GEOTECHNICAL SUBSURFACE INVESTIGATION

FOR

USS BATTLESHIP NORTH CAROLINA
LIVING WITH WATER IMPROVEMENTS

FEBRUARY 17, 2021

MOFFATT & NICHOL PROJECT NO. 10258/01
CATLIN PROJECT NO. 220161

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TABLE OF CONTENTS

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1.0 INTRODUCTION

The purpose of this project is to provide geotechnical information pertaining to activities proposed on the Battleship United States Ship (USS) North Carolina (Battleship) Living with Water Master Plan (Master Plan) dated April 7, 2020. The project site is located in New Hanover County along to the Cape Fear River in Wilmington, North Carolina north of the intersection of USS North Carolina Road and Battleship Road.

The USS Battleship project is to construct a service park to provide parking and walking access to the USS battleship. This project includes a parking lot at the east section, a future parking lot at the west section, walkway access to the USS Battleship, and a pedestrian bridge above a proposed tidal creek between the parking lots. Currently, the project site is partially developed and covered with asphalt pavement, grass and trees.

2.0 SCOPE OF INVESTIGATION

The Project Scope included the following tasks.

- Coordinate subsurface utility locate by NC 811 and Battleship personnel at proposed testing locations.
- Advance 19 Cone Penetration Test (CPT) soundings.
- Advance four (4) Direct Push Technology (DPT) soil borings.
- Collect two (2) bulk samples.
- Survey CPT, DPT, and bulk sample locations.
- Conduct laboratory testing.
- Geotechnical engineering analysis, recommendations, and reporting

3.0 FIELD EXPLORATION

Catlin Engineers and Scientists (CATLIN) conducted the field exploration for this project between December 11th and the 29th 2020.

Coordinates of proposed testing locations were determined using a georeferenced site plan provided by Moffatt and Nichol. Coordinates were input into a mapping grade (less than three horizontal feet accuracy) global positioning system (GPS) which was utilized by CATLIN personnel to physically mark the proposed testing locations. NC ONECALL associates and Battleship personnel were contacted to "clear" the proposed testing sites with relevance to underground utilities. Subsequent to completion of the testing, the ground surface elevation and location of each boring was collected using a real time kinematic (RTK) GPS. All units are recorded to the nearest foot horizontally using the North Carolina State Plane (NCSP) North American Datum 1983 (NAD83) coordinate system and one tenth of a foot vertically on the North American Vertical Datum 1988 (NAVD88). Testing locations are presented on Figure 2. Testing location NCSP NAD83 coordinates and NGVD88 elevations are presented on sounding and boring logs included in Appendix A.

3.1 Cone Penetration Testing

Sixteen CPT probes were advanced in general accordance with the American Society of Testing Materials (ASTM) Method D-5778 with a track-mounted CPT rig equipped with a Vertex electronic piezocone tip. The cone was pushed at a rate of 0.8 inches per second (in/sec). The piezocone had a base area of 1.6 square inches, a diameter of 1.4 inches, and a height of 1.2 inches corresponding to a 60° apex angle. The friction sleeve to which the cone was attached had a 1.4-inch diameter. Data collected from the CPT soundings includes cone tip resistance, sleeve friction resistance, and pore water pressure. Soundings were advanced to the proposed target depths or until equipment refusal occurred. Equipment refusal (CPT refusal) was encountered when the reaction force of the CPT (approximately nine (9) tons) was determined to be less than the force applied on the tooling string resulting in a physical "lift" of the CPT machinery. Data generated during the soundings was processed by CATLIN personnel using Coneplot CPT Processing software (Version 2.6.3) then post processed using gINT Geotechnical and Geoenvironmental software (Connect Edition Version 10.00.00.50) to facilitate generation of Sounding Reports and Subsurface Profiles. Testing locations are presented on Figure 2 and CPT Sounding Logs are presented in Appendix A.

3.2 Direct Push Technology Borings

Four (4) DPTs were advanced by CATLIN personnel immediately (within three horizontal feet) adjacent to four (4) existing CPT locations. The DPT borings were advanced to facilitate soil sample collection for physical descriptions and laboratory analysis to corroborate CPT software soil behavior type (SBT) interpretation. Direct push borings were advanced with a Geoprobe sampling system mounted on CATLIN's CPT machine. Samples were collected in four-foot intervals by advancing the dual tube sampling tooling

using a combination of a percussion hammer, machine reaction force, and hydraulics. Subsequent to each four-foot tooling advancement, the inner rods and sample collection tube (acetate liner) was removed, labeled, and stored for processing and logging at CATLIN's Wilmington office. DPT Boring Logs are presented in conjunction with the adjacent CPT soundings in Appendix A.

3.3 Bulk Sample Collection

Two (2) bulk samples were collected within the limits of the proposed parking area. These soils were collected using a manual auger, sealed in labeled 5-gallon buckets, and transported to CATLIN's Soil Laboratory in Wilmington, North Carolina for further analysis.

3.4 Groundwater Measurement and Borehole Abandonment

Groundwater levels across the project site were estimated from pore pressure readings obtained during the advancement of the CPT soundings and measured, where possible, in the open boreholes subsequent to advancement of the CPT. Estimated and measured depth to water ranged from 1.3 to 4.3 feet BLS which roughly corresponds to the observed levels of the Cape Fear River during the investigation. It is likely that these water levels will be tidally influenced and fluctuate relative to the water level of Cape Fear River.

Observed groundwater depths are presented on the CPT Sounding Logs in Appendix A and the subsurface profiles on Figures 3 through 5.

4.0 LABORATORY TESTING

Ten soil samples were collected from the DPT borings and submitted to CATLIN's Geotechnical Laboratory in Wilmington, North Carolina for one or more of the following analysis:

Test Description	Test Method
Engineering Soil Classification	ASTM D 2487
Sieve Analysis	ASTM D 6913
Atterberg Limits (Multi Point)	ASTM D 4318
Soil Moisture Content	ASTM D 2216
Organic Content	ASTM D 2974

Two (2) bulk samples were collected from the subject site and submitted to CATLIN's Geotechnical Laboratory for the following analysis:

Test Description	Test Method
California Bearing Ratio (1 Point)	ASTM D 1883

The results of the geotechnical laboratory analyses were utilized to refine the visual classifications of the site soils, correlate the CPT interpreted soil type with site soils, and provide geotechnical characteristics of the soils. Results of the laboratory testing performed during this investigation are included in Appendix B.

5.0 REGIONAL, LOCAL, AND SITE GEOLOGY

According to the Geologic Map of North Carolina (1985), the project site lies within the Coastal Plain Physiographic Province of North Carolina. According to Horton and Zullo in The Geology of the Carolinas (1991), the Coastal Plain is comprised of a seaward thickening wedge of post-Triassic, primarily unconsolidated, siliciclastic sediments and carbonate rocks that extend from the Fall Line to the continental shelf break. Coastal Plain sediments were deposited in a number of different environments including but not limited to, off-shore marine, near-shore marine, lagoonal, and deltaic. The eustatic rise and fall of sea level has resulted in numerous sedimentary packages of transgressive and regressive sequences deposited throughout the Coastal Plain.

According to the USGS Online Spatial Data website, the primary geologic formations found in New Hanover County, North Carolina include:

- Undifferentiated Coastal Plain deposits (Quaternary) - Comprised primarily of alluvial, eolian, fluvial, and lacustrine deposited marine sediments consisting of gravel, sand, silt, and clay.
- Castle Hayne Formation (Tertiary) - limestone with solution cavities common. New Hanover Member exhibits phosphate-pebble conglomerate with micritic thin layers.
- Peedee Formation (Cretaceous) - primarily unconsolidated greenish gray to olive black, clayey sand and clay which may be locally fossiliferous and calcareous

Land surface at the site is covered with asphalt pavement and grass with elevations at the testing locations ranging from 1.7 to 4.4 feet. Data generated during this investigation identified three (3) primary strata extending to an elevation of approximately minus 20 feet.

Material encountered from land surface to an average elevation of zero was identified as “recent” fill likely emplaced shortly prior to the construction of the battleship facility. The recent fill was described as light brown to gray consisting of fine to coarse sand and silty sand. A substantial amount of CPT SBT interpretation through this stratum was reported

as “Out of Range” which along with increased tip pressure readings indicates that this material is likely to consist of dense coarse sand and gravel.

Sand, gravelly sand, and silty to clayey sand interbedded with moderately to highly organic silt and clay rich layers extends from beneath the recent fill to elevations ranging from roughly -4 to -10 feet. The origin of this material is unclear as it appears to be a mixture of “historical fill” that may have been emplaced during the early periods of the development of Wilmington and the associated riverfront industries and alluvial over wash which has likely occurred during the many flooding events that have occurred through the site’s history. CPT and DPT refusal was encountered at elevations ranging from approximately -3 to -8 feet in soundings and borings advanced adjacent to the river indicating that large fill debris may exist in the subsurface in this vicinity.

Highly organic (organic content values ranging from 28.5% to 49.1%) alluvial silt and clay with wood fragments was encountered beneath the historical fill to an average elevation of minus 20 feet. This organic material appeared to be very soft with little to no tip or sleeve resistance indicated in the CPT data.

Sands and sand mixtures with thin layers of clays and organics (as indicated by the CPT SBT) extend from below the highly organic silts and clays to elevations ranging from -31.6 feet and -34.2 feet where CPT refusal was encountered in soundings CPT-09 and CPT-08, respectively. Based on relatively rapid increase in tip resistance noted in the CPT soundings, the refusal is likely due to the presence of limestone.

Subsurface profiles are presented on Figures 3 through 5. CPT and DPT logs are included in Appendix A.

6.0 SUMMARY RECOMMENDATIONS

The conclusions and preliminary recommendations presented in this report are based on the project description and soil data obtained from our field and laboratory testing, CPT sounding data, assumed continuity of the soils between borings, and generally accepted geotechnical engineering practices.

The borings/soundings performed at this site represent subsurface conditions at the location of the borings/soundings only; therefore, undisclosed subsurface conditions requiring special preparation may be revealed during construction, especially for those proposed structures located significant distances from our soil borings.

6.1 Pavement Design

6.1.1 California Bearing Ratio Testing

The California Bearing Ratio (CBR) test is a penetration test used to evaluate the subgrade strength of roads and pavements. A total of two (2) composite soil samples were obtained from approximately 0 feet to 4 feet BLS at four (4) boring locations within the proposed parking lot and driveway areas. These soil samples were brought to the CATLIN Soil Laboratory for testing in accordance with the 1-point CBR test procedures outlined in ASTM D 1883. In the 1-point CBR test, the soil samples will be compacted using 56 blow counts per layer. The CBR test results are shown in the Table 1 below and included in Appendix B. The results of these tests are used with the curves to determine the thickness of pavement and its component layers. Typically, CBR of soils decreases as moisture content increases above the optimum moisture content. Soil types have different effects on CBR as well, often related to their particle size; sandy soils generally have high CBR, while saturated fine-grained soils (clays and silts) have low CBR.

Table 1 *– CBR Test Results*

BORING	POINT ID	Blows Per Layer	Corrected CBR @ 0.1″ (%)	Corrected CBR @ 0.2″ (%)
CBR_01	CBR-01-01	56	9.2	11.2
	CBR-01-02	56	9.2	11.2
	CBR-01-03	56	11.9	14.8
	CBR-01-04	56	7.8	10.6
CBR_02	CBR-02-01	56	7.8	8.9
	CBR-02-02	56	12.5	16.2
	CBR-02-03	56	9.9	9.5

Refer to the laboratory results in Appendix B for more detail on the results of the CBR testing.

6.1.2 Pavement Thickness Recommendations

Based on the subsurface information and anticipated vehicle loads at the site, we recommend the following minimum thickness for the parking lots:

<u>Heavy Duty Bituminous Concrete Pavement Section (Driveways)</u>

- 1.5 inches NCDOT HMA Surface Course Type S9.5C
- 2.5 inches NCDOT Intermediate Course Type I9.0C
- 8 inches NCDOT Aggregate Base Course
- Stabilization Geotextile (AASHTO M288 Class 1 Woven, elongation <50%,

seams overlap 24" min.)

Light Duty Bituminous Concrete Pavement Section (Parking Stalls)

- 3 inches NCDOT HMA Surface Course Type S9.5C
- 8 inches NCDOT Aggregate Base Course
- Stabilization Geotextile (AASHTO M288 Class 1 Woven, elongation <50%, seams overlap 24" min.)

Concrete Walkway Pavement Section

- 4 inches Portland Cement Concrete
- 4 inches NCDOT Aggregate Base Course

6.2 Pedestrian Bridge End Bents Foundation Recommendations – Driven Pile

6.2.1 Driven Pile Capacities

Based on the current site conditions and anticipated structural loading, CATLIN recommends that the proposed end bents of the pedestrian bridge be supported on either HP 12x53 Piles or 10-inch to 12-inch diameter timber piles. The pile vertical and lateral capacities and estimated settlement under loadings equal to the allowable compressive capacities are shown in Table 2 below:

Table 2 *– Driven Pile Capacities*

Pile	Penetration Depth, BLS (Tip Elevation) (ft)	Allowable Compressive Capacity (kips)	Allowable Uplift Capacity (kips)	Settlement (in.)	Allowable Lateral Capacity, Fixed Head Pile Top Deflection = 1/4 in. (kips)
HP 12 x 53	25	10	5	<0.5	17
HP 12 x 53	30	18	7	<0.5	17
HP 12 x 53	35	22	9	<0.5	17
HP 12 x 53	40	27	10	<0.5	17
HP 12 x 53	45	32	12	<0.5	17
HP 12 x 53	50	41	14	<0.5	17
10" Timber	25	9	3	<0.5	7
10" Timber	30	19	4	<0.5	7
12" Timber	25	13	3	<0.5	11
12" Timber	30	27	5	<0.5	11

The ultimate vertical capacities and settlements of the driven piles were calculated using APILE program and the US Army Corps of Engineers Method, the Federal Highway Method, and the API RP-2A Method. The capacity values provided by the US Army Corps of Engineers Method were selected as the design ultimate capacities. A factor of safety (FS) of 2.0 was used for the allowable compressive capacity determination and a factor of

safety of 3.0 was used for the allowable uplift capacity determination. Lateral capacities for the piles were calculated utilizing LPILE analysis. The allowable lateral capacities were determined under the criteria that the allowable horizontal fixed head deflection is ¼ inch. The axial thrust utilized in the lateral analysis is equal to the allowable axial compressive load corresponding to the pile length used (see previous table for values). Larger axial thrust values may reduce lateral capacities.

6.2.2 Driven Pile Spacing

The individual pile capacities within a pile group will be reduced if the piles are installed too close to each other since the stress that transmitted from pile to the soil will overlap. In order to prevent a reduction in axial capacity due to "group effect", piles should be installed with a minimum center-to-center spacing of 3 times of pile side dimensions.

6.2.3 Construction/Installation Considerations

It is recommended that two overlength test piles (at least 5 feet longer than anticipated production piles), or indicator piles, be driven to establish pile driving criteria, production pile lengths, and the need to auger pilot holes prior to driving for production piles. Test piles may be used as production piles if the required pile capacity is reached. Production piles should not be ordered until the length estimates have been determined and verified; however, the overlength test piles can be driven in the locations for production piles.

Pile driving criteria and actual pile penetration depths shall be established during driving through dynamic testing with a Pile Driving Analyzer (PDA) and by applying the North Carolina State Building Code. All pile driving operations and static and dynamic testing should be observed by a soil technician working under the direction of a registered professional engineer. Static testing of the pile should be in accordance with ASTM D1143. The engineer should develop driving criteria for the project using both a wave equation analysis (once the contractor has designated the pile hammer to be utilized for driving) and results from dynamic monitoring of test piles with signal matching analyses (CAPWAP).

The potential exists that the recommended pile penetration depths may not meet the respective minimum criterion in some areas, due to the generation of excessive pore pressures within the clay and/or silt strata during driving, causing a temporary loss of shear strength. Once these large pore pressures have dissipated (assumed to take 3 to 7 days), the soil should regain strength and the piles should gain bearing capacity, a phenomenon known as pile "set-up". Dynamic testing with a PDA should be performed during restrike of the test piles after a sufficient waiting period for pile "set-up" to occur. It is recommended that pile restrikes be performed 3 days after initial driving.

6.3 Earthwork Operations

6.3.1 Site Drainage

Due to the occurrence of shallow standing water in soils in some areas on site and their sensitivity to moisture arising from their fine texture, earthwork operations will be hampered by a tendency for exposed surfaces to degrade under traffic. Much of this degradation and the consequent need for subgrade repair or replacement can be obviated by the implementation of a system of overall site subgrade drainage. Standing water levels recorded in boreholes located near existing site drainage features suggest that ditching may be effective in depressing the level of shallow groundwater.

Temporary site drainage ditches should follow the approximate routing of the designed stormwater drains and roadway swales. They should be deep enough to drain the in-place soils to a depth of at least two and one-half feet below the deepest cuts occurring in the grading scheme.

