	1.0150	1.3557	1.2960
3.00	600	1.0413	1.0354	1.4131	1.3393
4.00	600	0.9959	1.0321	1.3797	1.3458
5.00	600	1.0510	1.0266	1.5514	1.4242
6.00	600	1.0280	1.0079	1.5843	1.4496
7.00	800	1.0272	1.0184	1.6168	1.5014
8.00	700	1.0397	1.0277	1.7392	1.5985
9.00	800	1.0076	0.9931	1.5944	1.4746
10.00	1000	1.0347	1.0447	1.5878	1.4995
11.00	900	1.0404	0.9923	1.5980	1.4641
12.00	1000	1.0205	0.9679	1.5603	1.3872
13.00	1000	1.0215	1.0147	1.5059	1.4212
14.00	900	1.0322	1.0309	1.6457	1.5220
15.00	900	1.0383	0.9982	1.5994	1.4516
16.00	800	0.9965	1.0190	1.6439	1.5549
17.00	900	1.0199	1.0313	1.6995	1.5782
18.00	800	1.0129	1.0229	1.7086	1.5832
19.00	500	1.0318	1.0299	1.6370	1.4873

Vibracore: VC23 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.00	4.92	32.99	1.1825	0.6875	0.4950	39.0925	12.585534	84.389589	1.266228	1.758649
0.75	6.37	27.68	6.4950	5.3550	1.1400	40.5450	15.710938	68.269824	2.811691	13.207547
1.00	0.00	34.55	4.2000	3.1225	1.0775	38.7500	0.000000	89.161290	2.780645	8.058065
2.00	0.00	34.00	6.0800	4.5250	1.5550	40.0800	0.000000	84.830339	3.879741	11.289920
3.00	0.00	30.39	8.1540	6.1170	2.0370	38.5440	0.000000	78.844956	5.284869	15.870174
4.00	0.00	29.25	8.5140	6.4110	2.1030	37.7640	0.000000	77.454719	5.568796	16.976486
5.00	0.00	24.31	12.0120	8.9280	3.0840	36.3220	0.000000	66.929134	8.490722	24.580144
6.00	0.00	22.11	13.6890	10.2510	3.4380	35.7990	0.000000	61.761502	9.603620	28.634878
7.00	0.00	1.48	19.5840	15.3200	4.2640	21.0640	0.000000	7.026206	20.243069	72.730725
8.00	0.00	3.81	20.9825	16.4780	4.5045	24.7925	0.000000	15.367551	18.168801	66.463648
9.00	0.00	0.08	19.4720	15.2600	4.2120	19.5520	0.000000	0.409165	21.542553	78.048282
10.00	0.00	0.37	22.6550	17.7400	4.9150	23.0250	0.000000	1.606949	21.346363	77.046688
11.00	0.00	1.04	20.5920	16.7310	3.8610	21.6320	0.000000	4.807692	17.848558	77.343750
12.00	0.00	0.44	21.9900	15.9650	6.0250	22.4300	0.000000	1.961658	26.861346	71.176995
13.00	0.00	0.30	19.2200	15.3250	3.8950	19.5200	0.000000	1.536885	19.953893	78.509221
14.00	0.00	0.22	23.1075	17.5995	5.5080	23.3275	0.000000	0.943093	23.611617	75.445290
15.00	0.00	0.56	20.7495	15.9030	4.8465	21.3095	0.000000	2.627936	22.743377	74.628687
16.00	0.00	0.19	21.8960	17.4360	4.4600	22.0860	0.000000	0.860273	20.193788	78.945939
17.00	0.00	0.29	26.0820	20.1105	5.9715	26.3720	0.000000	1.099651	22.643334	76.257015
18.00	0.00	0.65	23.8280	18.4120	5.4160	24.4780	0.000000	2.655446	22.125991	75.218564
19.00	0.00	22.61	12.6300	8.9350	3.6950	35.2400	0.000000	64.160045	10.485244	25.354711



Vibracore: VC23 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.00	0.765	1.885	2.417	1.363	1.609	-0.568	1.383
0.75	-0.542	1.295	2.230	0.840	1.700	-0.371	0.757
1.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Vibracore: VC24 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.16	0.26	0.33	0.40	0.71	1.67	2.77	7.19	14.75	11.71	1.18	0.17	0.02
1	0.45	0.59	0.24	0.41	0.75	1.83	3.69	6.36	12.53	11.80	0.83	0.16	0.08
2	0.00	0.25	0.18	0.21	0.26	0.79	1.46	3.74	13.63	13.77	0.89	0.18	0.10
3	0.00	0.21	0.25	0.24	0.36	0.75	1.26	3.59	13.29	14.40	0.92	0.24	0.15
4	0.00	0.31	0.38	0.43	0.53	0.94	1.06	2.57	11.08	13.61	1.16	0.26	0.10
5	0.00	0.33	0.44	0.40	0.42	0.73	0.99	2.41	11.16	17.59	1.68	0.38	0.13
6	0.11	0.55	0.48	0.40	0.33	0.48	0.59	1.57	7.18	14.13	2.44	0.76	0.24
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	11.55	5.76	1.80	1.00	0.81	0.68	0.44	0.57	0.79	6.30	4.81	1.58	0.66
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.14	0.52	0.32	0.19	0.16	0.22	0.19	0.33	0.97	10.82	14.69	3.55	0.97
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC24 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

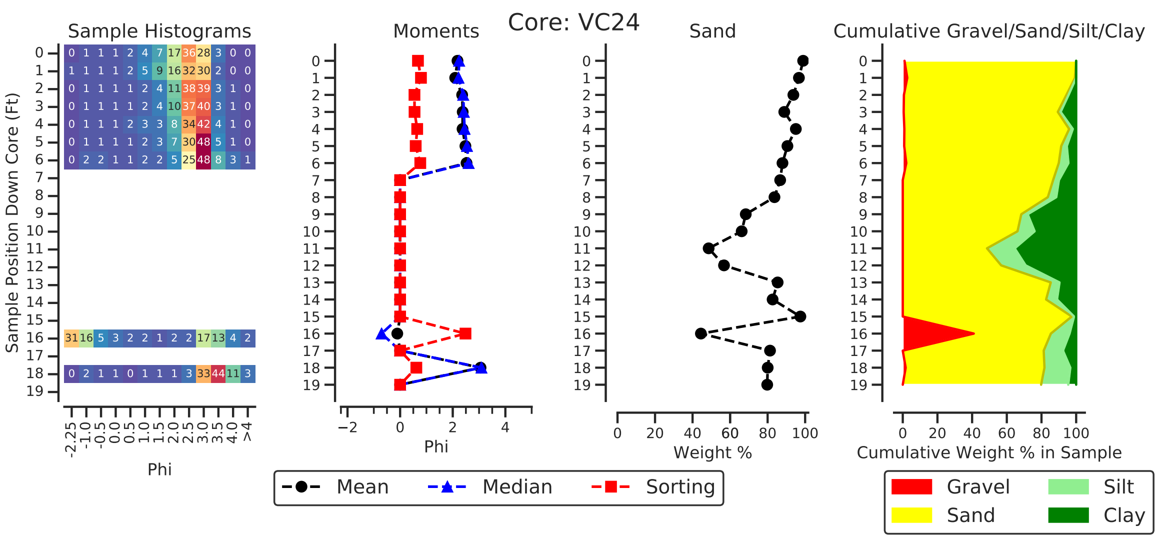
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	600	1.0271	1.0448	1.1129	1.1298
1	500	1.0614	1.0997	1.1696	1.1898
2	500	1.0631	1.0234	1.2431	1.1888
3	500	1.0581	1.0507	1.3204	1.2930
4	600	1.0410	1.0838	1.1830	1.2057
5	600	1.0493	1.0241	1.2598	1.1960
6	500	1.0592	1.0469	1.2791	1.2046
7	500	0.9874	1.0368	1.2992	1.2952
8	600	1.0275	1.0119	1.3487	1.2673
9	700	1.0041	1.0513	1.4106	1.4221
10	800	1.0009	1.0355	1.4961	1.4154
11	900	0.9945	1.0314	1.4352	1.3664
12	900	1.0234	1.0203	1.4373	1.3319
13	700	1.0286	1.0312	1.2990	1.2429
14	600	0.9919	1.0402	1.3294	1.2916
15	600	1.0262	1.0452	1.2090	1.1853
16	500	0.9904	0.9912	1.3105	1.1556
17	600	1.0097	1.0545	1.3688	1.2599
18	500	1.0571	1.1082	1.4055	1.2614
19	600	1.0113	1.0284	1.3970	1.1930

Vibracore: VC24 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	0.42	40.88	0.0200	0.0000	0.0200	41.3200	1.016457	98.935140	0.048403	0.000000
1	1.04	38.60	0.2850	0.0000	0.2850	39.9250	2.604884	96.681277	0.713838	0.000000
2	0.25	35.11	2.1000	1.6350	0.4650	37.4600	0.667379	93.726642	1.241324	4.364656
3	0.21	35.30	4.2075	3.5575	0.6500	39.7175	0.528734	88.877699	1.636558	8.957009
4	0.31	32.02	1.3600	0.6570	0.7030	33.6900	0.920154	95.043039	2.086673	1.950134
5	0.33	36.20	3.4450	2.1570	1.2880	39.9750	0.825516	90.556598	3.222014	5.395872
6	0.66	28.36	3.2375	1.4425	1.7950	32.2575	2.046036	87.917539	5.564597	4.471828
7	0.00	34.49	5.2950	3.9600	1.3350	39.7850	0.000000	86.690964	3.355536	9.953500
8	0.00	33.96	6.6360	4.6620	1.9740	40.5960	0.000000	83.653562	4.862548	11.483890
9	0.00	23.17	10.7275	9.4780	1.2495	33.8975	0.000000	68.353123	3.686113	27.960764
10	0.00	30.93	15.8080	11.1960	4.6120	46.7380	0.000000	66.177415	9.867774	23.954812
11	0.00	14.48	15.3315	10.5750	4.7565	29.8115	0.000000	48.571860	15.955252	35.472888
12	0.00	18.54	14.1255	9.5220	4.6035	32.6655	0.000000	56.757129	14.092850	29.150021
13	0.00	34.74	5.9640	3.9095	2.0545	40.7040	0.000000	85.347877	5.047415	9.604707
14	0.00	33.96	7.1250	4.5420	2.5830	41.0850	0.000000	82.657904	6.286966	11.055130
15	0.00	95.35	2.4840	1.2030	1.2810	97.8340	0.000000	97.461005	1.309361	1.229634
16	17.31	18.78	6.1625	1.6100	4.5525	42.2525	40.967990	44.447074	10.774510	3.810425
17	0.00	33.75	7.7730	3.1620	4.6110	41.5230	0.000000	81.280254	11.104689	7.615057
18	0.66	31.44	7.1800	1.3300	5.8500	39.2800	1.680244	80.040733	14.893075	3.385947
19	0.00	33.83	8.5710	1.9380	6.6330	42.4010	0.000000	79.785854	15.643499	4.570647

Vibracore: VC24 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	1.780	2.243	2.617	2.180	0.678	-0.273	1.179
1.0	1.655	2.221	2.625	2.093	0.792	-0.361	1.168
2.0	2.072	2.398	2.721	2.357	0.545	-0.264	1.231
3.0	2.085	2.420	2.736	2.378	0.548	-0.283	1.260
4.0	2.085	2.451	2.758	2.372	0.649	-0.396	1.536
5.0	2.154	2.541	2.802	2.481	0.592	-0.369	1.543
6.0	2.195	2.604	2.863	2.524	0.766	-0.398	2.148
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0	-2.455	-0.704	2.830	-0.108	2.484	0.297	0.521
17.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.0	2.742	3.091	3.372	3.056	0.616	-0.251	1.712
19.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Core: VC24
Sample Histograms
Sample Position Down Core (Ft)
Phi
Moments
Sand
Weight %
Cumulative Gravel/Sand/Silt/Clay
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC25 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.29	0.48	0.27	0.23	0.25	0.60	1.24	3.33	9.43	16.76	1.69	0.16	0.02
1	0.25	0.22	0.21	0.24	0.22	0.53	1.53	3.79	10.36	20.40	2.23	0.23	0.04
2	0.12	1.03	0.34	0.31	0.29	0.68	1.49	4.03	10.63	18.63	2.13	0.15	0.02
3	0.17	0.35	0.21	0.19	0.23	0.57	1.38	4.09	10.62	20.73	2.11	0.17	0.02
4	0.00	0.10	0.12	0.19	0.17	0.39	1.20	2.99	7.73	18.45	2.33	0.19	0.02
5	0.00	0.14	0.11	0.12	0.13	0.23	0.75	2.31	7.61	22.43	3.60	0.27	0.06
6	0.08	0.17	0.19	0.29	0.27	0.40	0.82	2.63	8.28	22.06	3.63	0.31	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.06	0.72	0.45	0.44	0.41	0.49	0.86	1.96	6.78	19.36	4.53	0.39	0.03
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.02	0.54	0.56	0.55	0.48	0.75	0.74	1.46	4.48	16.44	7.58	0.84	0.23

Vibracore: VC25 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

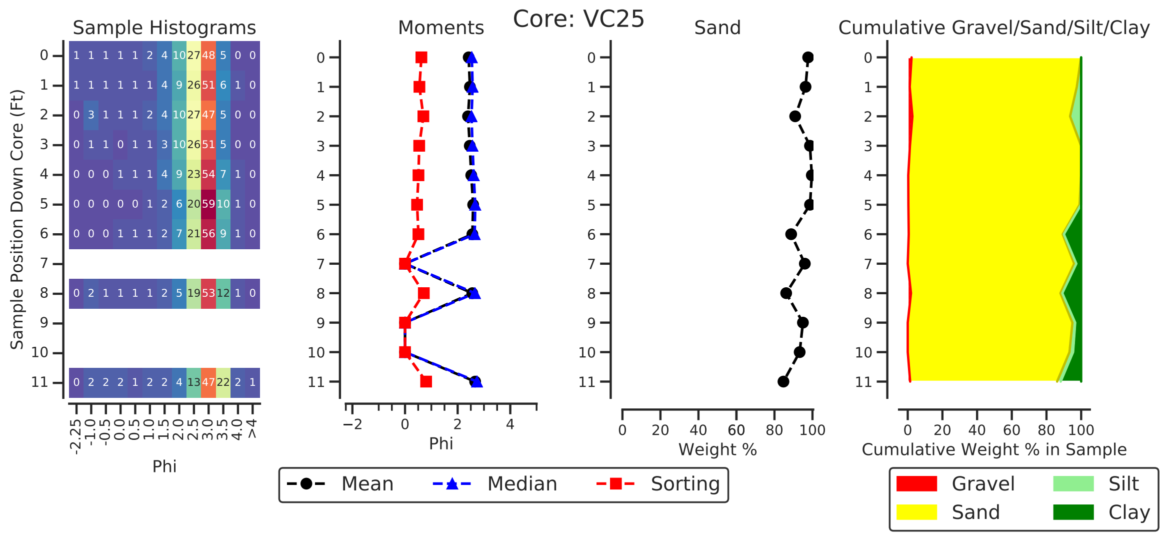
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0664	1.0513	1.1355	1.1153
1	500	1.0230	1.0910	1.1627	1.1258
2	500	1.1102	1.9781	1.3183	1.1836
3	500	1.0098	1.0591	1.0923	1.1354
4	500	1.0373	1.0556	1.1262	1.1368
5	500	1.0541	1.0859	1.1657	1.1874
6	500	1.0559	1.0344	1.3423	1.3087
7	500	1.0329	0.9792	1.1877	1.1170
8	500	0.9800	0.9898	1.2768	1.2697
9	500	1.0205	0.9866	1.1890	1.1334
10	500	1.0239	0.9922	1.2175	1.1568
11	500	1.0511	1.0271	1.3638	1.3160

Vibracore: VC25 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	0.77	33.96	0.0200	0.0000	0.0200	34.7500	2.215827	97.726619	0.057554	0.000000
1	0.47	39.74	1.0325	0.0000	1.0325	41.2425	1.139601	96.356913	2.503485	0.000000
2	1.15	38.68	2.7225	0.0000	2.7225	42.5525	2.702544	90.899477	6.397979	0.000000
3	0.52	40.30	0.0200	0.0000	0.0200	40.8400	1.273262	98.677767	0.048972	0.000000
4	0.10	33.76	0.0200	0.0000	0.0200	33.8800	0.295159	99.645809	0.059032	0.000000
5	0.14	37.56	0.3500	0.0375	0.3125	38.0500	0.367937	98.712221	0.821288	0.098555
6	0.25	38.88	4.6600	4.3575	0.3025	43.7900	0.570907	88.787394	0.690797	9.950902
7	0.00	32.68	1.3700	0.9450	0.4250	34.0500	0.000000	95.976505	1.248164	2.775330
8	0.78	35.67	4.9500	4.4975	0.4525	41.4000	1.884058	86.159420	1.092995	10.863527
9	0.00	32.35	1.7125	1.1700	0.5425	34.0625	0.000000	94.972477	1.592661	3.434862
10	0.00	32.39	2.3400	1.6150	0.7250	34.7300	0.000000	93.262309	2.087532	4.650158
11	0.56	33.88	5.5475	4.7225	0.8250	39.9875	1.400438	84.726477	2.063145	11.809941

Vibracore: VC25 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	2.106	2.537	2.797	2.419	0.622	-0.454	1.399
1.0	2.148	2.568	2.815	2.466	0.547	-0.386	1.227
2.0	2.079	2.527	2.794	2.394	0.697	-0.478	1.571
3.0	2.142	2.563	2.809	2.460	0.539	-0.401	1.194
4.0	2.214	2.610	2.839	2.516	0.511	-0.351	1.233
5.0	2.371	2.667	2.877	2.589	0.458	-0.281	1.374
6.0	2.298	2.646	2.868	2.559	0.509	-0.327	1.391
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	2.275	2.657	2.892	2.556	0.714	-0.443	2.097
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	2.398	2.736	2.999	2.664	0.802	-0.382	2.312



Vibracore: VC27 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.86	0.28	0.26	0.36	0.83	1.79	5.17	12.06	13.88	2.09	0.27	0.27	0.02
1	2.71	2.15	0.78	0.57	0.58	1.31	2.67	6.12	9.76	9.05	1.26	0.30	0.01
2	0.00	0.00	0.00	0.00	0.00	0.05	0.41	0.41	4.19	19.02	7.25	1.31	0.16
3	0.00	0.00	0.00	0.01	0.03	0.04	0.52	0.52	5.13	21.26	9.95	0.15	0.26
4	0.07	0.09	0.06	0.01	0.00	0.00	0.06	0.16	4.12	19.52	9.13	1.77	0.39
5	0.00	0.27	0.31	0.36	0.27	0.29	0.31	0.75	3.60	16.03	6.22	1.61	0.28
6	0.00	0.14	0.30	0.26	0.21	0.24	0.46	0.74	2.32	14.47	6.74	2.10	0.49
7	0.07	0.21	0.14	0.16	0.15	0.13	0.23	0.26	0.88	8.95	7.52	4.12	1.45
8	0.00	0.00	0.04	0.03	0.00	0.06	0.08	0.23	0.24	1.01	1.11	1.06	0.47
9	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.18	0.17	0.27	0.22	0.28	0.14
10	0.00	0.01	0.00	0.00	0.00	0.00	0.05	0.12	0.12	0.23	0.31	0.47	0.14
11	0.00	0.11	0.08	0.13	0.11	0.33	0.69	1.33	2.31	13.85	7.50	2.08	1.01
12	2.14	2.87	1.49	1.50	1.38	1.81	1.93	3.13	3.29	5.65	2.96	1.00	0.40
13	0.40	1.71	0.61	0.62	0.66	1.23	2.14	3.34	3.78	12.50	4.36	1.01	0.49
14	12.94	6.75	2.60	1.86	1.39	1.54	1.80	2.11	2.00	2.20	0.99	0.48	0.20
15	14.67	4.73	2.16	1.86	1.59	1.98	2.43	2.73	2.36	1.60	0.72	0.53	0.28
16	6.42	3.99	2.25	2.08	2.18	3.82	4.78	6.17	4.64	2.14	0.87	0.64	0.44
17	2.47	3.87	2.73	2.20	2.09	3.32	6.57	7.25	5.46	2.31	0.68	0.58	0.26
18	1.42	6.81	3.30	2.53	2.24	3.17	3.43	4.64	5.47	5.29	0.76	0.64	0.17