It is possible that some additional and/or alternative temporary dewatering measures, such as well points or sumps, will need to be implemented for the foundation construction since some excavations may have to be maintained below the water table.

6.3.2 Site Preparation and Grading

Site preparation should be initiated by clearing and grubbing the root systems of any trees occurring within the limits of construction and stripping surficial organic laden soil and surface vegetation. Surface stripping of up to approximately 6 inches over the undeveloped portion. Site preparation in areas of existing pavement to be demolished should consist of removal of pavement and aggregate base course (depending on plans for new parking/drive areas). To the extent possible, pneumatic-tired vehicles should be kept off areas exposed after stripping or exposed in cut. Where fill is placed, it should be end-dumped and spread with a bulldozer. Areas should be shaped to drain at the end of each workday or when rain is anticipated, as the on-site clays will readily degrade when saturated.

Prior to backfilling, the exposed subgrade in these areas should be proof rolled with a heavy smooth-drum roller or a loaded tandem-axle dump truck to identify regions of yielding soil. Where such regions occur, the soils should be undercut to firm material and backfilled with controlled structural fill. Proof rolling should be observed by a qualified geotechnical engineer or his designated representative so that appropriate judgments as to the depth and extent of subgrade repair can be made. In areas that require undercut of

soft, loose, saturated, yielding, and/or otherwise unsuitable soils, the horizontal dimensions of any removal and replacement measures should typically extend beyond the edge of the foundation (on all sides) a minimum of one half the depth of the excavation below the bottom of foundation.

6.3.3 Placement and Compaction of Fill

As indicated above, structural fill should be end-dumped and spread with tracked equipment to avoid pneumatic-tire traffic on the sensitive on-site soils. In areas of deep cut or undercut, it may not be possible to effectively compact structural fill in lifts of ordinary thickness without degrading the underlying native soils. Accordingly, in these areas, placement of an initial "bridge" lift ranging from 12 to 18 inches in loose thickness will likely be necessary to provide a firm base for further placement and compaction of fill soils. This bridge lift should be compacted on its surface in accordance with the project specifications governing degree of compaction but should not be expected to meet those compaction requirements at a depth greater than four inches.

Except as indicated above, structural fill should be placed in lifts not exceeding 8 inches in loose thickness and compacted to a minimum of 98 percent of their maximum dry density as determined by the Standard Proctor Method (ASTM D698) except where more stringent UFC or NCDOT compaction requirements govern. For this project, we recommend that structural fill consist of a relatively clean sand falling within USCS Soil Group "SP", "SP-SM", or "SP-SC". Soils falling within this classification when placed and compacted as outlined above are referred to herein as "controlled structural fill".

6.3.4 Utility Trench Backfill

Trench backfill for underground utilities and piping should consist of crushed rock for pipe bedding material followed by quarry screenings or coarse sand in the remaining pipezone backfill (Type A). As a second option (Type B), crushed rock may be placed as bedding and extend to springline of pipe, followed by quarry screenings or coarse sand in the remaining pipezone backfill. For pipes and utilities within wet soils or below the water table, backfill should consist of a minimum of 6 inches of crushed rock below and to the sides of pipe, extending a minimum of 12 inches above the top of pipe, and encased in geotextile fabric (Type C). All trench backfill should be placed and compacted as recommended in Section 3.6.3 above. Native soils may be used to backfill the remainder of the trench, unless utility or pipe is to traverse beneath or within the influence zone of any foundations, in which case controlled structural fill shall be placed and compacted as stated below.

For utility structures bearing in very soft clay or other unsuitable materials, the material should be undercut to a suitable depth as determined by the geotechnical engineer (anticipate 12 to 18 inches below pipe bearing elevation) and replaced with controlled structural fill or crushed/washed stone. Where crushed/washed stone is used and conventional compaction testing is not practical, material should be mechanically compacted until no further yielding is observed. If sand bedding material is to be used above crushed/washed stone, the stone layer should be wrapped in a non-woven geotextile separation fabric. All controlled structural fill should be placed and compacted to 95% of the ASTM D-1557 maximum dry density.

6.3.5 Suitability of On-Site Soils for Re-Use

The native, near surface granular soils, such as the sand (SP), clayey sand (SC) or silty sand (SM) in the upper stratum, are considered suitable for re-use as foundation subgrade material, provided they are moisture conditioned to placed/compacted in accordance with the recommendations provided herein. The native, near surface fine-grained soils, such as fat clay (CH), sandy clays (CL) or sandy silts (ML) in the upper stratum, are generally not suitable for re-use as foundation subgrade material due to their poor strength characteristics and sensitivity to moisture. It is recommended that they be used within landscaped or other non-structural areas. In addition, any high plasticity clays/silts (CH, MH) or organic materials such as peat (PT, OL, OH), with liquid limits greater than 50 and plasticity indices greater than 20, should not be re-used as backfill placed directly below or against foundations or retaining walls.

6.3.6 Stability of Excavations

Temporary slopes in shallow, open excavations above the water table may be adequately maintained at inclinations of no steeper than 1(H):1(V), although they should be evaluated by a geotechnical engineer during construction due to the relatively unconsolidated nature of Coastal Plain soils. The crests of all slopes should also be maintained at least 5 feet from any building or other structure limits. Temporary shoring or bracing of excavation sidewalls should be maintained for excavations that will extend below the water table, such as in the case of removing obstructions deeper than four feet BLS. Dewatering devices and/or site drainage techniques capable of maintaining a stable and surface-dry trench bottom should be provided.

7.0 LIMITATIONS

This report and the subsurface investigation on which it is based in made for the purpose of study, planning, and design, and not for construction or pay purposes. General soil and strata descriptions and the indicated boundaries are based on a geologic interpretation of the available subsurface data and may not necessarily reflect the actual subsurface conditions between the test borings or between the sample intervals. The laboratory data and data collected in-situ is only as reliable as is inherent to the standard test method. Water levels and/or soil moisture conditions are reported as they were observed at the time of the investigation. These conditions can vary considerably from season to season and during times of extreme weather events.

8.0 REFERENCES

Horton, J. Wright Jr., and Zullo, Victor A., 1991, An Introduction to the Geology of the Carolinas in Horton J.W., Jr., and Zullo, V.A., eds., The Geology of the Carolinas; Carolina Geological Society Fiftieth Anniversary Volume, pp. 58 - 59.

Soller, David R., and Mills, Hugh H., 1991, Surficial Geology and Geomorphology in Horton J.W., Jr., and Zullo, V.A., eds., The Geology of the Carolinas; Carolina Geological Society Fiftieth Anniversary Volume, pp. 58 - 59.

USGS MapView online database: https://ngmdb.usgs.gov/ngmdb/ngmdb_home.html

USGS Online Spatial Data: https://mrdata.usgs.gov/geology/

FIGURES

SUBSURFACE INVESTIGATION LEGEND
(SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS)

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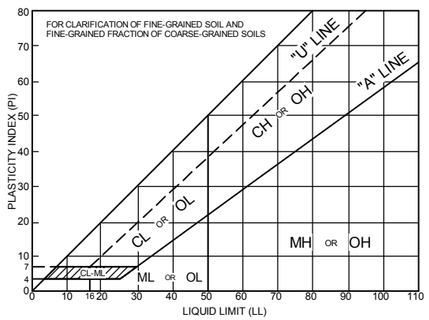
PROJECT REFERENCE	FIGURE
220161	1

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

Major Divisions		Group Symbols	Typical Names	Laboratory Classification Criteria
COARSE-GRAINED SOILS (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size) — Clean gravel (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW
	Gravel with fines (Appreciable amount of fines)	GM*	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4; Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
		GC	Clayey gravels, gravel-sand-silt mixtures	Atterberg limits above "A" line or P.I. greater than 7
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size) — Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		SP	Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
	Sands with fines (Appreciable amount of fines)	SM*	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4; Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
		SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7
FINE-GRAINED SOILS (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 60)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		OL	Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 60)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, organic silts	
		CH	Inorganic clays of high plasticity, fat clays	
		OH	Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils	Pt	Peat and other highly organic soils	

Determine percentages of sand and gravel from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows:
- Less than 5 percent..... GW, GP, SW, SP
- More than 12 percent..... GM, GC, SM, SC
- 6 to 12 percent..... Borderline cases requiring dual symbols**

Particle Size	Sieve sizes	mm
Material		
Silt or clay	< #200	< 0.074
Sand	#200 to #40	0.074 to 0.42
Fine	#40 to #10	0.42 to 2.00
Medium	#10 to #4	2.00 to 4.76
Coarse	#4 to 3/4 in.	4.76 to 19.1
Gravel	3/4 in. to 3 in.	19.1 to 76.2
Fine	3 in. to 12 in.	76.2 to 304.8
Coarse	12 in. to 36 in.	304.8 to 914.4
Cobble		
Boulders		



Plasticity Chart

* Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg Limits: suffix d used when L.L. is 23 or less and the P.I. is 6 or less; the suffix u is used when L.L. is greater than 26.

** Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

RELATIVE DENSITY / CONSISTENCY

RELATIVE VALUES PRESENTED ON FIELD LOGS WITH UNCORRECTED N-VALUES. FOR CLASSIFICATION ONLY, NOT FOR DESIGN

COARSE-GRAINED SOILS (major portions retained on No. 200 sieve)

Descriptive Terms	Relative Density	SPT Blow Count
Very loose	0 to 15 %	< 5
Loose	16 to 35 %	5 to 10
Medium dense	36 to 65 %	11 to 30
Dense	66 to 85 %	31 to 50
Very dense	86 to 100 %	> 50

FINE-GRAINED SOILS (major portions passing on No. 200 sieve)

	Unconfined Compressive	
Descriptive Terms	Strength kPa	SPT Blow Count
Very soft	< 25	< 3
Soft	25 to 50	3 to 4
Firm	50 to 100	5 to 8
Stiff	100 to 200	9 to 15
Very stiff	200 to 400	16 to 30
Hard	> 400	> 30

PERCENTAGE OF MATERIAL

ORGANICS	GRANULAR SOILS	SILT/CLAY SOILS	OTHER MATERIAL
TRACE	2 - 3%	3 - 5%	TRACE <5%
LITTLE	4 - 5%	6 - 12%	FEW 5 - 10%
MODERATELY	6 - 10%	13 - 120%	LITTLE 15 - 25%
HIGHLY	>10%	>20%	SOME 30 - 45%
			MOSTLY 50 - 100%

PLASTICITY

	PI RANGE	DRY STRENGTH
NON-PLASTIC	0	- NONE: CRUMBLES WITH MERE PRESSURE
LOW PLASTICITY	1 - 10	- LOW: CRUMBLES WITH SOME FINGER PRESSURE
MED. PLASTICITY	11 - 20	- MEDIUM: BREAKS INTO PIECES OR CRUMBLES WITH CONSIDERABLE PRESSURE
HIGH PLASTICITY	21 - 40	- HIGH: CAN'T BE BROKEN WITH FINGER PRESSURE
VERY PLASTIC	>40	- VERY HIGH: CAN'T BE BROKEN BETWEEN THUMB AND HARD SURFACE

GROUNDWATER

- WATER LEVEL AT END OF DRILLING, OR AS SHOWN
- WATER LEVEL AFTER 24 HOURS, OR AS SHOWN
- ESTIMATED WATER LEVEL FROM PORE PRESSURE

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE *(USE ONLY WITH LAB RESULTS)*
LL — LIQUID LIMIT; PLASTIC RANGE (PI); PL — PLASTIC LIMIT	- WET - (W)	VISIBLE FREE WATER, USUALLY IN COARSE-SOILS BELOW WATER TABLE. SEMISOLID; NEEDS DRYING TO FOR OPTIMUM MOISTURE
OM — OPTIMUM MOISTURE; SL — SHRINKAGE LIMIT	- MOIST - (M)	DAMP BUT NO VISIBLE WATER. SOLID; AT OR NEAR OPTIMUM MOISTURE
	- DRY - (D)	ABSENCE OF MOISTURE, DRY TO THE TOUCH REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE.

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY AS FOLLOWS:

BEDROCK	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
SAPROLITE	IN-SITU CHEMICALLY WEATHERED ROCK. TYPICALLY DOES NOT YIELD SPT REFUSAL IF TESTED.
LIMESTONE	MODERATELY TO STRONGLY CEMENTED COASTAL PLAIN SEDIMENTS, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.
WEATHERED LIMESTONE	WEAKLY TO NON CEMENTED COASTAL PLAIN SEDIMENTS FORMERLY CEMENTED INTO ROCK, BUT DOES NOT YIELD SPT REFUSAL. SAMPLES OFTEN RESEMBLE SOIL WITH EVIDENCE OF CEMENTED FRAGMENTS.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V. SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
SLIGHT (SLI.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL.*
SEVERE (SEV.)	ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, YIELDS SPT N VALUES > 100 BPF*
VERY SEVERE (V. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, YIELDS SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGISTS PICK.
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGISTS PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGISTS PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

CEMENTATION

DESCRIPTIVE TERM	DESCRIPTIVE TERM
WEAKLY CEMENTED	CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE
MODERATELY CEMENTED	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY CEMENTED	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

SYMBOLS

- ROADWAY EMBANKMENT WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS
- SHELBY TUBE SAMPLE ST SAMPLE DESIGNATION
- BULK OR SPT SAMPLE S OR SS SAMPLE DESIGNATION
- MODIFIED CALIFORNIA SAMPLE OR CPT SBT OUT OF RANGE
- TEST BORING
- AUGER BORING
- CORE BORING
- CONE PENETROMETER TEST
- PIEZOMETER INSTALLATION
- SOUNDING ROD
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- SPT REFUSAL

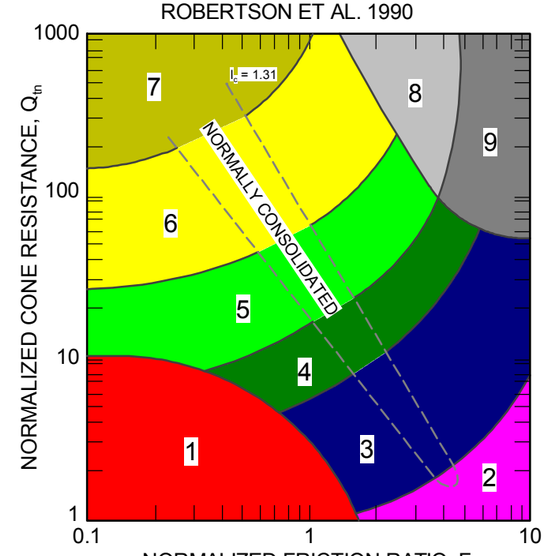
NOTE: BORING SYMBOLS MAY BE USED IN COMBINATION WITH ADDITIONAL SYMBOLS TO DEPICT COMPANION BORINGS (BORING INSTALLED WITHIN FIVE HORIZONTAL FEET) OR BORINGS WITH CORE, ETC.

ABBREVIATIONS

APPROX. - APPROXIMATELY
BLS - BELOW LAND SURFACE
BPF - BLOWS PER FOOT
BT - BORING TERMINATED
CALC. - CALCAREOUS
CBR - CALIFORNIA BEARING RATIO
CONSOL. - CONSOLIDATION
CPT - CONE PENETRATION TEST
CPTu - CPT WITH PORE PRESSURE
CSE. - COARSE
D - DRY
DCP - DYNAMIC CONE PENETROMETER
DPT - DIRECT PUSH TECHNOLOGIES
DTW - DEPTH TO WATER
DRK. - DARK
ELEV. - ELEVATION
F. - FINE
FIAD - FILLED IMMEDIATELY AFTER DRILLING
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
IGM - INTERMEDIATE GEOMATERIALS
LL - LIQUID LIMIT (%)
LS. - LIMESTONE
LT. - LIGHT
MED. - MEDIUM
MOD. - MODERATELY
M or MOI - MOIST
N/A - NOT APPLICABLE
NES - NOT ENOUGH SAMPLE
NM - NOT MEASURED
ORG. - ORGANIC
PERM. - PERMEABILITY
PL - PLASTIC LIMIT (%)
PLAST. - PLASTICITY
PI - PLASTICITY INDEX (%)
REF - REFUSAL
SAA - SAME AS ABOVE
SAT. - SATURATED
SBT - SOIL BEHAVIOR TYPE
SCPTu - SEISMIC CPTu
SEDS. - SEDIMENTS
SOLS - SURFICIAL ORGANIC LADEN SOIL
SPT - STANDARD PENETRATION TEST
ST - SHELBY TUBE
TR. - TRACE
UCP - UNDIVIDED COASTAL PLAIN.
UU - UNCONSOLIDATED UNDRAINED
W/ - WITH
W - WET
V. - VERY
VST - VANE SHEAR TEST
WOH or W - WEIGHT OF HAMMER
WOR or W - WEIGHT OF ROD

NORMALIZED CPT SOIL BEHAVIOR CHART

ROBERTSON ET AL. 1990



ZONE #	DESCRIPTION
1.	SENSITIVE, FINE GRAINED
2.	ORGANIC SOILS-PEATS
3.	CLAYS; CLAY TO SILTY CLAY
4.	SILT MIXTURES; CLAYEY SILT TO SILTY CLAY
5.	SAND MIXTURES; SILTY SAND TO SANDY SILT
6.	SANDS; CLEAN SANDS TO SILTY SANDS
7.	GRAVELLY SAND TO SAND
8.	VERY STIFF SAND TO CLAYEY SAND*
9.	VERY STIFF FINE GRAINED*

* = OVERCONSOLIDATED OR CEMENTED

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.

2. Descriptions on these boring logs apply only at the specific boring locations and at the time the borings were made. They are not guaranteed to be representative of subsurface conditions at other locations or times.

CATLIN
Engineers and Scientists
Wilmington, North Carolina

PROJECT REFERENCE NO.	SHEET NO.
220161	2

SITE PLAN AND PROFILE LAYOUT

0 100 200
FEET

PID R04700-006-001-000
STATE OF NORTH CAROLINA
CULTURAL FACILITY
1 BATTLESHIP ROAD NE
ONE STORY BUILDING (CIRCA 1962)
ZONING: B-2 BUSINESS DISTRICT
Class: GOV Exempt Government
LAND USE CODE: 841 CULTURAL EXHIBITION

A
A'
B
B'
C
C'

CPT-13
CPT-11
CPT-19
CPT-03
CPT-01
CPT-19
CBR-01
CPT-05
CPT-18
CPT-12
CPT-08
CPT-09
CPT-14
CBR-02
CPT-17A
CPT-17
CPT-15
CPT-16
CPT-06
CPT-04
CPT-07

USS NORTH CAROLINA ROAD
APPARENT 60 FOOT R/W (ASPHALT PAVEMENT)

BATTLESHIP ROAD
(ASPHALT PAVEMENT)

NOTES:
AERIAL IMAGERY OBTAINED FROM NC ONE MAP
SITE PLAN AND CONTOURS PROVIDED BY MOFFATT AND NICHOL IN DRAWING
03200962_MOFFATT_NICHOL_USS_NC_SOUTH_LOT_TOPO_12-18-2020_FINAL_SS.DWG

0 100 200
HORIZONTAL SCALE IN FEET
VE = 10.0

PROFILE THROUGH BORINGS PROJECTED ALONG A - A'

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PROJECT REFERENCE	FIGURE
220161	3

A

A'

CPT-13 CPT-11 CPT-10 CPT-03 CPT-01 CPT-19

FRICTION (tsf) 3 1.5 0
CONE RESIST. (tsf) 150 300

APPROXIMATE WATER SURFACE

APPROXIMATE LAND SURFACE

12/20

CLAYS

BT

Ⓐ LIGHT BROWN TO GRAY, RECENT FILL CONSISTING OF FINE TO COARSE SAND AND SILTY SAND. APPROXIMATELY 50% PAVEMENT COVERED

Ⓑ GRAY TO BROWN, HISTORIC FILL AND ALLUVIAL OVERWASH CONSISTING OF SAND AND GRAVEL WITH INTERBEDDED THIN SILT AND CLAY RICH LAYERS

Ⓒ GRAY, LOW TO MODERATELY ORGANIC ELASTIC/PLASTIC SILTS, CLAYS, AND SAND MIXTURES (ALLUVIAL)

Ⓓ DARK BROWN, HIGHLY ORGANIC SILT, AND SAND WITH WOOD FRAGMENTS. (ALLUVIAL)

NOTES: GROUNDLINE PROFILE ALONG -- GENERATED FROM 03200962_MOFFATT_NICHOL_USS_NC_SOUTH_LOT_TOPO_12-18-2020_FINAL_SS.dgn DATED 12/18/2020

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO PROFILE.

DEPTH TO WATER ESTIMATED FROM CPT PORE PRESSURE.

30 20 10 0 -10 -20 -30 -40 -50 -60

0 200 400 600 800 1,000 1,200 1,400

0 100 200
HORIZONTAL SCALE IN FEET
VE = 10.0

PROFILE THROUGH BORINGS PROJECTED ALONG B - B'

CATLIN Engineers and Scientists
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Wilmington, NC 28405
Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	FIGURE
220161	4

B B'

CPT-14 CPT-12 CPT-08 CPT-09 CPT-05 CPT-18

SOIL TEST RESULTS

BORE ID.	SAMPLE ID.	DEPTH INTERVAL	USCS CLASS.	L.L.	P.L.	P. I.	% PASSING SIEVES 10	40	200	MOISTURE CONTENT (%).	ORGANIC CONTENT (%)
CPT-05	S-05	4.0 - 6.0	SP	NP	NP	NP	100	70	4	-	-
CPT-09	S-01	0.0 - 3.0	SP-SM	NP	NP	NP	100	82	12	-	-
CPT-09	S-01	3.0 - 4.0	SP-SM	NP	NP	NP	100	82	12	-	-
CPT-09	S-02	7.0 - 9.0	NES	-	-	-	83	74	66	-	28.5
CPT-09	S-03	12.0 - 13.0	NES	-	-	-	-	-	-	-	45.5
CPT-09	S-04	16.0 - 17.0	NES	-	-	-	-	-	-	-	49.1
CPT-14	S-06	3.0 - 4.0	SP-SM	NP	NP	NP	96	56	5	-	-
CPT-14	S-07	6.0 - 7.0	MH	73	46	27	99	93	89	-	-
CPT-14	S-08	7.0 - 8.0	SP	NP	NP	NP	100	78	4	-	-
CPT-18	S-09	0.0 - 2.0	SM	NP	NP	NP	99	80	20	-	-

EXISTING LAND SURFACE

FRICTION (tsf) 3 1.5 0 CONE RESIST. (tsf) 150 300

S-06 SP-SM
S-07 OH
S-08 SP
12/20
BT

12/20
BT

12/20

S-01 SP-SM
S-02 28.5% ORG
S-03 45.5% ORG
S-04 49.1% ORG
REF

S-05 SP
12/20
BT

S-09 SM
12/20
REF

LARGE FILL DEBRIS

SANDS AND SAND MIXTURES
CLAYS
SANDS
SAND MIXTURES, CLAYS, AND ORGANICS
SANDS TO GRAVELLY SAND

Ⓐ LIGHT BROWN TO GRAY, RECENT FILL CONSISTING OF FINE TO COARSE SAND AND SILTY SAND. APPROXIMATELY 50% PAVEMENT COVERED

Ⓑ GRAY TO BROWN, HISTORIC FILL AND OVERWASH CONSISTING OF SAND AND GRAVEL WITH INTERBEDDED THIN SILT AND CLAY RICH LAYERS

Ⓒ GRAY, MODERATELY ORGANIC ELASTIC SILT WITH WOOD FRAGMENTS (ALLUVIAL)

Ⓓ DARK BROWN, HIGHLY ORGANIC SILT, AND SAND WITH WOOD FRAGMENTS. (ALLUVIAL)

NOTES: GROUNDLINE PROFILE ALONG -- GENERATED FROM 03200962_MOFFATT_NICHOL_USS_NC_SOUTH_LOT_TOPO_12-18-2020_FINAL_SS.dgn DATED 12/18/2020

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO PROFILE.

DEPTH TO WATER ESTIMATED FROM CPT PORE PRESSURE.

30 20 10 0 -10 -20 -30 -40 -50 -60

0 200 400 600 800 1,000 1,200 1,400

0 100 200
HORIZONTAL SCALE IN FEET
VE = 10.0

PROFILE THROUGH BORINGS PROJECTED ALONG C - C'

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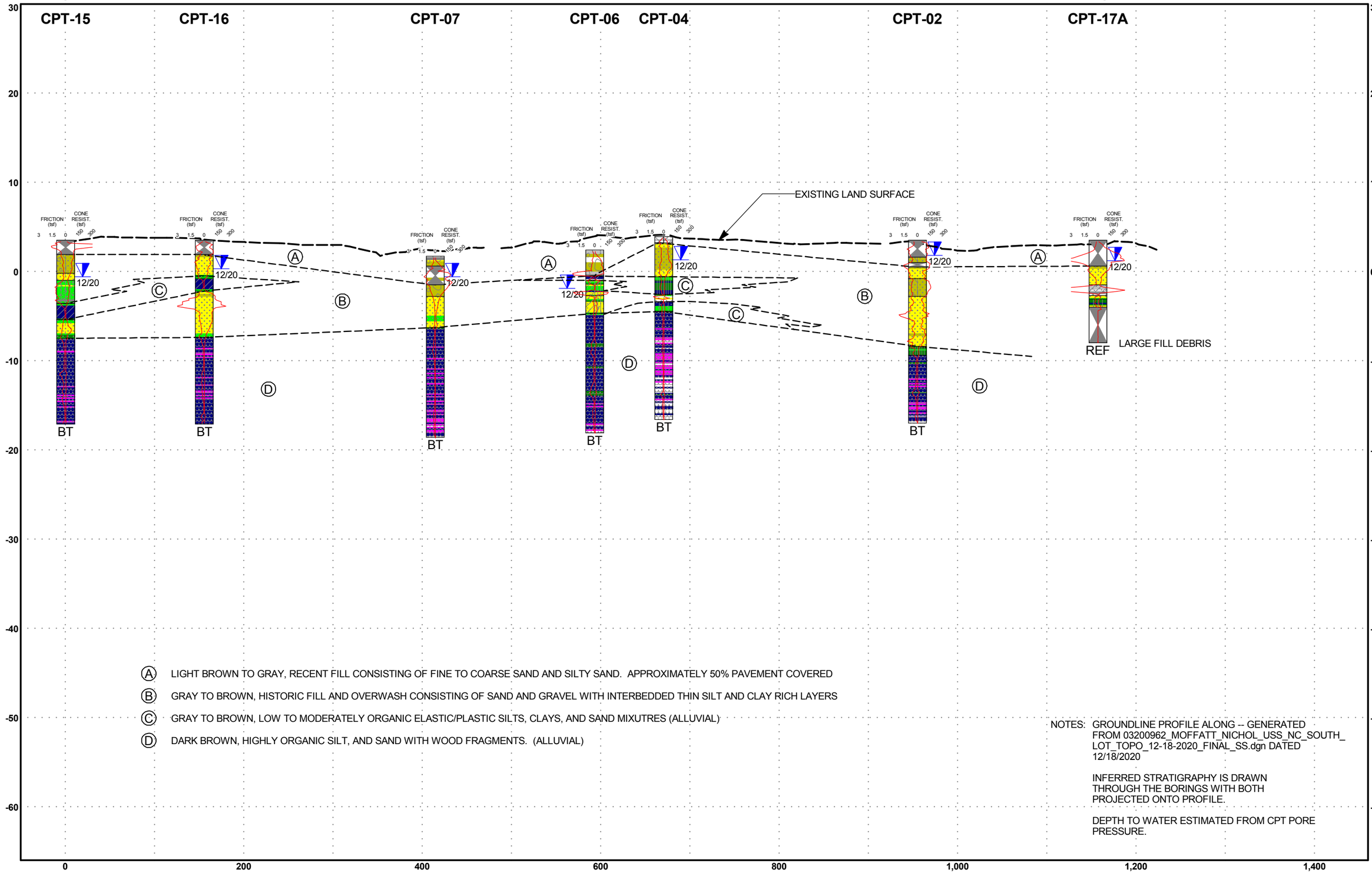
PROJECT REFERENCE	FIGURE
220161	5

C

C'



Ⓐ LIGHT BROWN TO GRAY, RECENT FILL CONSISTING OF FINE TO COARSE SAND AND SILTY SAND. APPROXIMATELY 50% PAVEMENT COVERED

Ⓑ GRAY TO BROWN, HISTORIC FILL AND OVERWASH CONSISTING OF SAND AND GRAVEL WITH INTERBEDDED THIN SILT AND CLAY RICH LAYERS

Ⓒ GRAY TO BROWN, LOW TO MODERATELY ORGANIC ELASTIC/PLASTIC SILTS, CLAYS, AND SAND MIXUTRES (ALLUVIAL)

Ⓓ DARK BROWN, HIGHLY ORGANIC SILT, AND SAND WITH WOOD FRAGMENTS. (ALLUVIAL)

NOTES: GROUNDLINE PROFILE ALONG -- GENERATED FROM 03200962_MOFFATT_NICHOL_USS_NC_SOUTH_LOT_TOPO_12-18-2020_FINAL_SS.dgn DATED 12/18/2020

INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO PROFILE.

DEPTH TO WATER ESTIMATED FROM CPT PORE PRESSURE.