Vibracore: VC27 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

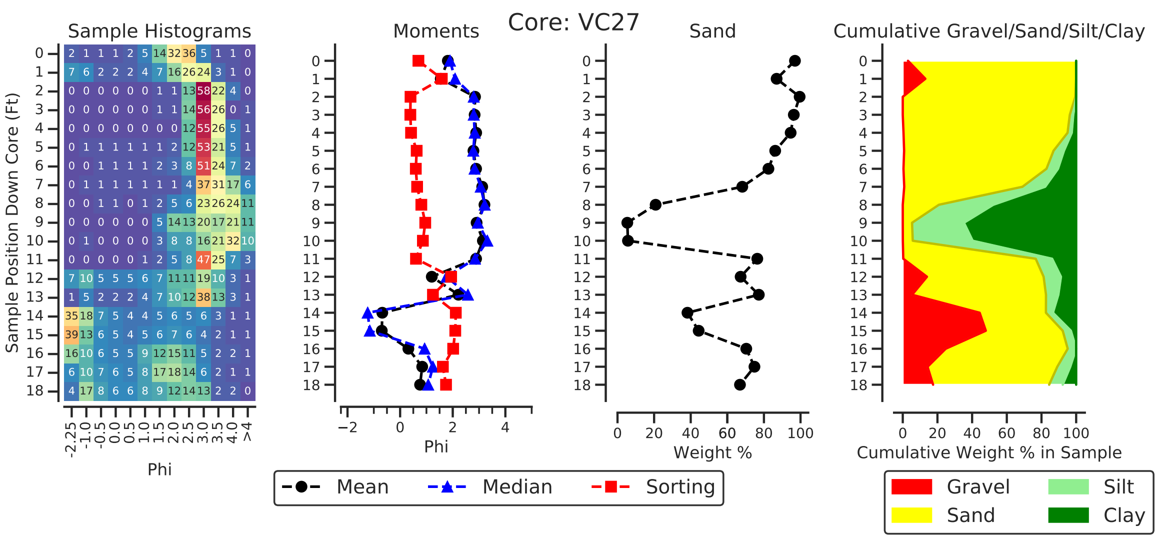
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0667	1.0396	1.1432	1.1132
1	500	1.0476	1.0621	1.1214	1.1368
2	600	1.0365	1.0195	1.1143	1.0925
3	500	1.0381	1.0703	1.1851	1.1965
4	500	1.0334	1.0365	1.1909	1.1740
5	500	1.0176	1.0418	1.2867	1.2392
6	500	0.9927	0.9947	1.3043	1.2361
7	600	1.0097	0.9956	1.4028	1.2928
8	1000	1.0274	0.9794	1.4113	1.2565
9	900	1.0560	0.9911	1.6205	1.4108
10	700	1.0115	1.0022	1.7207	1.4906
11	600	1.0292	1.0387	1.3848	1.3106
12	500	0.9674	0.9993	1.3208	1.2252
13	500	1.0359	1.0398	1.3891	1.3010
14	500	1.0100	1.0410	1.4118	1.3790
15	600	1.0175	1.0712	1.2129	1.2123
16	500	1.0892	1.0500	1.2536	1.1249
17	500	1.0891	1.0606	1.3719	1.2211
18	500	1.0893	1.0488	1.4758	1.2948

Vibracore: VC27 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	1.14	36.98	0.0200	0.0000	0.0200	38.1400	2.988988	96.958574	0.052438	0.000000
1	4.86	32.40	0.0100	0.0000	0.0100	37.2700	13.039979	86.933190	0.026831	0.000000
2	0.00	32.64	0.1600	0.0000	0.1600	32.8000	0.000000	99.512195	0.487805	0.000000
3	0.00	37.61	1.4350	0.6550	0.7800	39.0450	0.000000	96.324753	1.997695	1.677552
4	0.16	34.83	1.8275	0.9375	0.8900	36.8175	0.434576	94.601752	2.417329	2.546343
5	0.27	29.75	4.5075	2.4350	2.0725	34.5275	0.781985	86.163203	6.002462	7.052350
6	0.14	27.84	5.7800	3.5350	2.2450	33.7600	0.414692	82.464455	6.649882	10.470972
7	0.28	22.54	10.2430	5.9160	4.3270	33.0630	0.846868	68.172882	13.087137	17.893113
8	0.00	3.86	14.6650	8.8550	5.8100	18.5250	0.000000	20.836707	31.363023	47.800270
9	0.00	1.19	21.0425	14.3865	6.6560	22.2325	0.000000	5.352524	29.938154	64.709322
10	0.01	1.30	21.4620	13.5940	7.8680	22.7720	0.043914	5.708765	34.551203	59.696118
11	0.11	28.41	8.6780	5.1570	3.5210	37.1980	0.295715	76.375074	9.465563	13.863649
12	5.01	24.14	6.7350	3.1475	3.5875	35.8850	13.961265	67.270447	9.997213	8.771074
13	2.11	30.25	6.8200	4.0300	2.7900	39.1800	5.385401	77.207759	7.120980	10.285860
14	19.69	16.97	7.7450	5.9500	1.7950	44.4050	44.341853	38.216417	4.042338	13.399392
15	19.40	17.96	3.1420	1.2330	1.9090	40.5020	47.898869	44.343489	4.713347	3.044294
16	10.41	29.57	2.0500	0.0000	2.0500	42.0300	24.768023	70.354509	4.877468	0.000000
17	6.34	33.19	4.8300	1.5125	3.3175	44.3600	14.292155	74.819657	7.478584	3.409603
18	8.23	31.47	7.3325	3.6500	3.6825	47.0325	17.498538	66.911178	7.829692	7.760591

Vibracore: VC27 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	1.499	1.895	2.252	1.813	0.695	-0.300	1.409
1.0	1.228	2.089	2.572	1.543	1.584	-0.614	1.691
2.0	2.583	2.798	3.036	2.847	0.395	0.095	1.263
3.0	2.576	2.798	3.045	2.832	0.388	0.033	1.180
4.0	2.610	2.836	3.134	2.891	0.415	0.139	1.134
5.0	2.544	2.780	3.043	2.787	0.629	-0.167	2.129
6.0	2.585	2.831	3.164	2.887	0.596	-0.023	1.756
7.0	2.714	3.063	3.467	3.120	0.646	0.030	1.320
8.0	2.699	3.214	3.711	3.205	0.806	-0.072	1.225
9.0	2.243	2.954	3.656	2.907	0.955	-0.021	0.885
10.0	2.636	3.315	3.763	3.145	0.865	-0.253	1.066
11.0	2.583	2.849	3.214	2.887	0.603	-0.004	1.545
12.0	-0.204	1.764	2.732	1.203	1.939	-0.421	0.844
13.0	1.626	2.577	2.906	2.217	1.247	-0.574	1.545
14.0	-2.538	-1.233	1.157	-0.678	2.116	0.365	0.673
15.0	-2.609	-1.153	1.255	-0.697	2.096	0.317	0.638
16.0	-1.096	0.931	1.889	0.313	2.016	-0.360	0.813
17.0	-0.301	1.245	1.955	0.839	1.625	-0.377	0.971
18.0	-0.737	1.068	2.216	0.758	1.745	-0.249	0.709


Core: VC27
Sample Histograms
Sample Position Down Core (Ft)
Phi
Moments
Phi
Sand
Weight %
Cumulative Gravel/Sand/Silt/Clay
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC28 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	27.14	6.67	0.39	0.17	0.14	0.22	0.32	0.67	0.90	0.77	0.22	0.11	0.07
1	0.00	0.48	0.34	0.31	0.39	0.68	0.95	1.49	1.46	1.29	0.89	0.70	0.12
2	0.00	0.01	0.11	0.10	0.18	0.24	0.25	0.40	0.40	0.45	0.43	0.46	0.07
3	0.16	0.24	0.28	0.27	0.33	0.72	0.99	1.63	2.11	1.68	0.73	0.47	0.08
4	0.00	0.00	0.00	0.01	0.08	0.12	0.09	0.04	0.10	0.15	0.20	0.19	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.56	0.43	0.20	0.11	0.12	0.15	0.11	0.52	0.82	1.16	0.82	0.38	0.09
8	1.52	0.40	0.15	0.09	0.09	0.12	0.25	0.52	0.98	1.01	0.48	0.15	0.00
9	0.28	0.17	0.07	0.05	0.08	0.11	0.11	0.21	0.40	0.62	0.45	0.25	0.00
10	0.00	0.24	0.13	0.18	0.17	0.35	0.61	2.21	6.56	6.98	2.20	0.85	0.23
11	0.00	0.26	0.14	0.15	0.37	1.07	2.09	5.43	10.44	8.00	1.84	0.68	0.16
12	0.10	0.44	0.43	0.81	1.25	2.38	4.46	6.69	8.60	5.92	1.40	0.56	0.15
13	10.55	3.95	1.55	1.69	1.72	2.93	4.64	5.54	3.69	1.54	0.43	0.29	0.11
14	9.40	5.99	2.15	1.74	1.74	2.84	3.71	5.78	3.42	1.25	0.43	0.26	0.07
15	8.57	4.13	2.11	1.93	1.79	2.95	3.71	5.40	3.21	1.16	0.54	0.40	0.15
16	2.16	3.56	2.42	2.62	2.45	3.52	5.49	7.76	5.73	3.07	0.92	0.68	0.20
17	4.09	4.87	2.09	2.25	2.26	3.07	3.37	5.23	4.26	1.87	0.72	0.53	0.27
18	3.07	2.16	0.86	0.66	0.78	1.39	2.84	9.10	11.52	6.95	1.32	0.28	0.08