APPENDICES

APPENDIX A

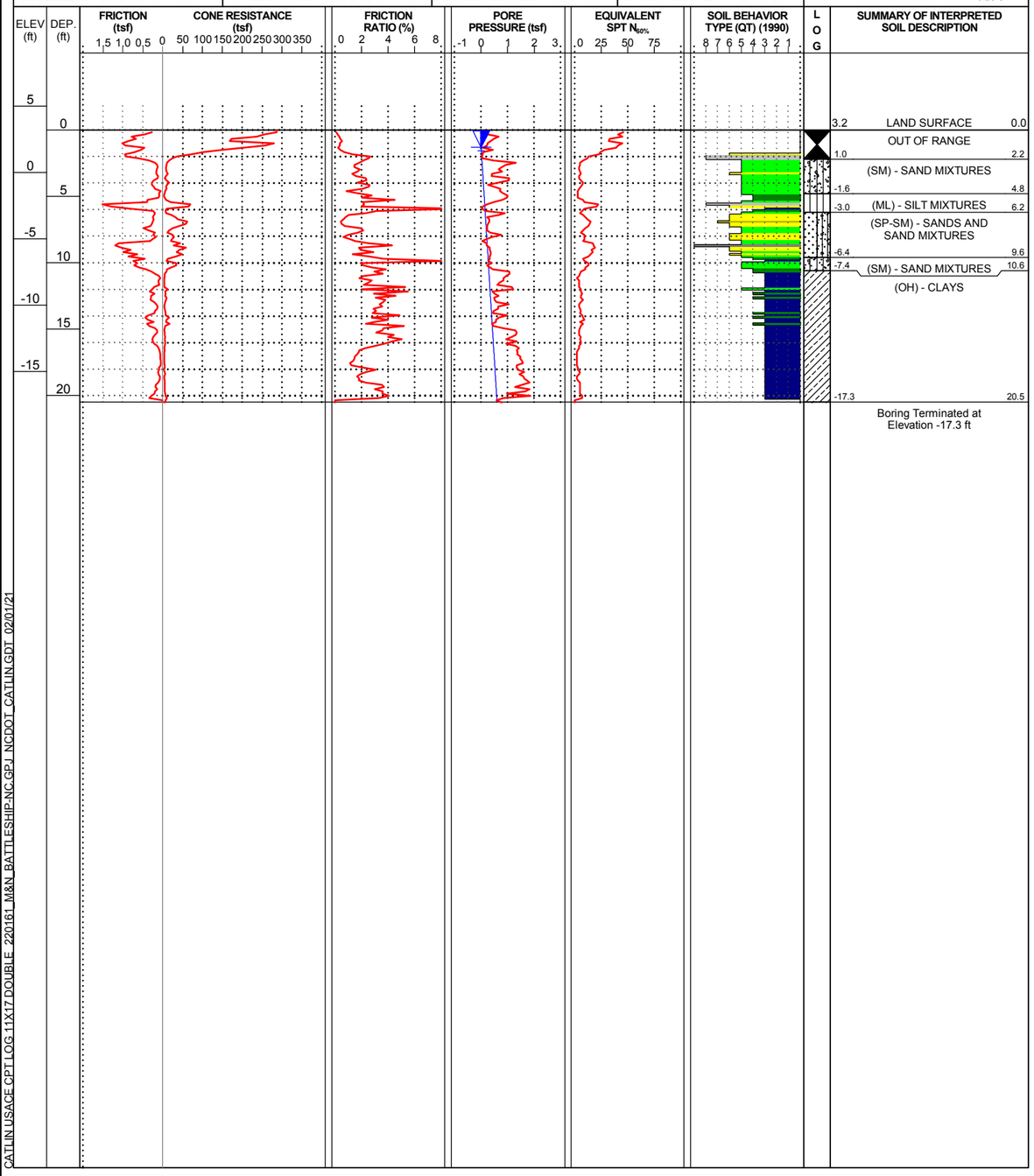
CONE PENETRATION TESTING AND DIRECT PUSH TECHNOLOGIES SOUNDING AND BORING LOGS

CONE PENETRATION TEST SOUNDING REPORT

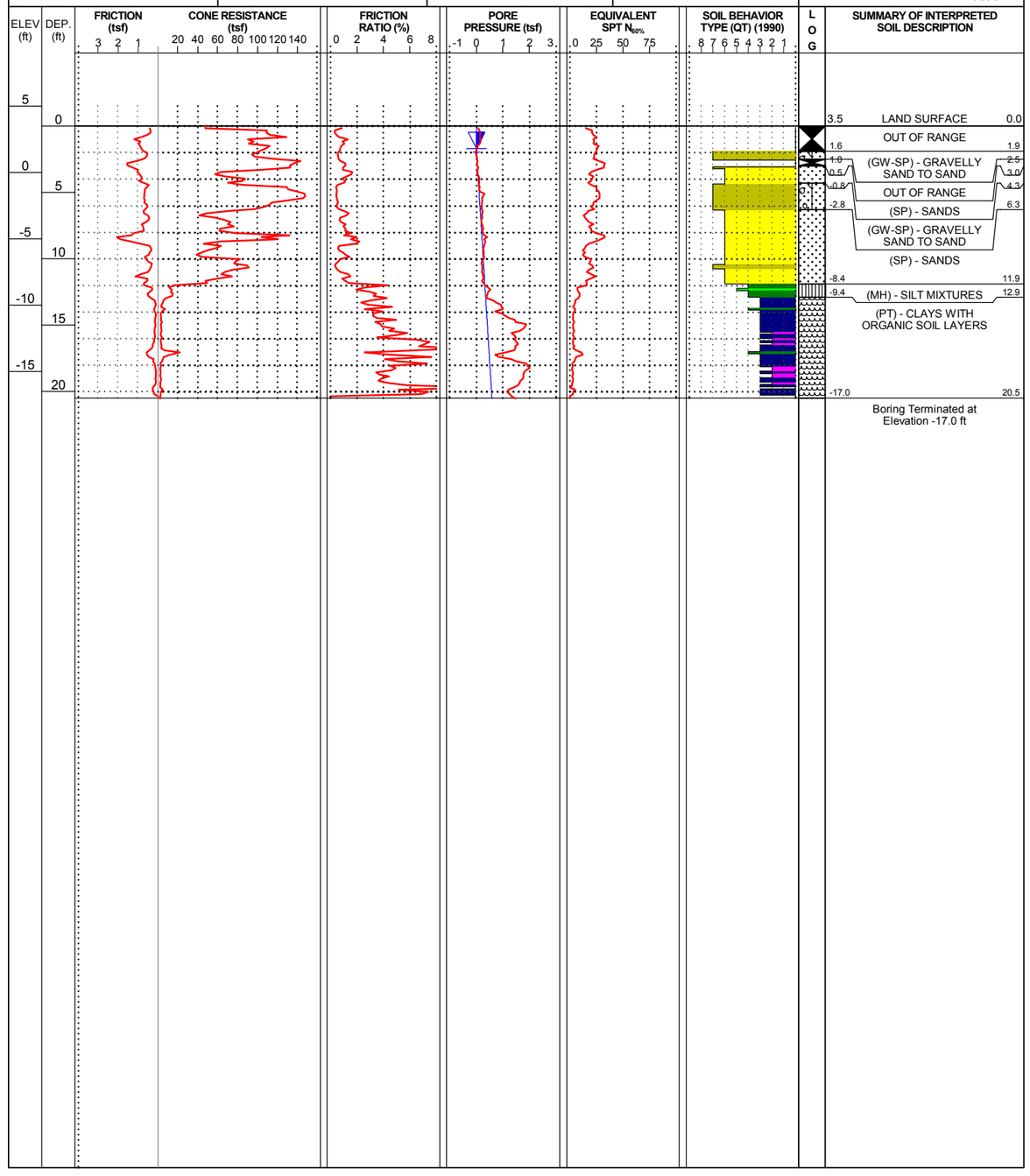
220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	1

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-01	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 1.3
COLLAR ELEV.: 3.2 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,531	**EASTING:** 2,316,528	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in²		**CONE ID:** DSG1156
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/17/20	**COMP. DATE:** 12/17/20	**SURF. WATER DEPTH:** N/A



CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-02	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 1.7
COLLAR ELEV.: 3.5 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,286	**EASTING:** 2,316,536	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in²		**CONE ID:** DSG1156
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/11/20	**COMP. DATE:** 12/11/20	**SURF. WATER DEPTH:** N/A

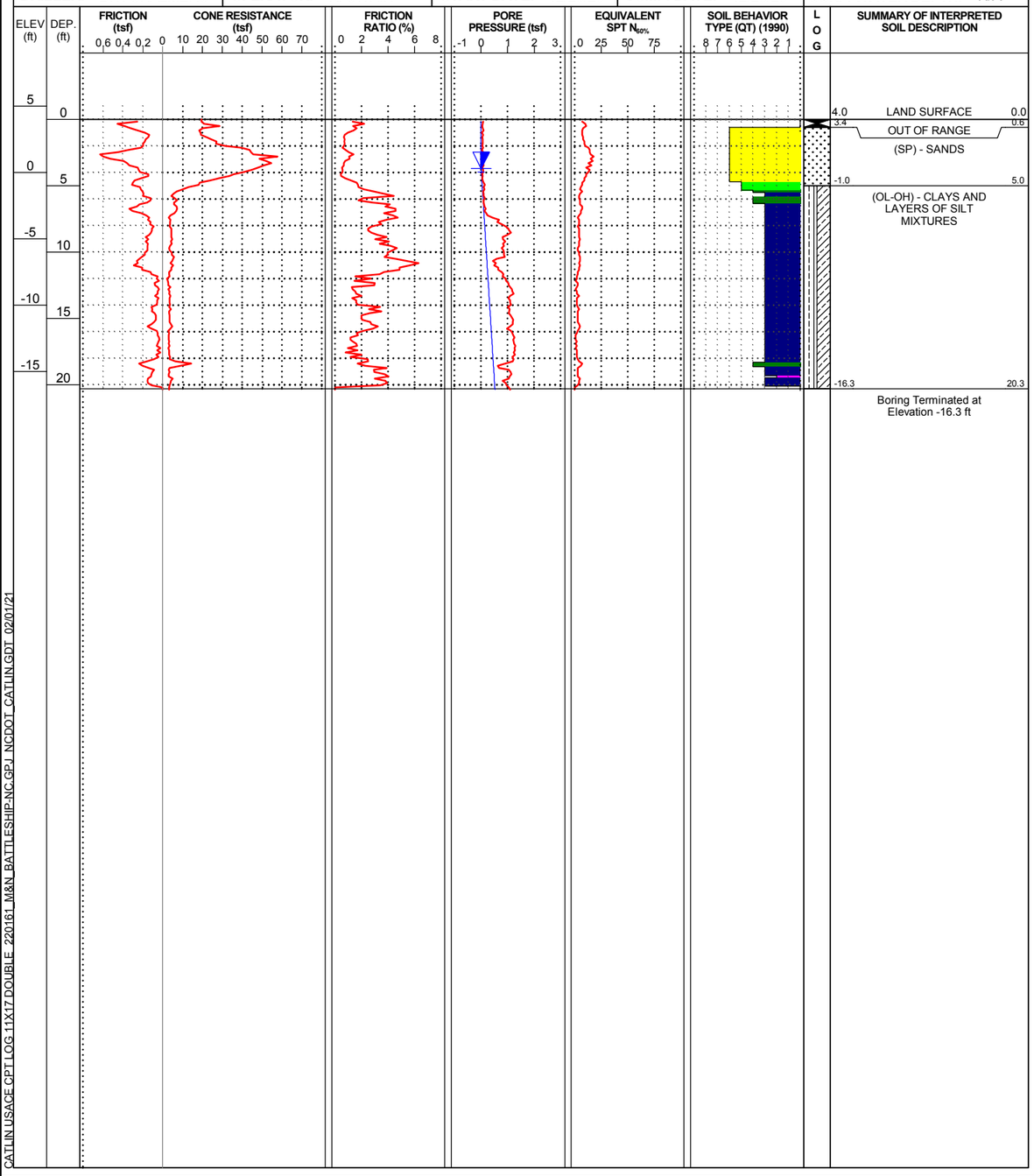


CONE PENETRATION TEST SOUNDING REPORT

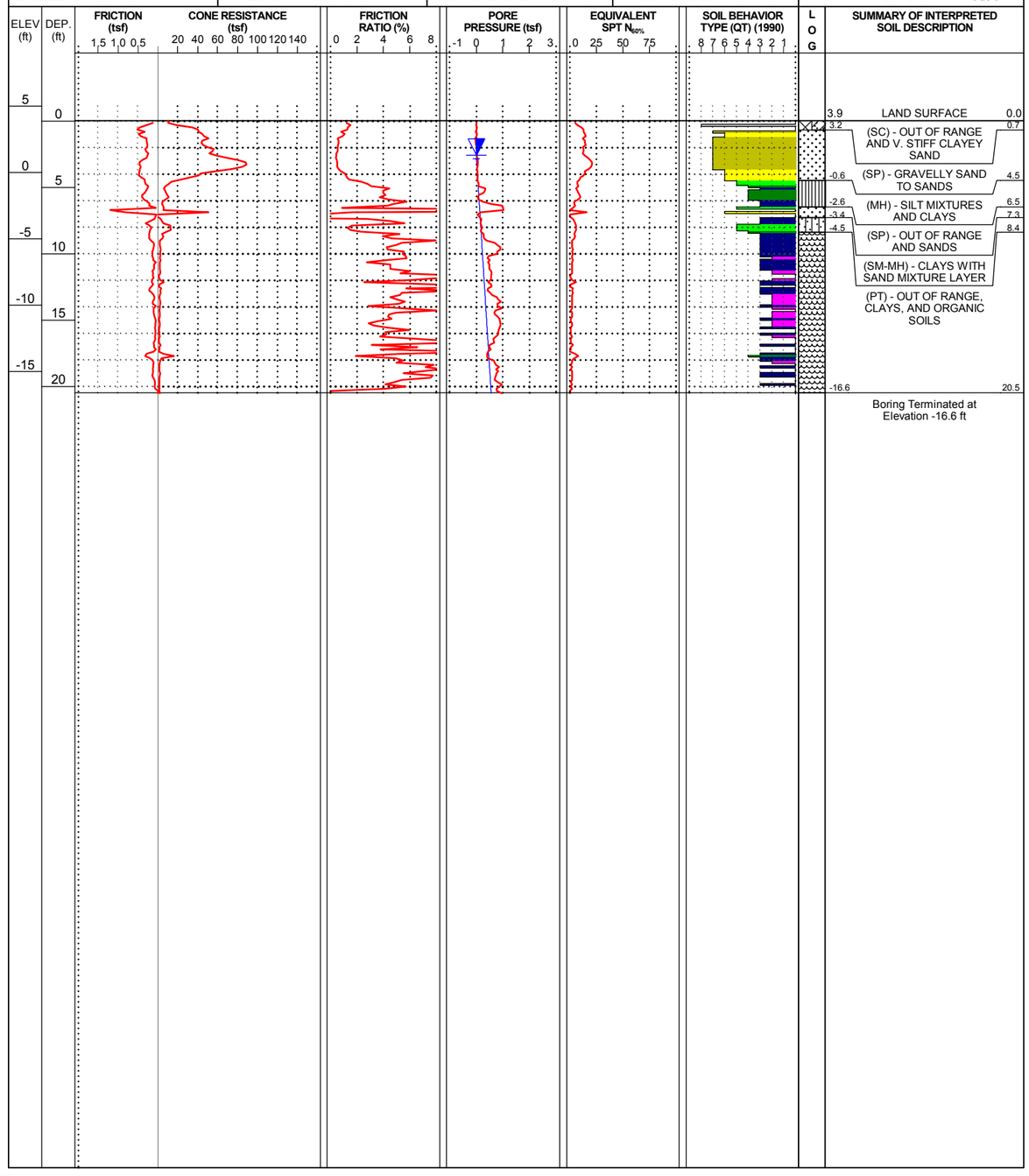
220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	2

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-03	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 3.7
COLLAR ELEV.: 4.0 ft	**TOTAL DEPTH:** 20.3 ft	**NORTHING:** 178,493	**EASTING:** 2,316,236	**24 HR.** M
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/29/20	**COMP. DATE:** 12/29/20	**SURF. WATER DEPTH:** N/A

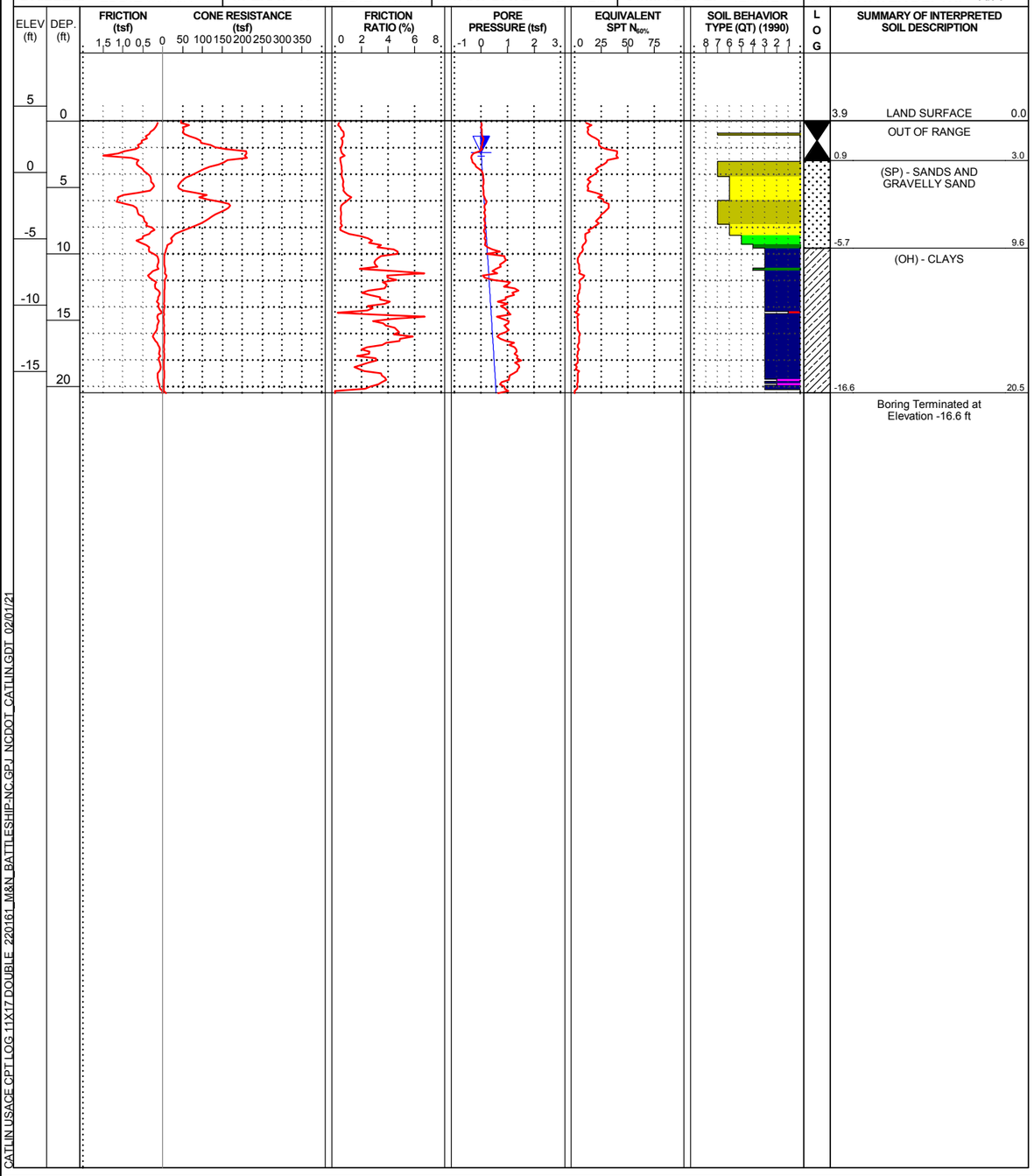


CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-04	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.6
COLLAR ELEV.: 3.9 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,256	**EASTING:** 2,316,252	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DSG1156
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/17/20	**COMP. DATE:** 12/17/20	**SURF. WATER DEPTH:** N/A



CONE PENETRATION TEST SOUNDING REPORT

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-05	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.4
COLLAR ELEV.: 3.9 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,379	**EASTING:** 2,316,388	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2	**CONE ID:** DSG1156	
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/17/20	**COMP. DATE:** 12/17/20	**SURF. WATER DEPTH:** N/A



DIRECT PUSH TECHNOLOGY BORING REPORT

220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	3

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** L.PUGH	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-05-GEO	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**0 HR.** N/A
COLLAR ELEV.: 3.9 ft	**TOTAL DEPTH:** 12.0 ft	**NORTHING:** 178,379	**EASTING:** 2,316,390	**24 HR.** FIAD
DRILL MACHINE: CATLIN CPT/DPT-01		**DRILL METHOD:** Direct Push	**HAMMER TYPE:** N/A	
DRILLER: D.T. CHALMERS	**START DATE:** 12/28/20	**COMP. DATE:** 12/28/20	**SURFACE WATER DEPTH:** N/A	

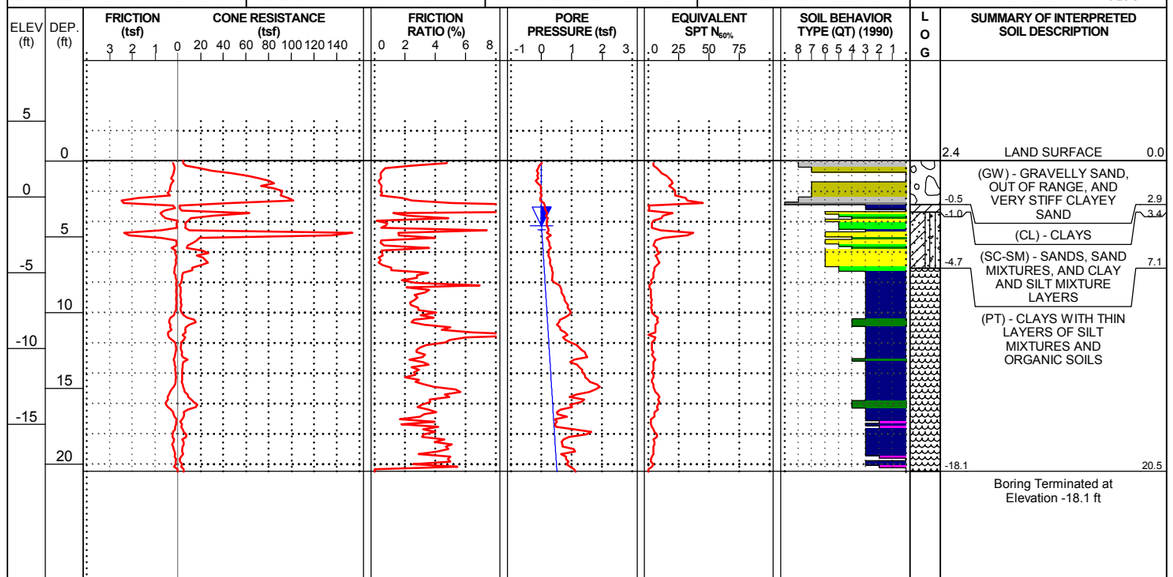
ELEV (ft)	SAMP. ELEV. TOP (ft)	SAMP. DEPTH TOP (ft)	RECOVERY % (RQD)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT PASSING SIEVES 10	40	200	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	FIELD MOISTURE	SAMP. NO. & USCS	LOG	SOIL AND ROCK DESCRIPTION
															3.9 LAND SURFACE 0.0
															3.4 SURFICIAL ORGANIC LADEN SOIL 0.5
															ARTIFICIAL FILL (SP) - LIGHT BROWN, F. SAND
0	-0.1	4.0		NP	NP	NP	100	70	4	-	-		S-05 SP		
															-4.1 8.0 NO RETURN - LITHOLOGY INFERRED FROM SISTER BORING CPT-05 DATA -5.6 9.5 NO RETURN - LITHOLOGY INFERRED FROM SISTER BORING CPT-05 DATA -8.1 12.0
															Boring Terminated at Elevation -8.1 ft

CONE PENETRATION TEST SOUNDING REPORT

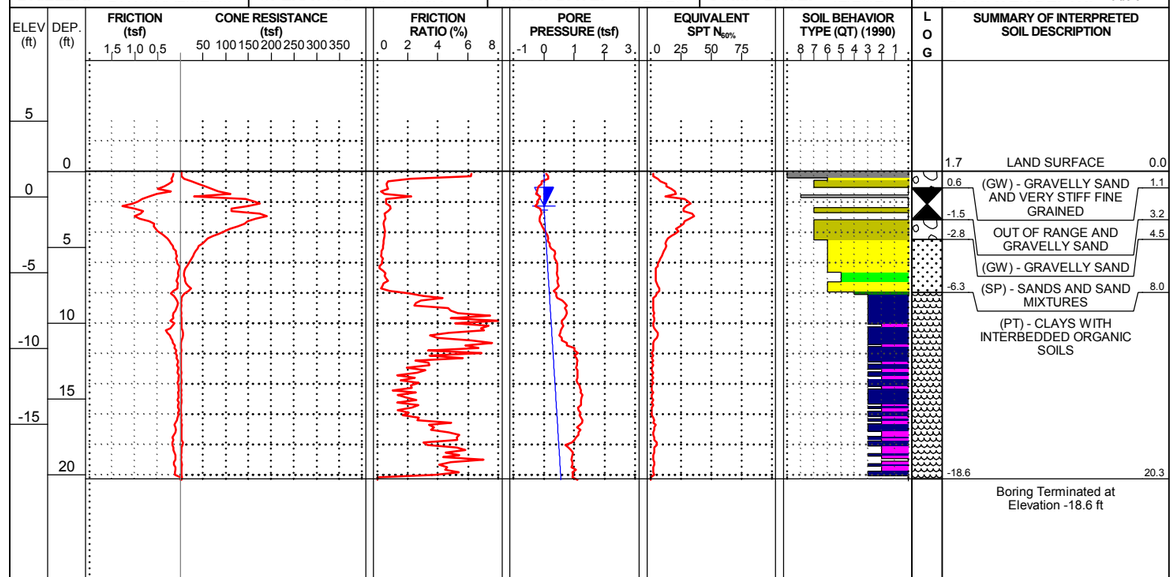
220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	4

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-06	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 4.3
COLLAR ELEV.: 2.4 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,194	**EASTING:** 2,316,174	**24 HR.** M
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/29/20	**COMP. DATE:** 12/29/20	**SURF. WATER DEPTH:** N/A

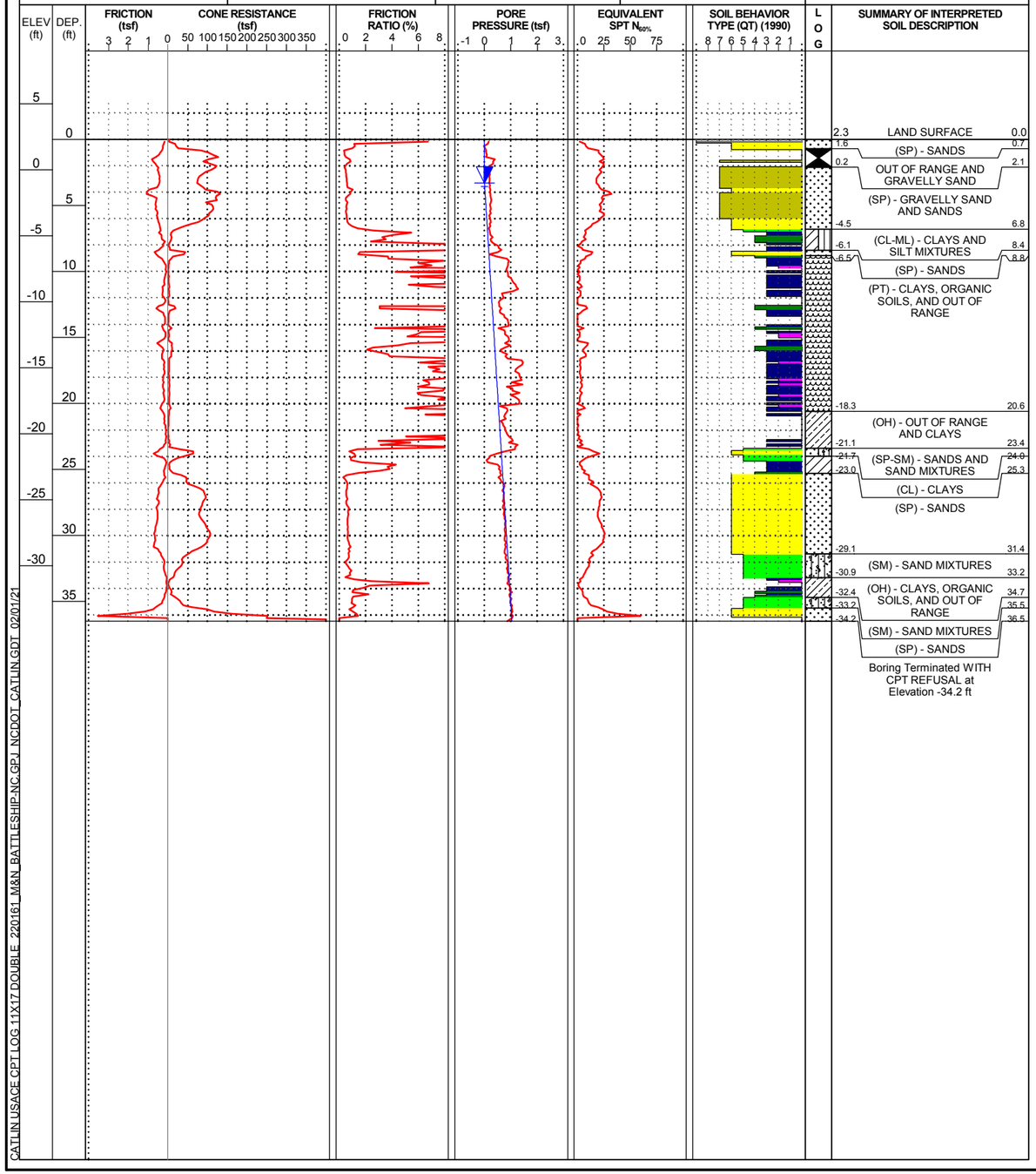


CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-07	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.3
COLLAR ELEV.: 1.7 ft	**TOTAL DEPTH:** 20.3 ft	**NORTHING:** 178,170	**EASTING:** 2,315,996	**24 HR.** M
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/29/20	**COMP. DATE:** 12/29/20	**SURF. WATER DEPTH:** N/A



CONE PENETRATION TEST SOUNDING REPORT

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-08	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 3.3
COLLAR ELEV.: 2.3 ft	**TOTAL DEPTH:** 36.5 ft	**NORTHING:** 178,382	**EASTING:** 2,315,958	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/29/20	**COMP. DATE:** 12/29/20	**SURF. WATER DEPTH:** N/A



CATLIN USACE CPT LOG 11X17 DOUBLE 220161 M&N BATTLESHIP-NC.GPJ NCDOT_CATLIN.GDT 02/01/21

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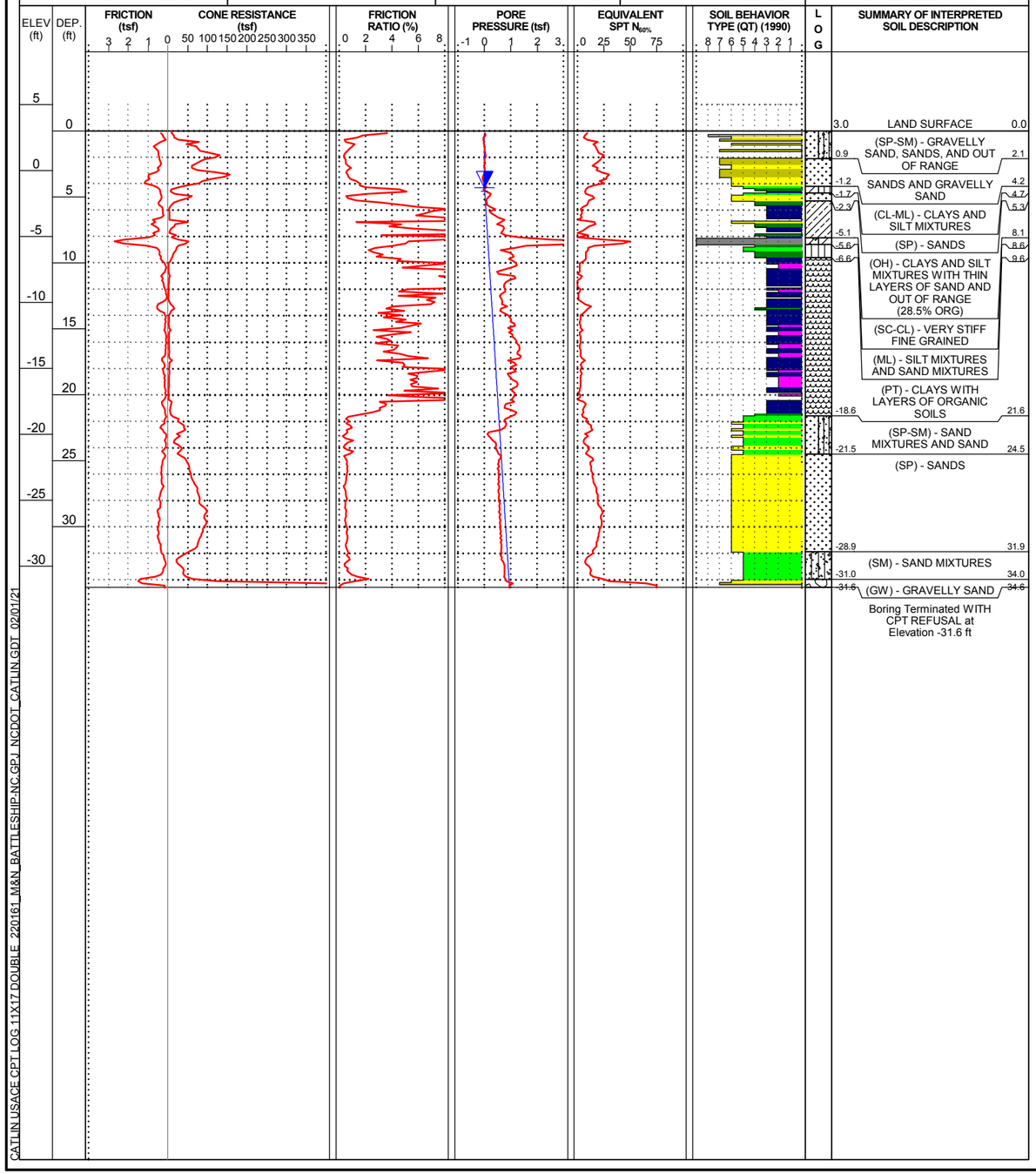
CONE PENETRATION TEST SOUNDING REPORT

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-09	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 4.3
COLLAR ELEV.: 3.0 ft	**TOTAL DEPTH:** 34.6 ft	**NORTHING:** 178,402	**EASTING:** 2,316,097	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2	**CONE ID:** DPG1563	
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/29/20	**COMP. DATE:** 12/29/20	**SURF. WATER DEPTH:** N/A



DIRECT PUSH TECHNOLOGY BORING REPORT

CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	6

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** L.PUGH	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-09-GEO	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**0 HR.** N/A
COLLAR ELEV.: 3.0 ft	**TOTAL DEPTH:** 20.0 ft	**NORTHING:** 178,402	**EASTING:** 2,316,098	**24 HR.** FIAD
DRILL MACHINE: CATLIN CPT/DPT-01		**DRILL METHOD:** Direct Push	**HAMMER TYPE:** N/A	
DRILLER: D.T. CHALMERS	**START DATE:** 12/28/20	**COMP. DATE:** 12/28/20	**SURFACE WATER DEPTH:** N/A	

ELEV (ft)	SAMP. ELEV. TOP (ft)	SAMP. DEPTH TOP (ft)	RECOVERY % (RQD)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT PASSING SIEVES 10	40	200	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	FIELD MOISTURE	SAMP. NO. & USCS	LOG	SOIL AND ROCK DESCRIPTION
															3.0 LAND SURFACE 0.0
				NP	NP	NP	100	82	12		-		SP-SM		ARTIFICIAL FILL (SP) - LIGHT BROWN TO GRAY, F. SAND
	0.0	3.0		NP	NP	NP	100	82	12	-	-		S-01 SP-SM		
	-4.0	7.0		NA	NA	NA	83	74	66	-	28.5		S-02		-4.0 ALLUVIAL (OL) - DARK BROWN, ORGANIC SILT, WITH WOOD FRAGMENTS
	-9.0	12.0		NA	NA	NA	NA	NA		-	45.5		S-03		
	-13.0	16.0		NA	NA	NA	NA	NA		-	49.1		S-04		
															-17.0 20.0 Boring Terminated at Elevation -17.0 ft