Vibracore: VC28 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

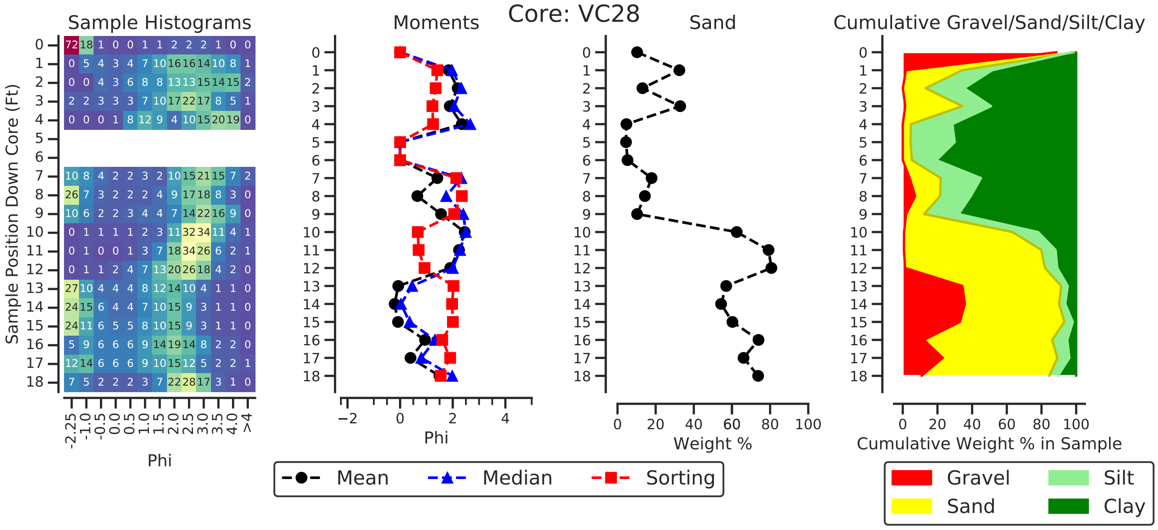
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0034	1.0035	1.1166	1.1418
1	900	1.0252	1.0134	1.5055	1.3955
2	1000	1.0181	1.0102	1.5178	1.4083
3	1000	0.9900	0.9834	1.4568	1.3584
4	900	1.0152	0.9747	1.5599	1.4077
5	1000	1.0272	1.0348	1.5978	1.4797
6	900	1.0057	1.0287	1.7288	1.6591
7	800	1.0460	1.0088	1.6234	1.4458
8	900	1.0108	1.0194	1.5777	1.4808
9	900	1.0302	1.0265	1.5766	1.4711
10	900	1.0054	1.0165	1.3649	1.2747
11	500	1.0083	1.0260	1.4088	1.3070
12	500	1.0182	1.0409	1.4023	1.3161
13	500	1.0440	1.0822	1.2851	1.2641
14	500	1.0349	1.0845	1.3014	1.2924
15	500	1.0010	1.0723	1.1997	1.2020
16	500	1.0572	1.0115	1.4091	1.2072
17	500	1.0291	1.0334	1.2868	1.1940
18	500	1.0329	1.0198	1.4295	1.3237

Vibracore: VC28 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	33.81	3.91	0.4000	0.9575	-0.5575	38.1200	88.693599	10.257083	-1.462487	2.511805
1	0.48	8.50	17.2335	12.6945	4.5390	26.2135	1.831118	32.426040	17.315505	48.427337
2	0.01	3.02	20.0550	14.9050	5.1500	23.0850	0.043318	13.082088	22.308859	64.565735
3	0.40	9.21	18.4200	13.7500	4.6700	28.0300	1.427042	32.857653	16.660721	49.054584
4	0.00	0.98	20.0115	14.9850	5.0265	20.9915	0.000000	4.668556	23.945406	71.386037
5	0.00	1.10	23.5300	17.2450	6.2850	24.6300	0.000000	4.466098	25.517661	70.016240
6	0.00	1.55	28.0395	23.8680	4.1715	29.5895	0.000000	5.238345	14.097906	80.663749
7	0.99	4.39	19.1860	13.4800	5.7060	24.5660	4.029960	17.870227	23.227225	54.872588
8	1.92	3.84	21.0105	16.2630	4.7475	26.7705	7.172074	14.344147	17.734073	60.749706
9	0.45	2.35	20.0880	15.5070	4.5810	22.8880	1.966096	10.267389	20.014855	67.751660
10	0.24	20.24	11.9075	7.1190	4.7885	32.3875	0.741027	62.493246	14.785025	21.980702
11	0.26	30.21	7.6725	4.5250	3.1475	38.1425	0.681654	79.202989	8.251950	11.863407
12	0.54	32.50	7.2525	4.3800	2.8725	40.2925	1.340200	80.660172	7.129118	10.870509
13	14.50	24.02	3.6375	2.0475	1.5900	42.1575	34.394829	56.976813	3.771571	4.856787
14	15.39	23.32	4.2325	2.6975	1.5350	42.9425	35.838621	54.305176	3.574547	6.281656
15	12.70	23.20	2.6175	0.7425	1.8750	38.5175	32.972026	60.232362	4.867917	1.927695
16	5.72	34.66	6.4975	2.3925	4.1050	46.8775	12.202016	73.937390	8.756866	5.103728
17	8.96	25.65	4.2125	1.5150	2.6975	38.8225	23.079400	66.069934	6.948290	3.902376
18	5.23	35.70	7.4950	5.0975	2.3975	48.4250	10.800207	73.722251	4.950955	10.526588

Vibracore: VC28 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.0	1.039	1.970	2.781	1.844	1.412	-0.198	1.135
2.0	1.270	2.325	3.215	2.187	1.351	-0.199	0.892
3.0	1.213	2.053	2.660	1.887	1.228	-0.268	1.252
4.0	1.194	2.667	3.362	2.344	1.252	-0.341	0.686
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.281	2.326	2.967	1.415	2.135	-0.578	0.995
8.0	-2.303	1.750	2.599	0.654	2.347	-0.549	0.536
9.0	0.727	2.400	3.000	1.555	2.054	-0.591	1.167
10.0	2.098	2.493	2.864	2.454	0.672	-0.151	1.378
11.0	1.829	2.278	2.689	2.238	0.704	-0.137	1.204
12.0	1.324	2.002	2.484	1.904	0.928	-0.226	1.143
13.0	-2.335	0.458	1.675	-0.072	2.028	-0.288	0.583
14.0	-2.188	0.032	1.631	-0.208	1.975	-0.132	0.598
15.0	-2.116	0.359	1.671	-0.082	2.006	-0.238	0.620
16.0	-0.117	1.324	2.040	0.947	1.599	-0.366	1.002
17.0	-1.062	0.806	1.898	0.394	1.901	-0.280	0.798
18.0	1.235	1.980	2.430	1.495	1.540	-0.582	1.905


Core: VC28
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC31 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.92	0.97	1.01	1.76	3.31	6.68	5.04	9.42	8.99	3.28	0.30	0.06	0.01
1	1.19	2.37	1.37	1.41	1.78	3.07	4.63	6.98	11.01	7.18	0.58	0.11	0.01
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.17	0.23	0.53	1.04	2.62	4.45	6.04	15.23	6.70	1.00	1.03	0.30
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.77	0.78	0.36	0.56	1.39	3.73	4.10	5.56	12.40	6.81	0.77	0.55	0.11
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.25	0.15	0.36	1.43	5.07	5.60	7.33	12.38	4.36	0.33	0.17	0.07
18	0.20	1.66	0.70	0.90	1.60	4.69	5.47	7.48	11.64	4.28	0.43	0.20	0.09
19	0.00	0.10	0.20	0.36	1.03	3.78	6.57	8.07	11.62	4.53	0.92	1.00	0.57

Vibracore: VC31 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

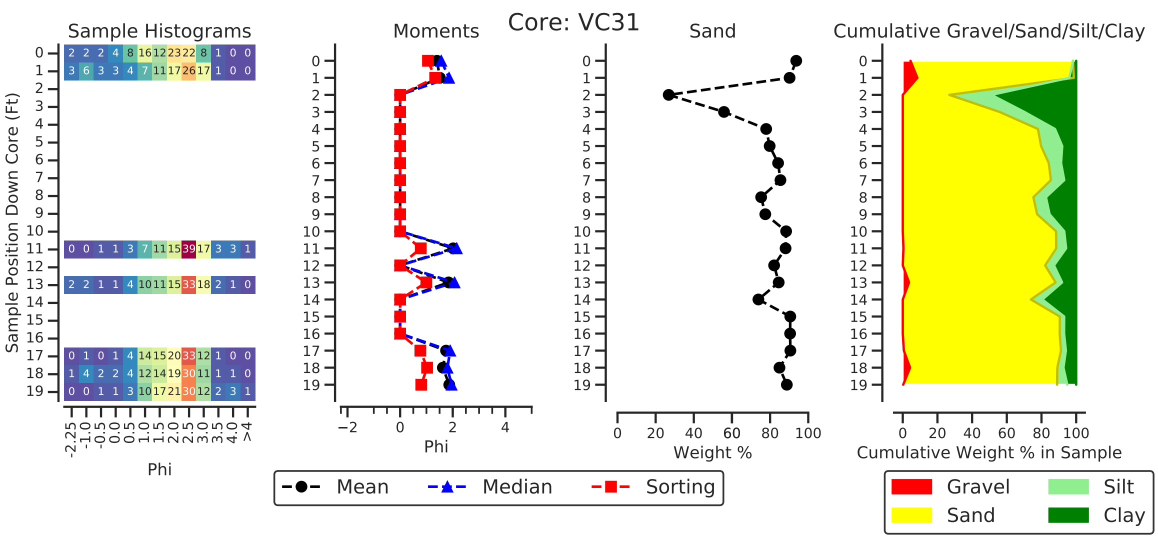
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0500	1.0447	1.1812	1.1744
1	500	1.0335	1.0295	1.1561	1.1964
2	800	1.0186	1.0105	1.5608	1.4059
3	900	1.0124	1.0013	1.3924	1.2906
4	800	1.0293	1.0332	1.3317	1.2452
5	700	1.0427	1.0022	1.3689	1.1920
6	600	1.0346	1.0128	1.3498	1.2312
7	800	1.0239	0.9900	1.2521	1.1504
8	800	0.9706	1.0073	1.3002	1.2693
9	700	1.0268	1.0339	1.3793	1.3058
10	800	0.9952	1.0264	1.2058	1.1919
11	600	1.0345	1.0120	1.2937	1.1971
12	800	0.9801	1.0144	1.2480	1.2343
13	700	1.0263	1.0511	1.2687	1.2505
14	900	1.0161	0.9888	1.3362	1.2530
15	500	1.0037	0.9934	1.2463	1.1980
16	600	1.0520	1.0211	1.2734	1.2100
17	500	0.9986	1.0115	1.2397	1.2088
18	500	0.9809	1.0397	1.2687	1.2687
19	500	1.0223	1.0157	1.2882	1.2034

Vibracore: VC31 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	1.89	39.85	0.7900	0.7425	0.0475	42.5300	4.443922	93.698566	0.111686	1.745826
1	3.56	38.12	0.5750	1.6725	-1.0975	42.2550	8.425038	90.214176	-2.597326	3.958111
2	0.00	6.49	17.6880	11.8160	5.8720	24.1780	0.000000	26.842584	24.286541	48.870874
3	0.00	15.92	12.6000	8.5185	4.0815	28.5200	0.000000	55.820477	14.311010	29.868513
4	0.00	28.60	8.0960	4.4800	3.6160	36.6960	0.000000	77.937650	9.853935	12.208415
5	0.00	31.21	7.9170	3.1430	4.7740	39.1270	0.000000	79.765891	12.201293	8.032816
6	0.00	34.36	6.4560	3.5520	2.9040	40.8160	0.000000	84.182673	7.114857	8.702470
7	0.00	30.05	5.1280	2.4160	2.7120	35.1780	0.000000	85.422707	7.709364	6.867929
8	0.00	28.00	9.1840	6.4800	2.7040	37.1840	0.000000	75.301205	7.271945	17.426850
9	0.00	30.41	8.8375	6.0165	2.8210	39.2475	0.000000	77.482642	7.187719	15.329639
10	0.00	33.70	4.4240	2.6200	1.8040	38.1240	0.000000	88.395761	4.731927	6.872311
11	0.17	38.87	5.0760	2.5530	2.5230	44.1160	0.385348	88.108623	5.719014	5.787016
12	0.00	30.80	6.7160	4.7960	1.9200	37.5160	0.000000	82.098305	5.117816	12.783879
13	1.55	36.23	5.0940	3.4790	1.6150	42.8740	3.615245	84.503429	3.766852	8.114475
14	0.00	27.99	9.9045	7.3890	2.5155	37.8945	0.000000	73.862962	6.638166	19.498872
15	0.00	34.27	3.5650	2.6150	0.9500	37.8350	0.000000	90.577508	2.510903	6.911590
16	0.00	34.65	3.6420	2.6670	0.9750	38.2920	0.000000	90.488875	2.546224	6.964901
17	0.25	37.18	3.5975	2.4325	1.1650	41.0275	0.609347	90.622144	2.839559	5.928950
18	1.86	37.39	4.7850	3.2250	1.5600	44.0350	4.223913	84.909731	3.542637	7.323720
19	0.10	38.08	4.7175	2.1925	2.5250	42.8975	0.233114	88.769742	5.886124	5.111020

Vibracore: VC31 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.685	1.563	2.122	1.400	1.058	-0.298	1.038
1.0	0.875	1.860	2.385	1.512	1.332	-0.486	1.271
2.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	1.566	2.151	2.474	2.016	0.784	-0.250	1.211
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	1.230	2.068	2.450	1.841	0.995	-0.425	1.172
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	1.189	1.902	2.320	1.745	0.768	-0.264	0.891
18.0	1.008	1.797	2.292	1.624	1.025	-0.363	1.206
19.0	1.321	1.954	2.385	1.867	0.803	-0.099	1.066



Core: VC31
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC32 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	2.25	3.06	2.36	2.57	3.15	4.91	4.58	7.27	8.05	3.78	0.52	0.21	0.16
1	8.09	3.57	1.91	2.05	1.92	2.80	3.04	4.12	4.65	2.89	0.73	0.38	0.29
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.06	0.15	0.21	0.30	0.82	1.97	9.60	14.59	5.48	0.98	0.65	0.33

Vibracore: VC32 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

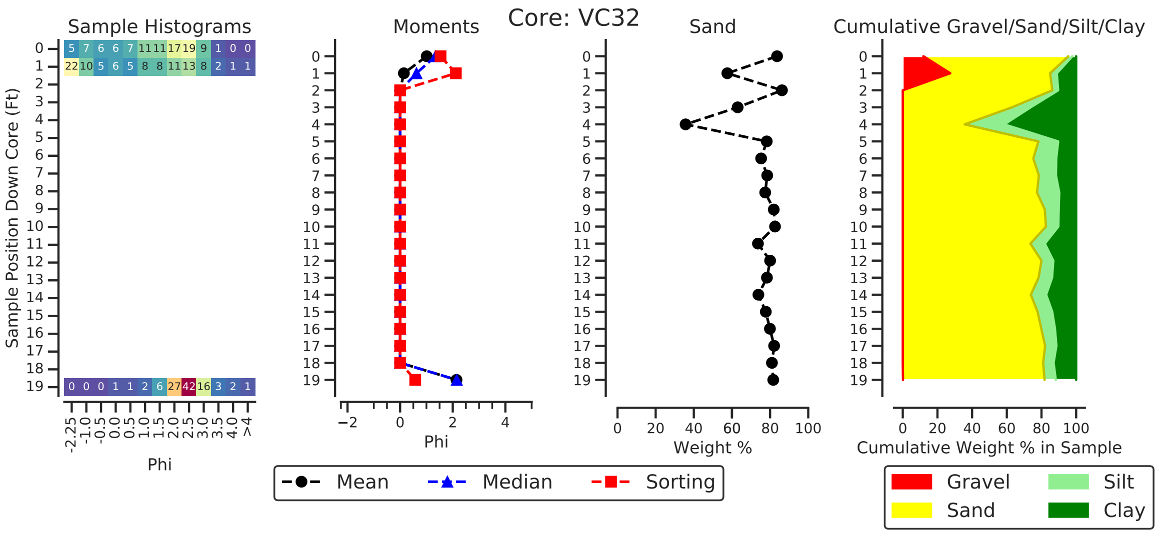
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0407	1.0367	1.2144	1.1760
1	500	1.0199	1.0469	1.3638	1.3369
2	600	1.0051	0.9841	1.2905	1.2240
3	800	1.0470	1.0161	1.4780	1.3511
4	1000	1.0011	1.0361	1.5203	1.4066
5	600	1.0021	1.0245	1.3760	1.2552
6	800	0.9867	1.0005	1.3325	1.2149
7	600	0.9867	1.0188	1.3543	1.2638
8	500	1.0154	0.9898	1.4529	1.2359
9	500	1.0296	0.9980	1.4169	1.2582
10	500	1.0064	1.0035	1.3501	1.2474
11	500	1.0017	1.0545	1.5041	1.4305
12	500	1.0124	0.9920	1.4143	1.2913
13	500	1.0343	1.0017	1.4702	1.3173
14	500	1.0150	1.0033	1.4957	1.3558
15	500	0.9940	0.9939	1.4210	1.2968
16	500	1.0026	1.0532	1.4114	1.3412
17	500	1.0453	1.0062	1.4307	1.2883
18	500	1.0352	1.0504	1.4208	1.3460
19	500	1.0389	0.9732	1.4357	1.2731