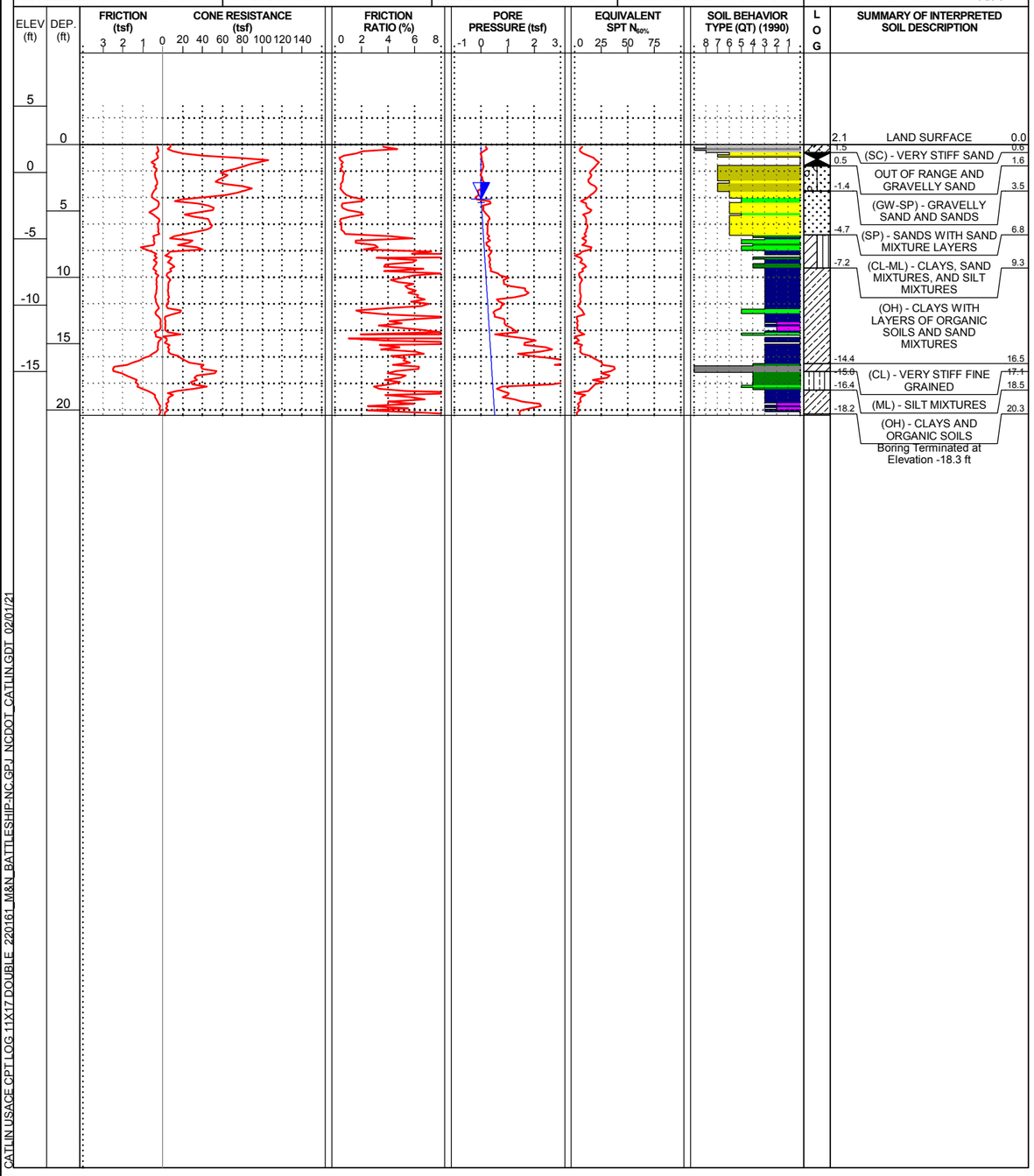
CATLIN USACE CPT LOG 11X17 DOUBLE 220161 M&N BATTLESHIP-NC.GPJ NCDOT_CATLIN.GDT 02/01/21

CONE PENETRATION TEST SOUNDING REPORT

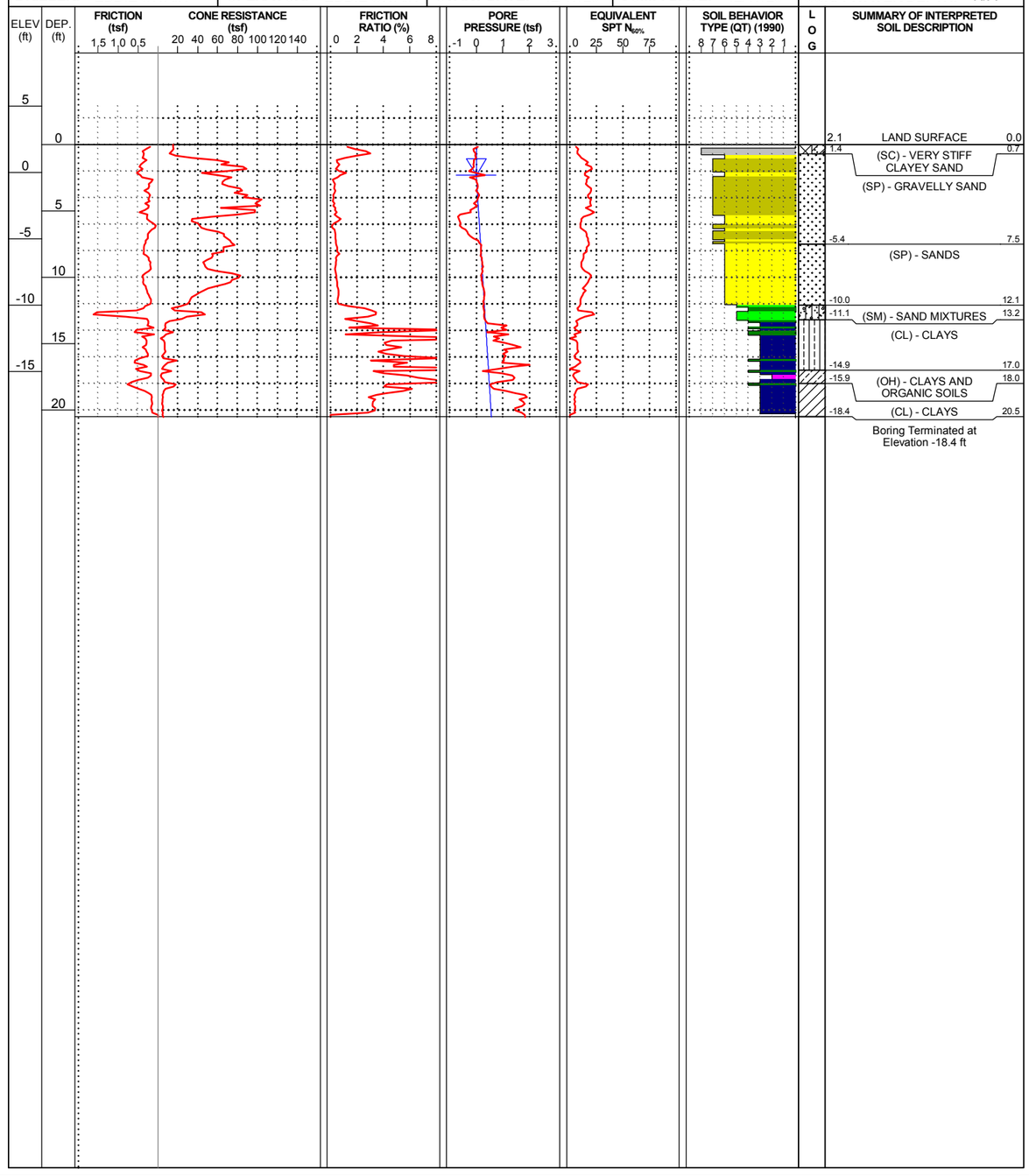
220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	7

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-10	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 4.1
COLLAR ELEV.: 2.1 ft	**TOTAL DEPTH:** 20.4 ft	**NORTHING:** 178,559	**EASTING:** 2,316,094	**24 HR.** M
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in²		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/29/20	**COMP. DATE:** 12/29/20	**SURF. WATER DEPTH:** N/A



CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-11	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.3
COLLAR ELEV.: 2.1 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,511	**EASTING:** 2,315,897	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in²		**CONE ID:** DSG1156
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/17/20	**COMP. DATE:** 12/17/20	**SURF. WATER DEPTH:** N/A

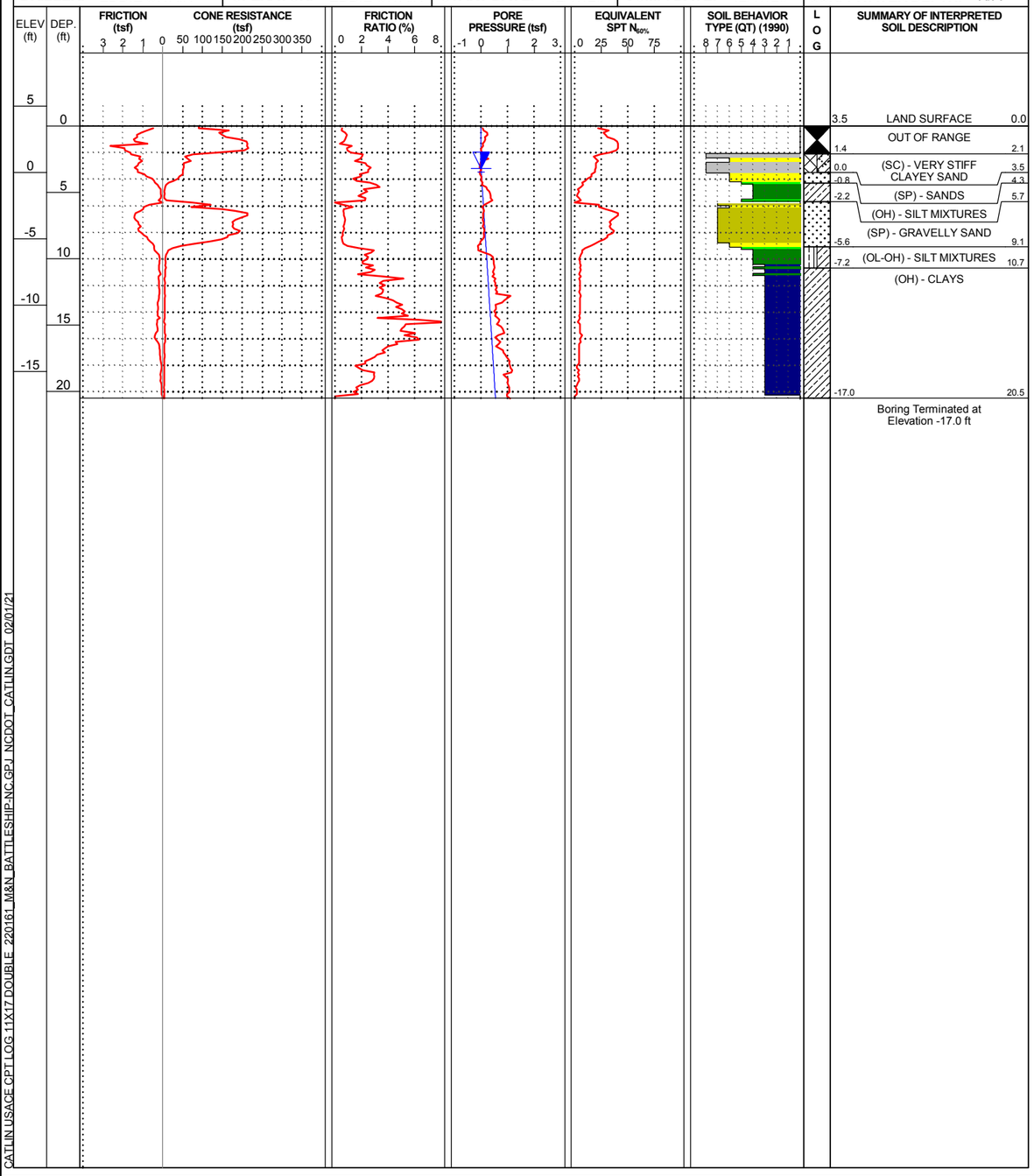


CONE PENETRATION TEST SOUNDING REPORT

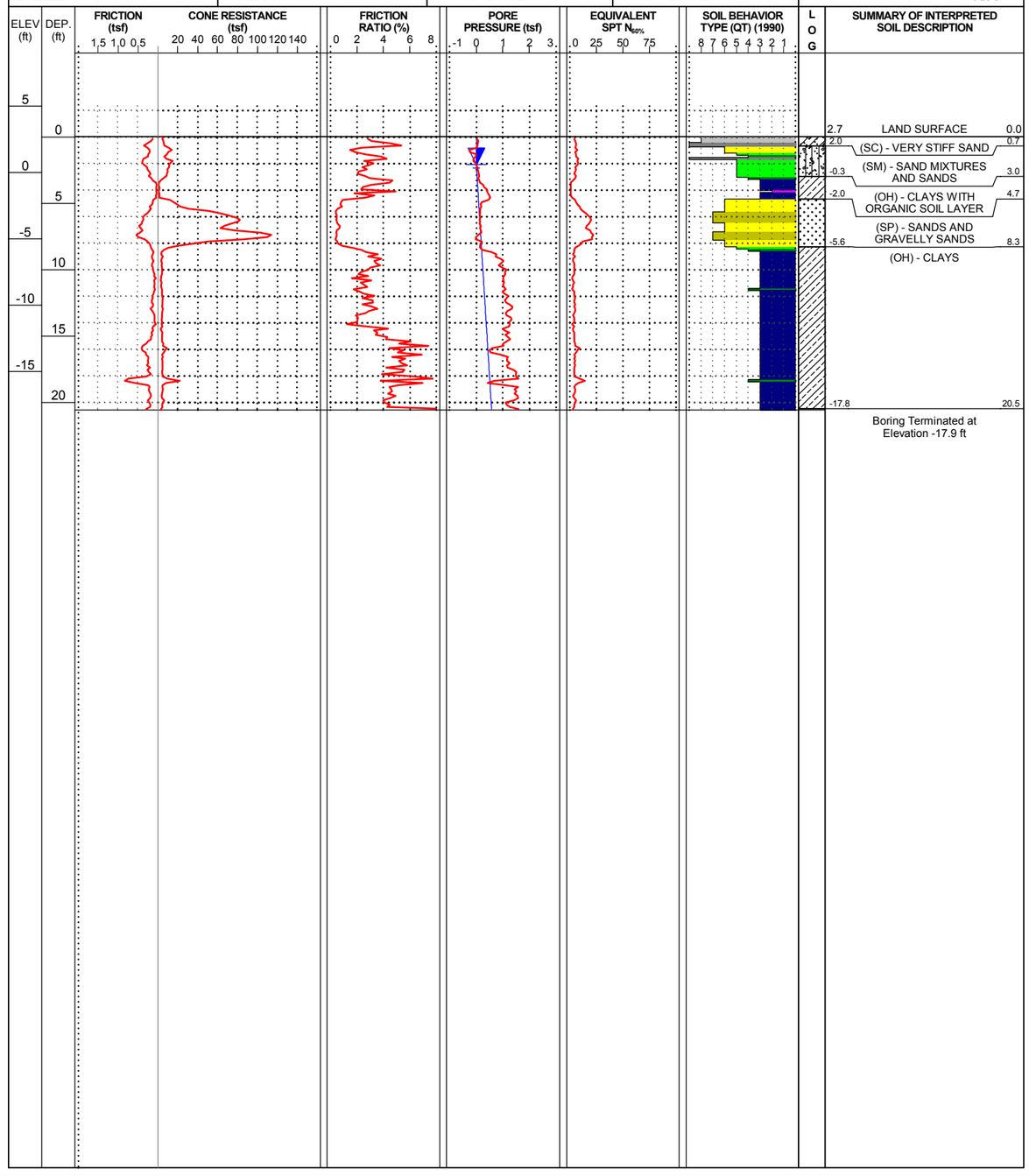
220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	8

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-12	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 3.2
COLLAR ELEV.: 3.5 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,394	**EASTING:** 2,315,745	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DSG1156
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/17/20	**COMP. DATE:** 12/17/20	**SURF. WATER DEPTH:** N/A