Vibracore: VC32 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	5.31	37.40	2.0025	0.9825	1.0200	44.7125	11.875874	83.645513	2.281241	2.197372
1	11.66	24.49	6.3875	4.7500	1.6375	42.5375	27.411108	57.572730	3.849545	11.166618
2	0.00	34.79	5.5620	4.1970	1.3650	40.3520	0.000000	86.216297	3.382732	10.400971
3	0.00	22.54	13.2400	9.4000	3.8400	35.7800	0.000000	62.996087	10.732253	26.271660
4	0.00	11.63	20.9600	13.5250	7.4350	32.5900	0.000000	35.685793	22.813747	41.500460
5	0.00	29.54	8.2170	3.9210	4.2960	37.7570	0.000000	78.237148	11.378023	10.384829
6	0.00	29.96	9.8320	4.5760	5.2560	39.7920	0.000000	75.291516	13.208685	11.499799
7	0.00	29.28	8.0280	4.3500	3.6780	37.3080	0.000000	78.481827	9.858475	11.659698
8	0.00	28.95	8.4375	3.6525	4.7850	37.3875	0.000000	77.432297	12.798395	9.769308
9	0.00	32.54	7.1825	4.0050	3.1775	39.7225	0.000000	81.918308	7.999245	10.082447
10	0.00	28.87	6.0925	3.5975	2.4950	34.9625	0.000000	82.574187	7.136217	10.289596
11	0.00	28.08	10.0600	6.9000	3.1600	38.1400	0.000000	73.623492	8.285265	18.091243
12	0.00	30.20	7.5475	4.9825	2.5650	37.7475	0.000000	80.005298	6.795152	13.199550
13	0.00	30.37	8.3975	5.3900	3.0075	38.7675	0.000000	78.338815	7.757787	13.903398
14	0.00	26.90	9.5175	6.3125	3.2050	36.4175	0.000000	73.865587	8.800714	17.333699
15	0.00	28.55	8.1750	5.0725	3.1025	36.7250	0.000000	77.739959	8.447924	13.812117
16	0.00	30.71	7.7200	4.7000	3.0200	38.4300	0.000000	79.911527	7.858444	12.230029
17	0.00	32.73	7.1350	4.5525	2.5825	39.8650	0.000000	82.102095	6.478114	11.419792
18	0.00	30.37	7.1400	4.8900	2.2500	37.5100	0.000000	80.965076	5.998400	13.036524
19	0.06	34.75	7.7500	4.9975	2.7525	42.5600	0.140977	81.649436	6.467340	11.742246

Vibracore: VC32 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	0.076	1.342	2.124	1.011	1.536	-0.373	1.027
1.0	-1.893	0.621	1.979	0.142	2.118	-0.260	0.630
2.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.0	1.775	2.153	2.454	2.143	0.574	-0.050	1.237


Core: VC32
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
5 7 6 6 7 11 11 17 19 9 1 0 0
22 10 5 6 5 8 8 11 13 8 2 1 1
0 0 0 1 1 2 6 27 42 16 3 2 1
-2.25 -1.0 -0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 >4
Phi
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay

Vibracore: VC33 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.0	0.90	1.36	0.75	0.86	1.05	2.23	2.72	7.58	10.71	8.82	4.51	0.69	0.09
1.0	0.48	1.22	0.63	0.66	1.07	2.27	2.94	8.39	11.98	9.20	2.15	0.30	0.06
2.0	0.00	0.43	0.31	0.50	0.55	1.00	1.74	6.39	11.02	10.92	6.31	0.96	0.15
3.0	0.07	1.56	0.82	0.75	0.65	0.98	2.82	8.12	8.42	8.21	2.92	0.39	0.04
4.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC33 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

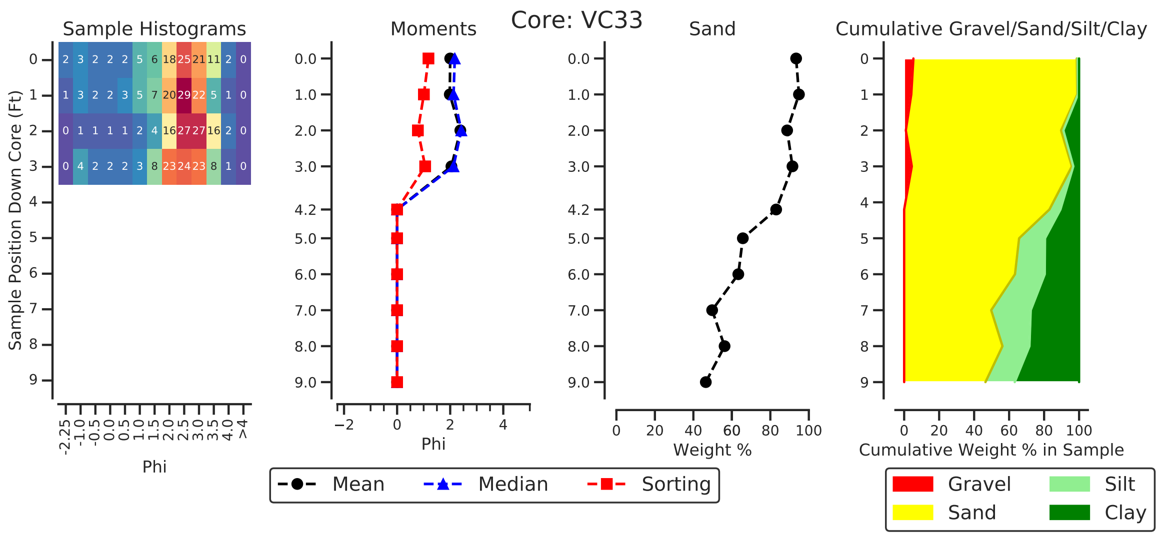
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.0	500	1.0613	1.0586	1.1801	1.1719
1.0	500	1.0586	1.0416	1.1739	1.1525
2.0	500	1.0545	1.0442	1.3330	1.3050
3.0	500	1.0293	1.0530	1.1892	1.2020
4.2	500	0.9870	1.0089	1.3415	1.2688
5.0	500	1.0108	1.0089	1.5664	1.3675
6.0	600	0.9883	1.0088	1.4647	1.3104
7.0	900	1.0187	1.0124	1.5029	1.3237
8.0	800	1.0226	1.0005	1.4612	1.3199
9.0	800	1.0067	1.0213	1.4590	1.3634

Vibracore: VC33 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.0	2.26	39.92	0.5600	0.3325	0.2275	42.7400	5.287787	93.401965	0.532288	0.777960
1.0	1.70	39.59	0.4425	0.2725	0.1700	41.7325	4.073564	94.866112	0.407356	0.652968
2.0	0.43	39.70	4.6125	4.0200	0.5925	44.7425	0.961055	88.729955	1.324244	8.984746
3.0	1.63	34.08	1.5375	1.2250	0.3125	37.2475	4.376133	91.496074	0.838982	3.288811
4.2	0.00	31.12	6.3625	3.9975	2.3650	37.4825	0.000000	83.025412	6.309611	10.664977
5.0	0.00	21.82	11.3900	6.4650	4.9250	33.2100	0.000000	65.703101	14.829871	19.467028
6.0	0.00	19.52	11.2920	6.0480	5.2440	30.8120	0.000000	63.351941	17.019343	19.628716
7.0	0.00	17.12	17.2890	9.5085	7.7805	34.4090	0.000000	49.754425	22.611817	27.633759
8.0	0.00	17.39	13.5440	8.7760	4.7680	30.9340	0.000000	56.216461	15.413461	28.370078
9.0	0.00	12.23	14.0920	9.6840	4.4080	26.3220	0.000000	46.463035	16.746448	36.790517

Vibracore: VC33 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	1.546	2.172	2.701	2.000	1.181	-0.366	1.592
1.0	1.564	2.126	2.575	1.984	1.009	-0.367	1.545
2.0	1.933	2.418	2.879	2.382	0.783	-0.180	1.220
3.0	1.579	2.125	2.660	2.046	1.057	-0.296	1.582
4.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000



Vibracore: VC34 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0.0	8.42	4.28	2.33	1.78	1.56	2.49	3.08	3.38	3.94	4.02	0.81	0.43	0.21
1.0	11.72	6.73	2.10	1.66	1.54	2.70	3.24	3.18	2.85	3.28	0.68	0.30	0.14
2.0	6.62	7.39	2.68	2.02	1.81	2.51	2.18	2.59	3.00	3.56	0.87	0.39	0.20
3.0	6.40	7.02	3.05	1.91	1.59	1.81	1.58	2.44	3.94	4.63	1.05	0.44	0.26
4.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Vibracore: VC34 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