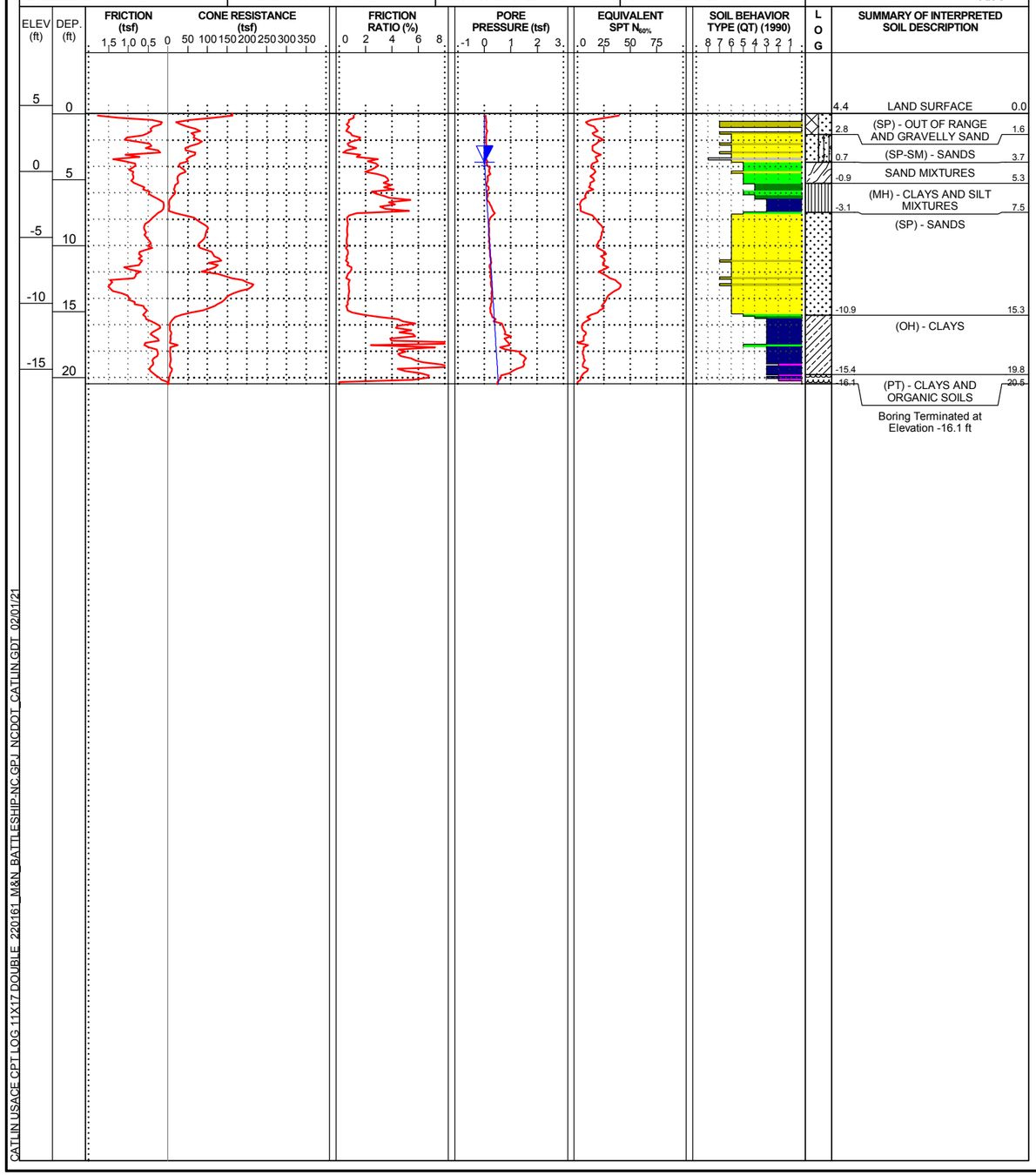


CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-13	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.1
COLLAR ELEV.: 2.7 ft	**TOTAL DEPTH:** 20.6 ft	**NORTHING:** 178,514	**EASTING:** 2,315,589	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/30/20	**COMP. DATE:** 12/30/20	**SURF. WATER DEPTH:** N/A



CONE PENETRATION TEST SOUNDING REPORT

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-14	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 3.7
COLLAR ELEV.: 4.4 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,352	**EASTING:** 2,315,654	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2	**CONE ID:** DSG1156	
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/17/20	**COMP. DATE:** 12/17/20	**SURF. WATER DEPTH:** N/A



DIRECT PUSH TECHNOLOGY BORING REPORT

220161 CATLIN Engineers and Scientists 220 Old Dairy Road Wilmington, NC 28405 Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	9

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** L.PUGH	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-14-GEO	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**0 HR.** N/A
COLLAR ELEV.: 4.4 ft	**TOTAL DEPTH:** 8.0 ft	**NORTHING:** 178,352	**EASTING:** 2,315,655	**24 HR.** FIAD
DRILL MACHINE: CATLIN CPT/DPT-01		**DRILL METHOD:** Direct Push	**HAMMER TYPE:** N/A	
DRILLER: D.T. CHALMERS	**START DATE:** 12/28/20	**COMP. DATE:** 12/28/20	**SURFACE WATER DEPTH:** N/A	

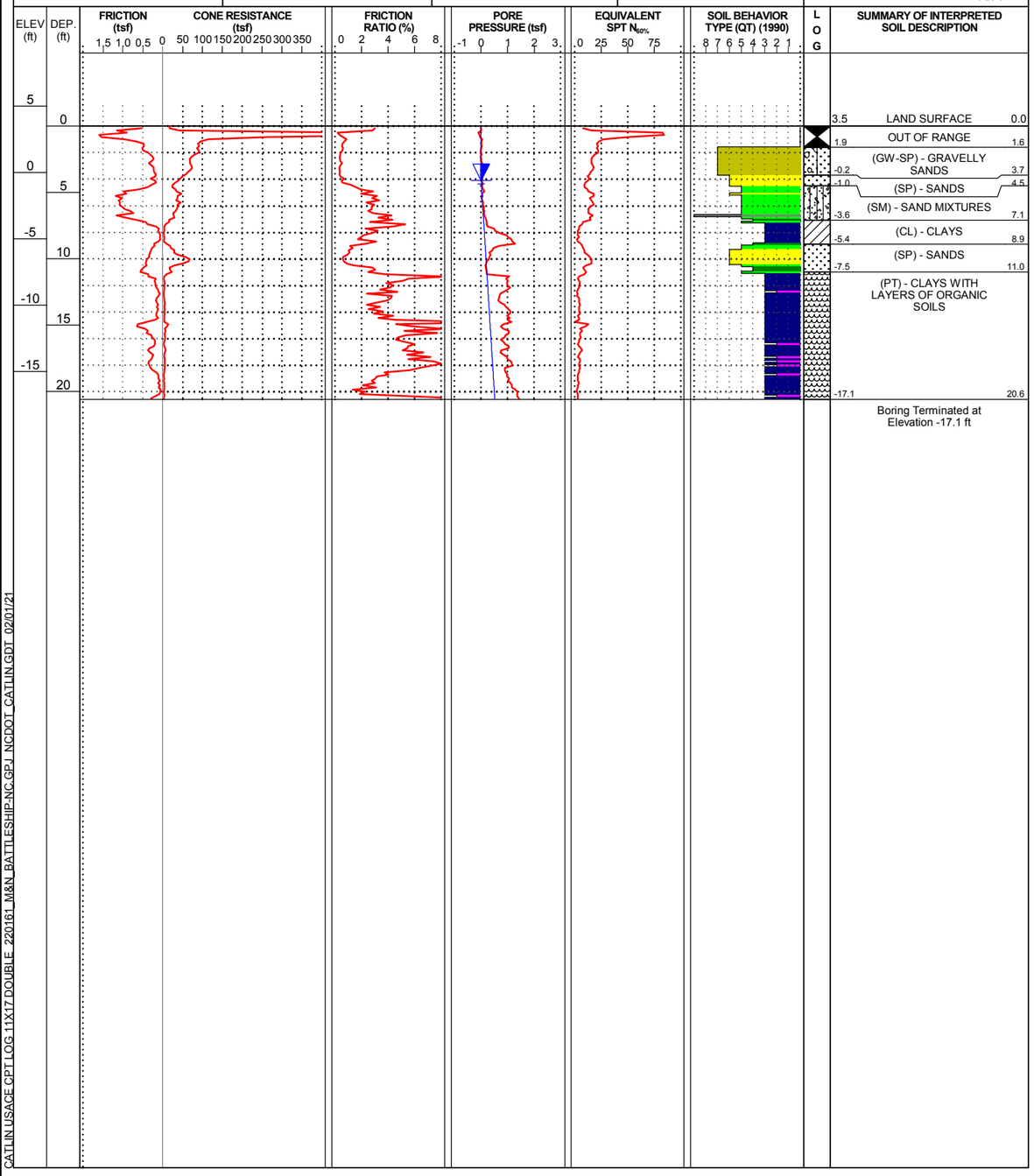
ELEV (ft)	SAMP. ELEV. TOP (ft)	SAMP. DEPTH TOP (ft)	RECOVERY % (RQD)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT PASSING SIEVES 10	40	200	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	FIELD MOISTURE	SAMP. NO. & USCS	LOG	SOIL AND ROCK DESCRIPTION
															4.4 LAND SURFACE 0.0
															4.1 TOPSOIL 0.3
															ARTIFICIAL FILL (SP-SM) - LIGHT BROWN, F. AND CSE. SAND TO SILTY SAND 4.0
	1.4	3.0		NP	NP	NP	96	56	5	-	-		S-06 SP-SM		
															ALLUVIAL
	-1.6	6.0													-1.6 WOOD DEBRIS 6.0
	-2.6	7.0		73	46	27	99	93	89	-	-		S-07 MH		-2.6 (MH) - GRAY, ELASTIC SILT 7.0
				NP	NP	NP	100	78	4	-	-		S-08 SP		-3.6 (SP) - GRAY, F. SAND 8.0
															Boring Terminated at Elevation -3.6 ft

CONE PENETRATION TEST SOUNDING REPORT

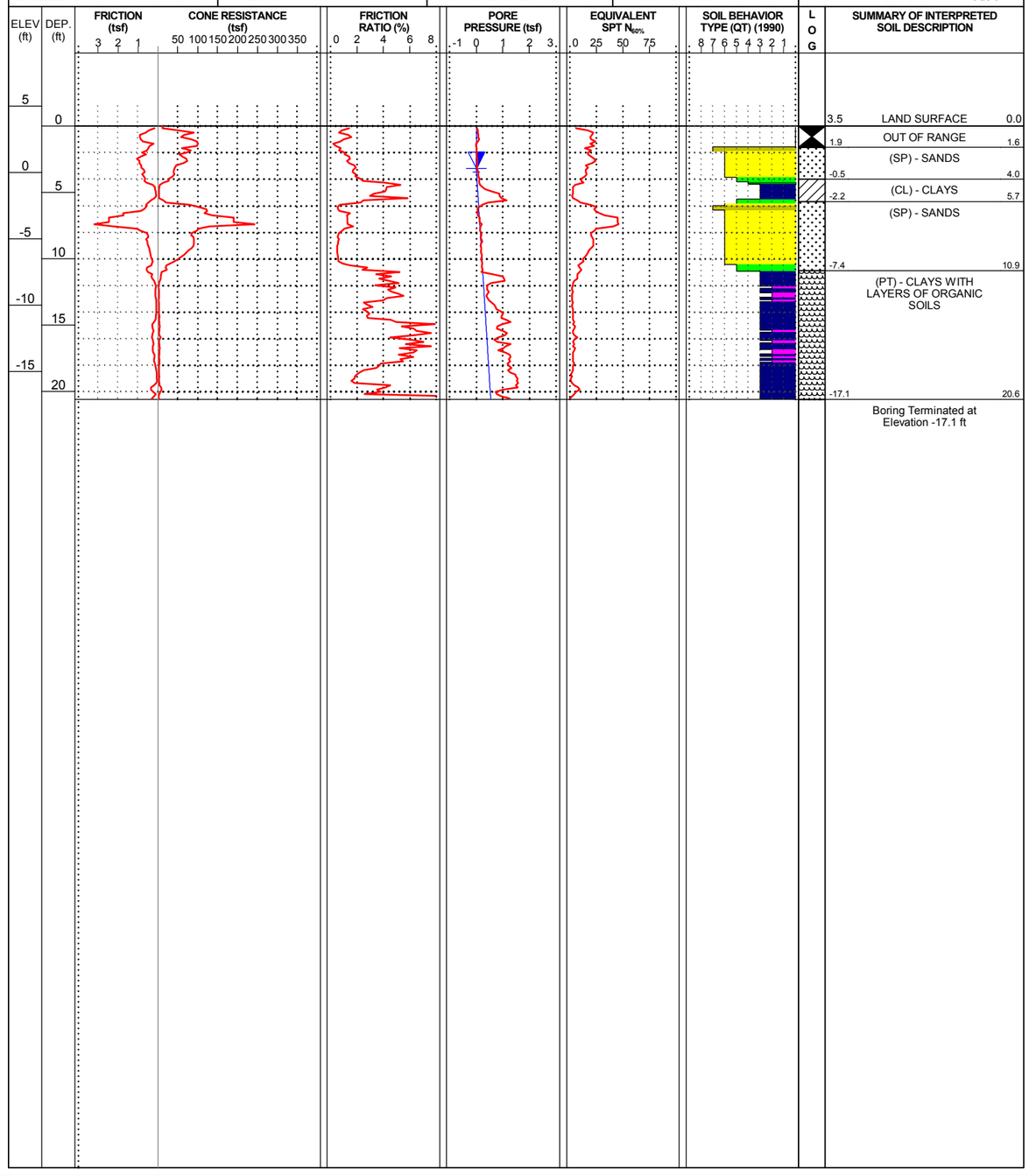
220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	10

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-15	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 4.1
COLLAR ELEV.: 3.5 ft	**TOTAL DEPTH:** 20.6 ft	**NORTHING:** 178,231	**EASTING:** 2,315,581	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/30/20	**COMP. DATE:** 12/30/20	**SURF. WATER DEPTH:** N/A



CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-16	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 3.2
COLLAR ELEV.: 3.5 ft	**TOTAL DEPTH:** 20.6 ft	**NORTHING:** 178,231	**EASTING:** 2,315,737	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/17/20	**COMP. DATE:** 12/17/20	**SURF. WATER DEPTH:** N/A