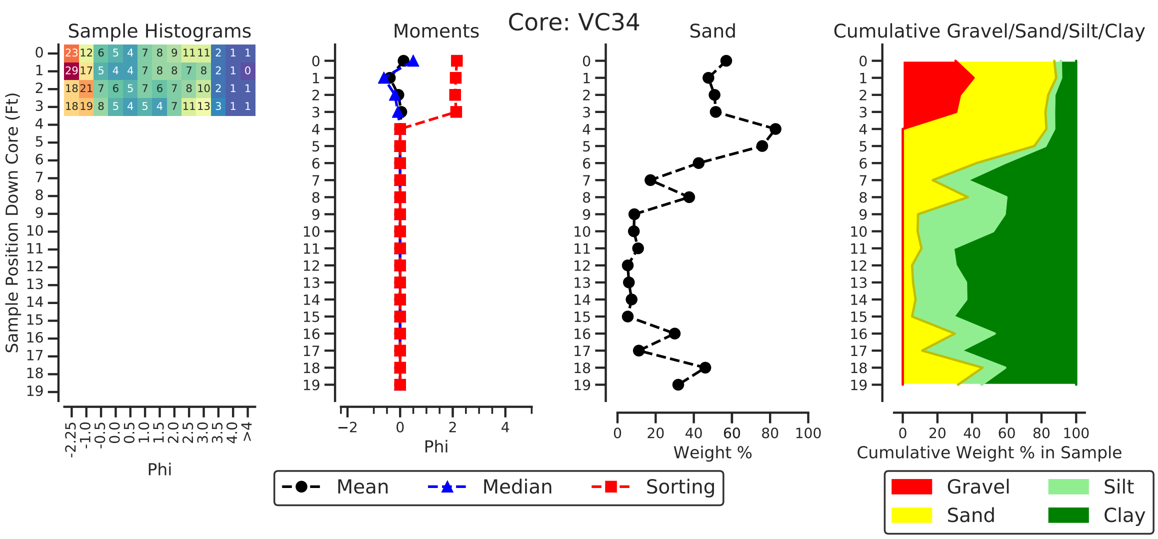
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0.0	500	1.0267	1.0261	1.3289	1.2740
1.0	500	1.0079	1.0148	1.3103	1.2713
2.0	600	1.0353	1.0104	1.3571	1.2884
3.0	500	1.0357	1.0343	1.4342	1.3565
4.0	600	1.0251	1.0706	1.3344	1.3253
5.0	1000	1.0576	1.0104	1.3643	1.2626
6.0	1000	0.9988	1.0096	1.4474	1.3598
7.0	900	0.9969	0.9893	1.6624	1.5186
8.0	1000	1.0454	1.0065	1.3760	1.2552
9.0	1000	1.0051	1.0120	1.3325	1.2149
10.0	1000	0.9853	1.0229	1.3543	1.2638
11.0	1000	0.9867	1.0290	1.5003	1.4578
12.0	1000	0.9845	1.0259	1.5281	1.4516
13.0	1000	1.0254	0.9873	1.5417	1.3686
14.0	1000	1.0335	1.0094	1.6078	1.4340
15.0	800	1.0292	1.0134	1.7805	1.6004
16.0	1000	1.0403	1.0236	1.5277	1.3835
17.0	900	1.0313	1.0057	1.7159	1.5426
18.0	600	1.0194	1.0009	1.7120	1.5500
19.0	1000	1.0067	1.0503	1.6140	1.5568

Vibracore: VC34 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0.0	12.70	23.82	5.2650	3.6975	1.5675	41.7850	30.393682	57.006103	3.751346	8.848869
1.0	18.45	21.53	5.2000	3.9125	1.2875	45.1800	40.836653	47.653829	2.849712	8.659805
2.0	14.01	21.61	6.8540	5.3400	1.5140	42.4740	32.984885	50.878184	3.564534	12.572397
3.0	13.42	22.44	7.7225	5.5550	2.1675	43.5825	30.792176	51.488556	4.973326	12.745942
4.0	0.00	30.34	6.2790	4.6410	1.6380	36.6190	0.000000	82.853164	4.473088	12.673749
5.0	0.00	32.51	10.3350	7.6100	2.7250	42.8450	0.000000	75.878165	6.360135	17.761699
6.0	0.00	12.91	17.4300	12.5100	4.9200	30.3400	0.000000	42.551088	16.216216	41.232696
7.0	0.00	5.31	25.4475	19.3185	6.1290	30.7575	0.000000	17.264082	19.926847	62.809071
8.0	0.00	6.94	11.5300	7.4350	4.0950	18.4700	0.000000	37.574445	22.171088	40.254467
9.0	0.00	1.10	11.3700	5.1450	6.2250	12.4700	0.000000	8.821171	49.919808	41.259022
10.0	0.00	1.26	13.4500	7.0450	6.4050	14.7100	0.000000	8.565602	43.541808	47.892590
11.0	0.00	2.50	20.6800	16.4400	4.2400	23.1800	0.000000	10.785160	18.291631	70.923210
12.0	0.00	1.26	22.1800	16.2850	5.8950	23.4400	0.000000	5.375427	25.149317	69.475256
13.0	0.00	1.32	20.8150	14.0650	6.7500	22.1350	0.000000	5.963406	30.494692	63.541902
14.0	0.00	1.89	23.7150	16.2300	7.4850	25.6050	0.000000	7.381371	29.232572	63.386057
15.0	0.00	1.48	26.0520	19.4800	6.5720	27.5320	0.000000	5.375563	23.870405	70.754032
16.0	0.00	8.30	19.3700	12.9950	6.3750	27.6700	0.000000	29.996386	23.039393	46.964221
17.0	0.00	3.31	26.3070	19.6605	6.6465	29.6170	0.000000	11.176014	22.441503	66.382483
18.0	0.00	15.16	17.7780	13.4730	4.3050	32.9380	0.000000	46.025867	13.070010	40.904123
19.0	0.00	11.85	25.3650	20.3250	5.0400	37.2150	0.000000	31.841999	13.542926	54.615075

Vibracore: VC34 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	-2.027	0.498	2.029	0.131	2.157	-0.200	0.605
1.0	-2.394	-0.617	1.563	-0.391	2.113	0.156	0.616
2.0	-1.855	-0.198	1.819	-0.067	2.090	0.073	0.662
3.0	-1.782	-0.084	2.164	0.045	2.131	0.056	0.619
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
15.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
17.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000


Core: VC34
Sample Histograms
Sample Position Down Core (Ft)
Phi
Moments
Phi
Mean
Median
Sorting
Sand
Weight %
Cumulative Gravel/Sand/Silt/Clay
Cumulative Weight % in Sample
Gravel
Sand
Silt
Clay

Vibracore: VC37 Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
0	0.00	0.00	0.03	0.04	0.10	0.22	0.73	5.23	17.49	14.10	2.02	0.79	0.10
1	0.00	0.00	0.00	0.01	0.02	0.12	0.48	4.50	17.84	14.41	2.08	0.68	0.07
2	0.14	0.05	0.00	0.01	0.05	0.19	0.60	5.64	17.61	10.75	1.52	0.38	0.01
3	0.00	0.42	0.17	0.18	0.28	0.59	1.23	7.00	18.13	10.35	1.73	0.34	0.00
4	0.26	1.15	0.52	0.46	0.46	0.64	1.00	5.59	16.33	12.45	1.73	0.99	0.10
5	0.07	1.30	0.54	0.45	0.55	1.00	1.89	7.24	16.98	11.02	1.22	0.32	0.00
6	0.00	0.16	0.03	0.07	0.14	0.46	1.89	7.91	16.63	13.62	1.64	0.70	0.08
7	0.00	0.00	0.00	0.02	0.07	0.23	0.67	5.95	17.08	13.14	2.26	0.96	0.08
8	0.28	1.32	0.51	0.43	0.48	0.63	0.95	6.15	15.80	9.83	1.31	0.49	0.03
9	1.03	0.73	0.21	0.18	0.19	0.30	0.74	4.93	14.27	10.81	1.40	0.57	0.04
10	0.00	0.18	0.27	0.40	0.33	0.42	0.93	5.67	16.95	15.56	2.00	0.74	0.11
11	0.00	0.01	0.03	0.10	0.15	0.31	0.98	6.60	14.03	12.04	3.06	1.29	0.14
12	0.00	0.24	0.08	0.10	0.16	0.38	0.96	5.18	16.25	16.42	2.90	0.67	0.08
13	0.00	0.04	0.05	0.07	0.18	0.52	1.78	6.90	14.19	13.87	2.24	0.76	0.14
14	0.00	0.15	0.07	0.07	0.12	0.26	1.09	6.99	16.48	14.05	1.85	0.58	0.13
15	0.13	0.00	0.00	0.00	0.00	0.19	0.72	5.24	14.84	14.55	3.00	1.22	0.23

Vibracore: VC37 Wet (pipetted $< 63\mu m$) Weight Fraction (g)

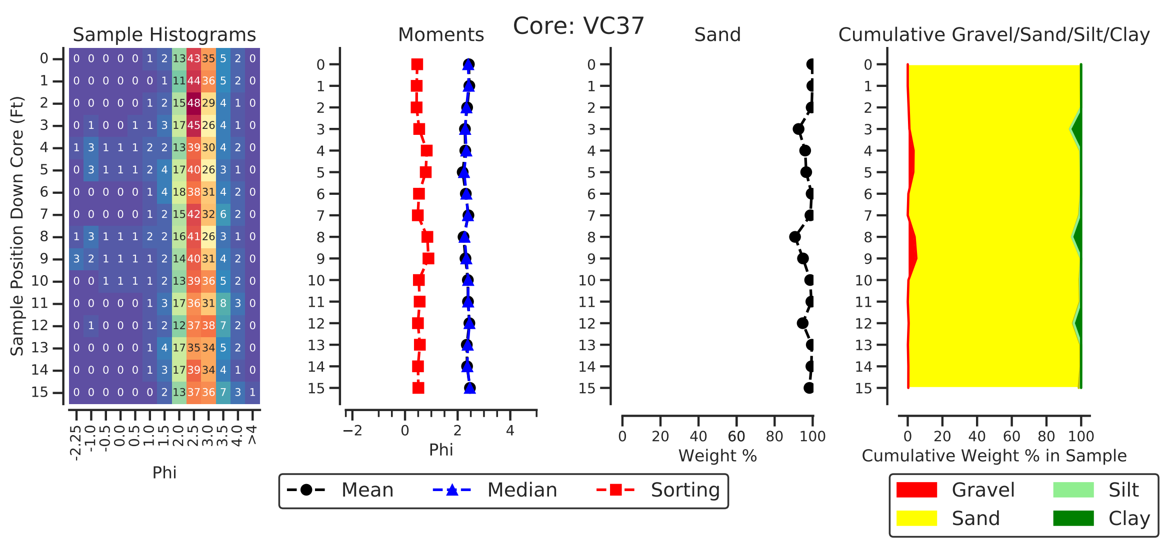
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
0	500	1.0235	1.0624	1.1085	1.1408
1	500	1.0671	1.0442	1.1306	1.1062
2	500	1.0395	1.0831	1.1054	1.1471
3	600	1.0665	1.0146	1.2593	1.2066
4	500	1.0248	1.0497	1.1305	1.1557
5	500	1.0297	1.0666	1.1329	1.1681
6	500	1.0041	1.0360	1.0757	1.1072
7	500	1.0301	1.0435	1.1462	1.1576
8	500	1.0327	1.0490	1.2171	1.2341
9	500	1.0376	1.0852	1.1284	1.1727
10	500	1.0519	1.0324	1.1634	1.1419
11	500	1.0563	1.0340	1.1610	1.1375
12	500	1.0549	1.0492	1.2377	1.2278
13	500	1.0576	1.0820	1.1580	1.1730
14	500	1.0892	1.0207	1.1892	1.1102
15	600	1.0761	1.0532	1.1868	1.1559

Vibracore: VC37 Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
0	0.00	40.75	0.1000	0.0000	0.1000	40.8500	0.000000	99.755202	0.244798	0.000000
1	0.00	40.14	0.0700	0.0000	0.0700	40.2100	0.000000	99.825914	0.174086	0.000000
2	0.19	36.75	0.0100	0.0000	0.0100	36.9500	0.514208	99.458728	0.027064	0.000000
3	0.42	40.00	2.7840	2.7600	0.0240	43.2040	0.972132	92.584020	0.055550	6.388297
4	1.41	40.17	0.2425	0.1500	0.0925	41.8225	3.371391	96.048778	0.221173	0.358659
5	1.37	41.21	0.0800	0.0375	0.0425	42.6600	3.211439	96.601031	0.099625	0.087904
6	0.16	43.09	0.0800	0.0000	0.0800	43.3300	0.369259	99.446111	0.184630	0.000000
7	0.00	40.38	0.4825	0.3525	0.1300	40.8625	0.000000	98.819211	0.318140	0.862649
8	1.60	36.58	2.1400	2.1275	0.0125	40.3200	3.968254	90.724206	0.031002	5.276538
9	1.76	33.60	0.0400	0.0000	0.0400	35.4000	4.971751	94.915254	0.112994	0.000000
10	0.18	43.27	0.3975	0.2375	0.1600	43.8475	0.410514	98.682935	0.364901	0.541650
11	0.01	38.59	0.2575	0.0875	0.1700	38.8575	0.025735	99.311587	0.437496	0.225182
12	0.24	43.10	2.1500	1.9650	0.1850	45.4900	0.527588	94.746098	0.406683	4.319631
13	0.04	40.56	0.1500	0.0000	0.1500	40.7500	0.098160	99.533742	0.368098	0.000000
14	0.15	41.56	0.1300	0.0000	0.1300	41.8400	0.358509	99.330784	0.310707	0.000000
15	0.13	39.76	0.5510	0.0810	0.4700	40.4410	0.321456	98.316065	1.162187	0.200292

Vibracore: VC37 Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
0.0	2.110	2.402	2.741	2.426	0.463	0.041	1.057
1.0	2.138	2.420	2.749	2.444	0.443	0.046	1.036
2.0	2.073	2.335	2.659	2.360	0.440	0.017	1.013
3.0	2.006	2.285	2.612	2.277	0.539	-0.120	1.257
4.0	2.010	2.329	2.695	2.290	0.825	-0.302	2.122
5.0	1.835	2.243	2.587	2.191	0.787	-0.339	1.760
6.0	2.005	2.331	2.691	2.310	0.530	-0.099	1.034
7.0	2.093	2.389	2.741	2.410	0.486	0.061	1.073
8.0	1.903	2.264	2.607	2.223	0.849	-0.355	2.149
9.0	2.019	2.329	2.684	2.297	0.890	-0.357	2.503
10.0	2.079	2.401	2.742	2.387	0.526	-0.109	1.148
11.0	2.054	2.399	2.784	2.393	0.556	0.030	1.061
12.0	2.116	2.450	2.781	2.445	0.491	-0.043	1.067
13.0	2.023	2.382	2.746	2.347	0.564	-0.097	1.086
14.0	2.052	2.369	2.719	2.358	0.493	-0.043	0.984
15.0	2.126	2.464	2.808	2.467	0.507	0.024	1.091



Vibracore: VC37A Dry Mechanical Sieve Weight Fraction (g) by Screen

Depth (ft)	-2.25ϕ	-1ϕ	-0.5ϕ	0ϕ	0.5ϕ	1.0ϕ	1.5ϕ	2.0ϕ	2.5ϕ	3.0ϕ	3.5ϕ	4.0ϕ	pan
13	0.06	0.32	0.17	0.26	0.57	1.36	2.80	8.82	13.57	10.91	2.06	0.73	0.03
14	0.00	0.61	0.38	0.46	0.51	1.20	2.57	8.04	11.33	9.47	1.92	0.84	0.06
15	0.00	0.56	0.25	0.40	0.53	1.21	2.22	5.88	8.30	5.72	1.89	2.20	0.80
16	0.33	0.57	0.24	0.23	0.22	0.37	0.99	3.65	7.67	6.66	1.07	0.71	0.21
17	0.00	0.46	0.38	0.27	0.24	0.32	0.35	1.58	6.33	14.22	6.91	6.25	0.81
18	0.00	0.60	0.40	0.35	0.27	0.39	0.44	1.76	9.13	16.75	4.15	1.02	0.16

Vibracore: VC37A Wet (pipetted $< 63\mu m$) Weight Fraction (g)

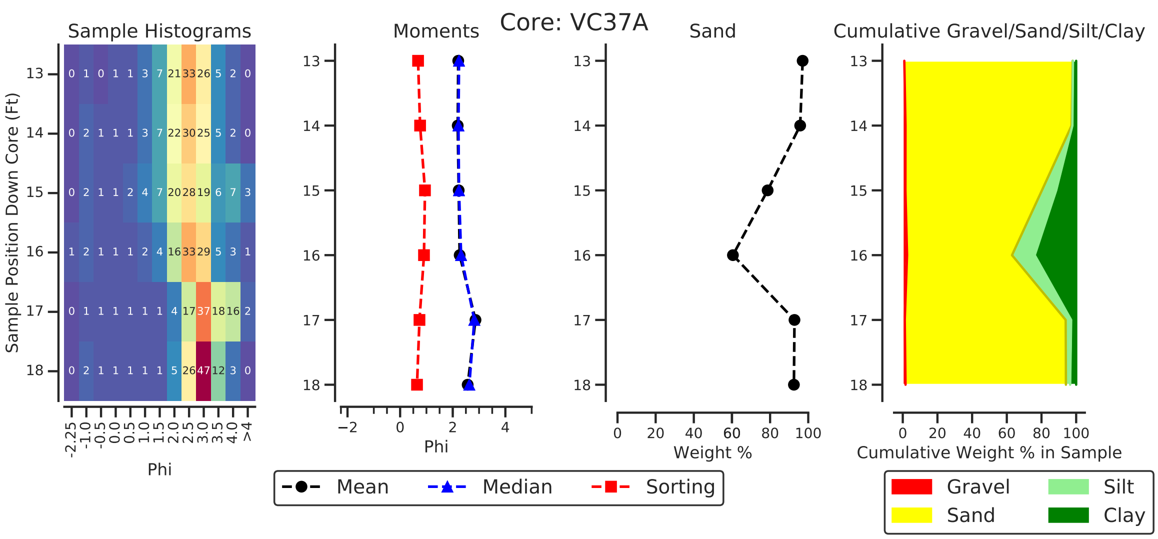
Depth (ft)	Cyl Vol (ml)	Pan Wt. 1st Draw (g)	Pan Wt. 2nd Draw (g)	Sample Wt. 1st Draw (g)	Sample Wt. 2nd Draw (g)
13	500	0.9820	1.0363	1.1157	1.1675
14	500	0.9917	1.0331	1.1299	1.1664
15	700	1.0143	1.0314	1.2965	1.2511
16	1000	1.0338	1.0159	1.3964	1.2882
17	500	1.0031	1.0267	1.1670	1.1727
18	500	1.0346	0.9809	1.2169	1.1329

Vibracore: VC37A Weight and Percent Weight by Size Class

Depth (ft)	GravelWt	SandWt	TotalFinesWt	ClayWt	SiltWt	TotalWt	GravelWtPct	SandWtPct	SiltWtPct	ClayWtPct
13	0.38	41.25	0.8725	0.7800	0.0925	42.5025	0.894065	97.053115	0.217634	1.835186
14	0.61	36.72	1.0150	0.8325	0.1825	38.3450	1.590820	95.762159	0.475942	2.171078
15	0.56	28.60	7.1770	4.1895	2.9875	36.3370	1.541129	78.707653	8.221647	11.529570
16	0.90	21.81	13.3400	8.6150	4.7250	36.0500	2.496533	60.499307	13.106796	23.897365
17	0.46	36.85	2.4075	1.1500	1.2575	39.7175	1.158180	92.780261	3.166111	2.895449
18	0.60	34.66	2.2175	1.3000	0.9175	37.4775	1.600961	92.482156	2.448136	3.468748

Vibracore: VC37A Descriptive Statistics (Log Inclusive Graphics Method)

Depth (ft)	Q1	Median	Q3	Mean	SD	Skew	Kurt
13.0	1.776	2.238	2.652	2.209	0.682	-0.146	1.133
14.0	1.725	2.217	2.655	2.189	0.759	-0.169	1.250
15.0	1.697	2.237	2.773	2.226	0.944	-0.061	1.359
16.0	1.881	2.317	2.719	2.263	0.907	-0.286	1.898
17.0	2.468	2.821	3.321	2.865	0.735	-0.028	1.237
18.0	2.254	2.630	2.895	2.567	0.642	-0.312	1.749


Core: VC37A
Sample Histograms
Moments
Sand
Cumulative Gravel/Sand/Silt/Clay
Sample Position Down Core (Ft)
Phi
Weight %
Cumulative Weight % in Sample
Mean
Median
Sorting
Gravel
Sand
Silt
Clay