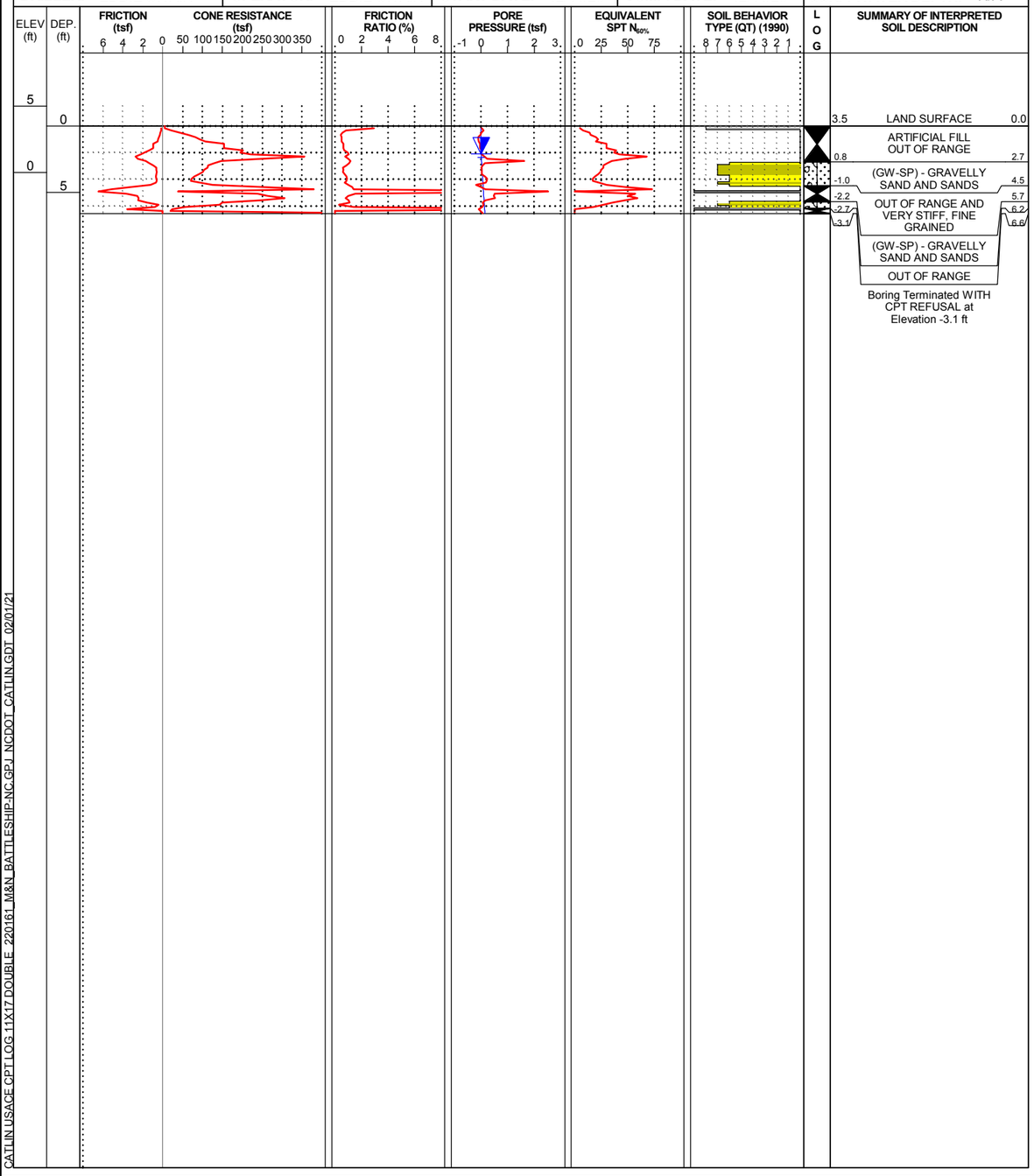


CONE PENETRATION TEST SOUNDING REPORT

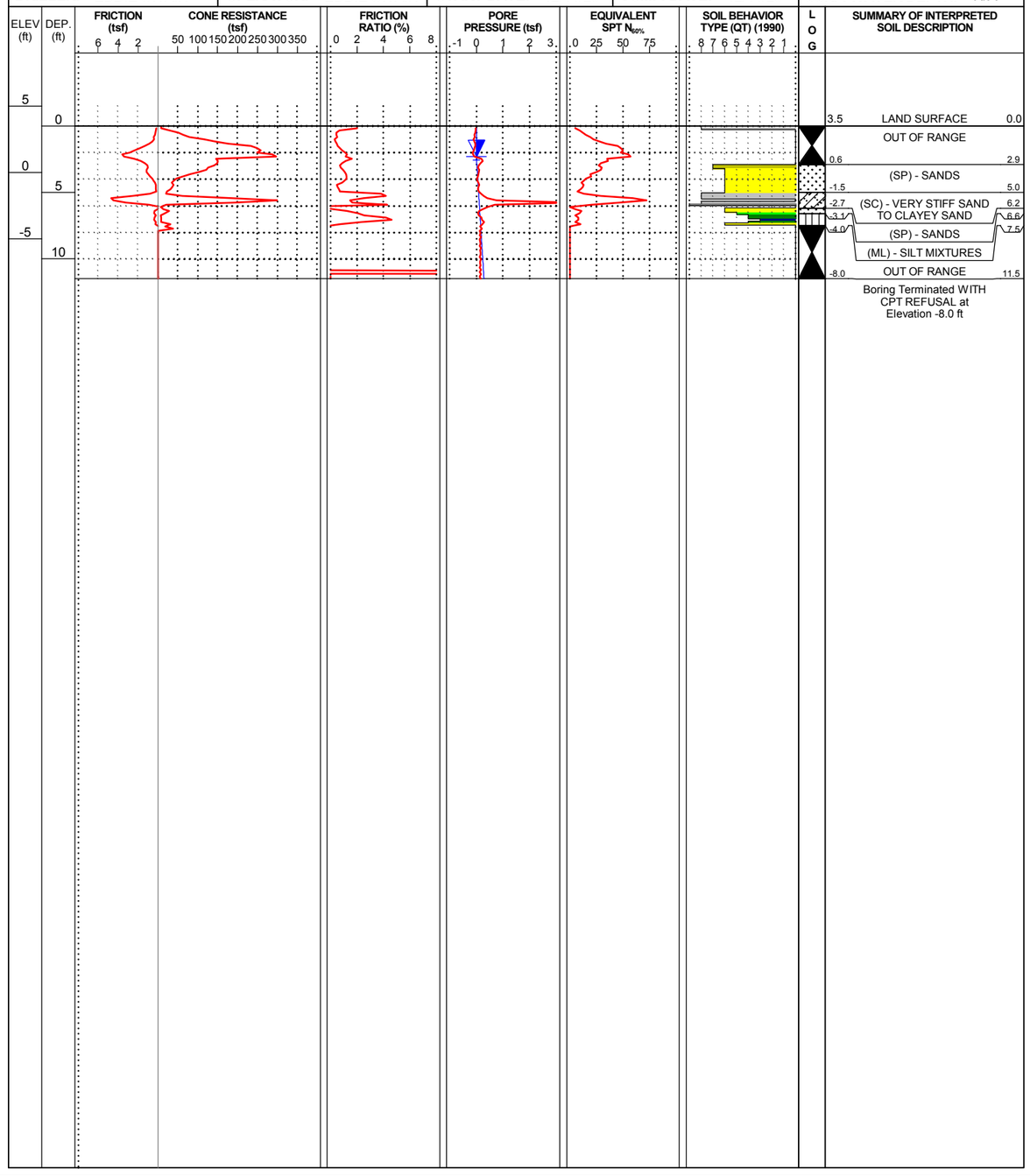
220161 — CATLIN Engineers and Scientists, 220 Old Dairy Road, Wilmington, NC 28405, Corporate Licensure No. for Engineering Services C-0585

PROJECT REFERENCE	SHEET
220161	11

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-17	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.1
COLLAR ELEV.: 3.5 ft	**TOTAL DEPTH:** 6.6 ft	**NORTHING:** 178,287	**EASTING:** 2,316,745	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2	**CONE ID:** DSG1156	
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/11/20	**COMP. DATE:** 12/11/20	**SURF. WATER DEPTH:** N/A

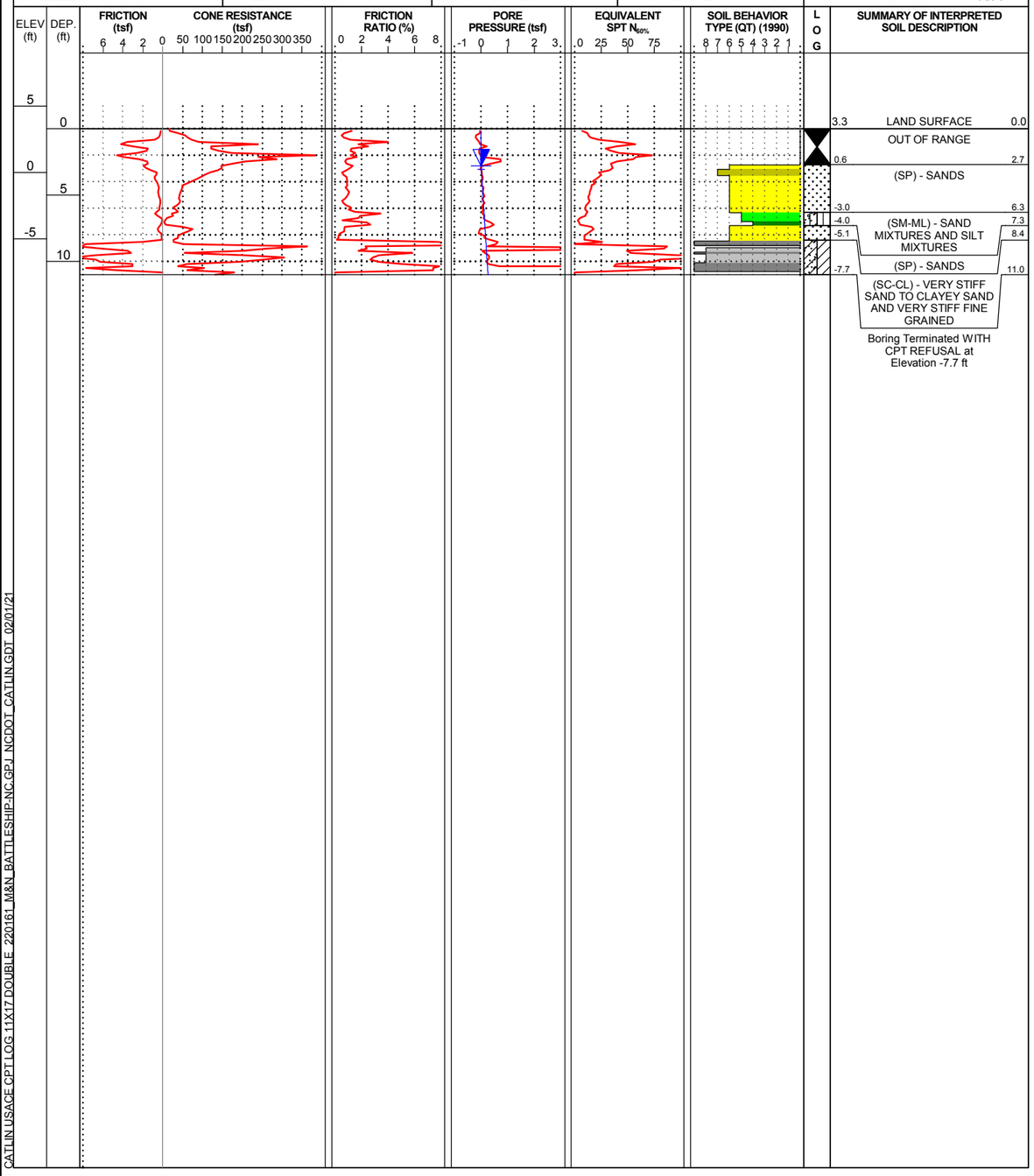


CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-17A	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.3
COLLAR ELEV.: 3.5 ft	**TOTAL DEPTH:** 11.5 ft	**NORTHING:** 178,294	**EASTING:** 2,316,738	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2	**CONE ID:** DSG1156	
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/11/20	**COMP. DATE:** 12/11/20	**SURF. WATER DEPTH:** N/A



CONE PENETRATION TEST SOUNDING REPORT

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-18	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 2.8
COLLAR ELEV.: 3.3 ft	**TOTAL DEPTH:** 11.0 ft	**NORTHING:** 178,409	**EASTING:** 2,316,671	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2	**CONE ID:** DSG1156	
DRILLER: EDDIE SWAIN	**OPERATOR:** EDDIE SWAIN	**START DATE:** 12/11/20	**COMP. DATE:** 12/11/20	**SURF. WATER DEPTH:** N/A



DIRECT PUSH TECHNOLOGY BORING REPORT

CATLIN Engineers and Scientists — 220 Old Dairy Road, Wilmington, NC 28405 — Corporate Licensure No. for Engineering Services C-0585

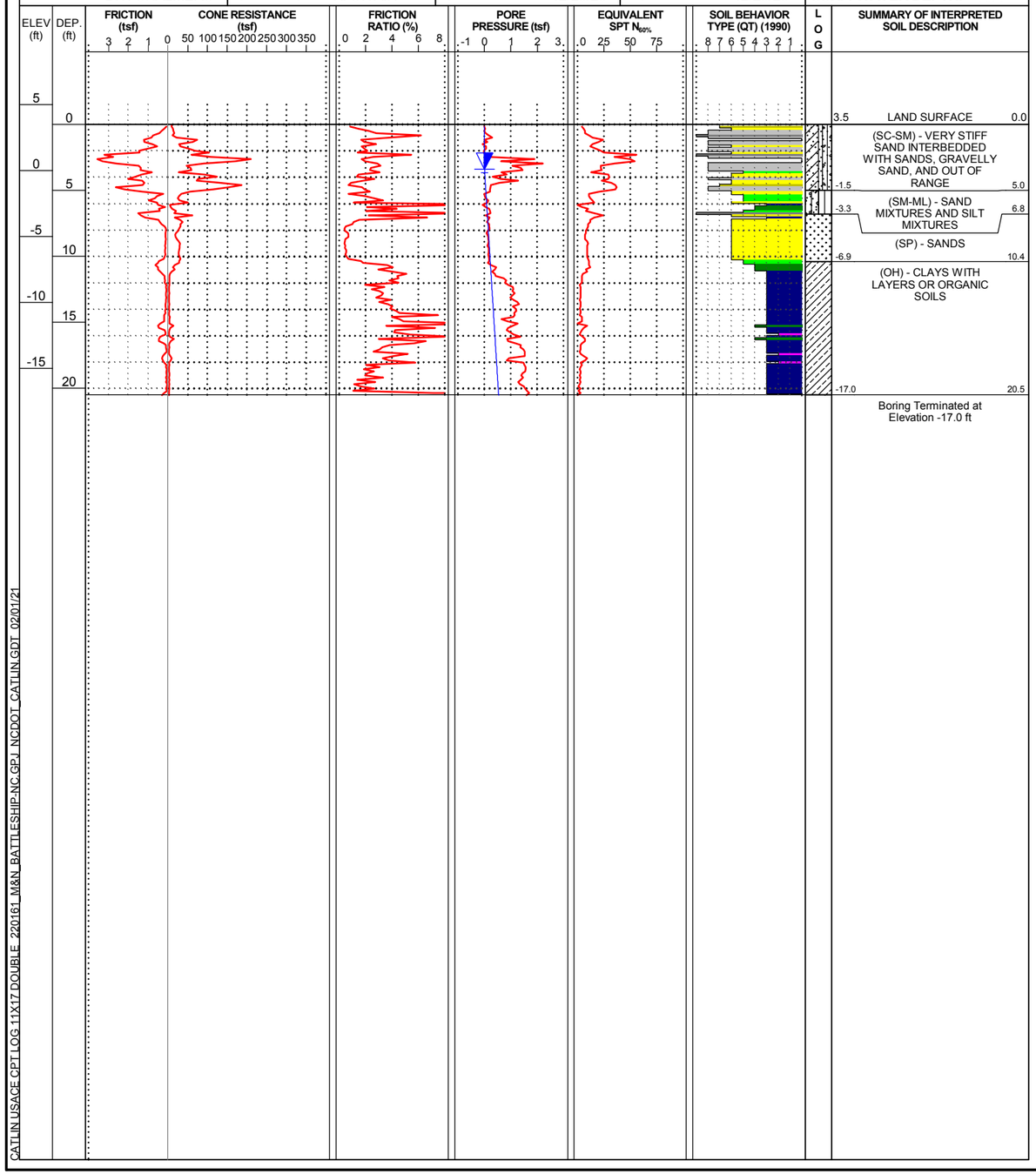
PROJECT REFERENCE	SHEET
220161	12

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** L.PUGH	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-18-GEO	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**0 HR.** N/A
COLLAR ELEV.: 3.3 ft	**TOTAL DEPTH:** 2.0 ft	**NORTHING:** 178,409	**EASTING:** 2,316,672	**24 HR.** FIAD
DRILL MACHINE: CATLIN CPT/DPT-01		**DRILL METHOD:** Direct Push	**HAMMER TYPE:** N/A	
DRILLER: D.T. CHALMERS	**START DATE:** 12/28/20	**COMP. DATE:** 12/28/20	**SURFACE WATER DEPTH:** N/A	

ELEV (ft)	SAMP. ELEV. TOP (ft)	SAMP. DEPTH TOP (ft)	RECOVERY % (RQD)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	PERCENT PASSING SIEVES 10	40	200	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	FIELD MOISTURE	SAMP. NO. & USCS	LOG	SOIL AND ROCK DESCRIPTION
3.3	3.3	0.0													3.3 LAND SURFACE 0.0
				NP	NP	NP	99	80	20	-	-		S-09 SM		1.3 (SM) - LIGHT BROWN, SILTY, F. SAND 2.0
															UNDIVIDED COASTAL PLAIN
															Boring Terminated WITH DPT REFUSAL at Elevation 1.3 ft

CONE PENETRATION TEST SOUNDING REPORT

CATLIN NO.: 220161	**CITY, STATE:** WILMINGTON, NC	**COUNTY:** NEW HANOVER	**LOGGED BY:** S. V. HUDSON	
SITE DESCRIPTION: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER				**GROUND WTR (ft)**
BORING NO.: CPT-19	**STATION:** N/A	**OFFSET:** N/A	**ALIGNMENT:** N/A	**EST. 0 HR.** 3.4
COLLAR ELEV.: 3.5 ft	**TOTAL DEPTH:** 20.5 ft	**NORTHING:** 178,541	**EASTING:** 2,316,689	**24 HR.** N/A
CPT RIG/MAX. DOWN PRESSURE: CATLIN CPT/DPT-01 / ~9 TONS - NON-ANCHORED		**CONE TYPE:** Type II Piezo. / 60° / 2.33 in^2		**CONE ID:** DPG1563
DRILLER: D.T. CHALMERS	**OPERATOR:** K. SWAIN	**START DATE:** 12/29/20	**COMP. DATE:** 12/29/20	**SURF. WATER DEPTH:** N/A



CATLIN USACE CPT LOG 11X17 DOUBLE 220161 M&N BATTLESHIP-NC.GPJ NCDOT_CATLIN.GDT 02/01/21

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APPENDIX B

GEOTECHNICAL LABORATORY RESULTS

Borehole	Depth	Sample Id.	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Class-ification	Water Content (%)	Organic Content (%)	Other
CPT-05-GEO	4.0	S-05	NP	NP	NP	4.76	4	SP			
CPT-09-GEO	0.0	S-01	NP	NP	NP	9.51	12	SP-SM			
CPT-09-GEO	3.0	S-01	NP	NP	NP	9.51	12	SP-SM			
CPT-09-GEO	7.0	S-02				9.51	66			28.5	
CPT-09-GEO	12.0	S-03								45.5	
CPT-09-GEO	16.0	S-04								49.1	
CPT-14-GEO	3.0	S-06	NP	NP	NP	9.51	5	SP-SM			
CPT-14-GEO	6.0	S-07	73	46	27	4.76	89	MH			
CPT-14-GEO	7.0	S-08	NP	NP	NP	4.76	4	SP			
CPT-18-GEO	0.0	S-09	NP	NP	NP	4.76	20	SM			

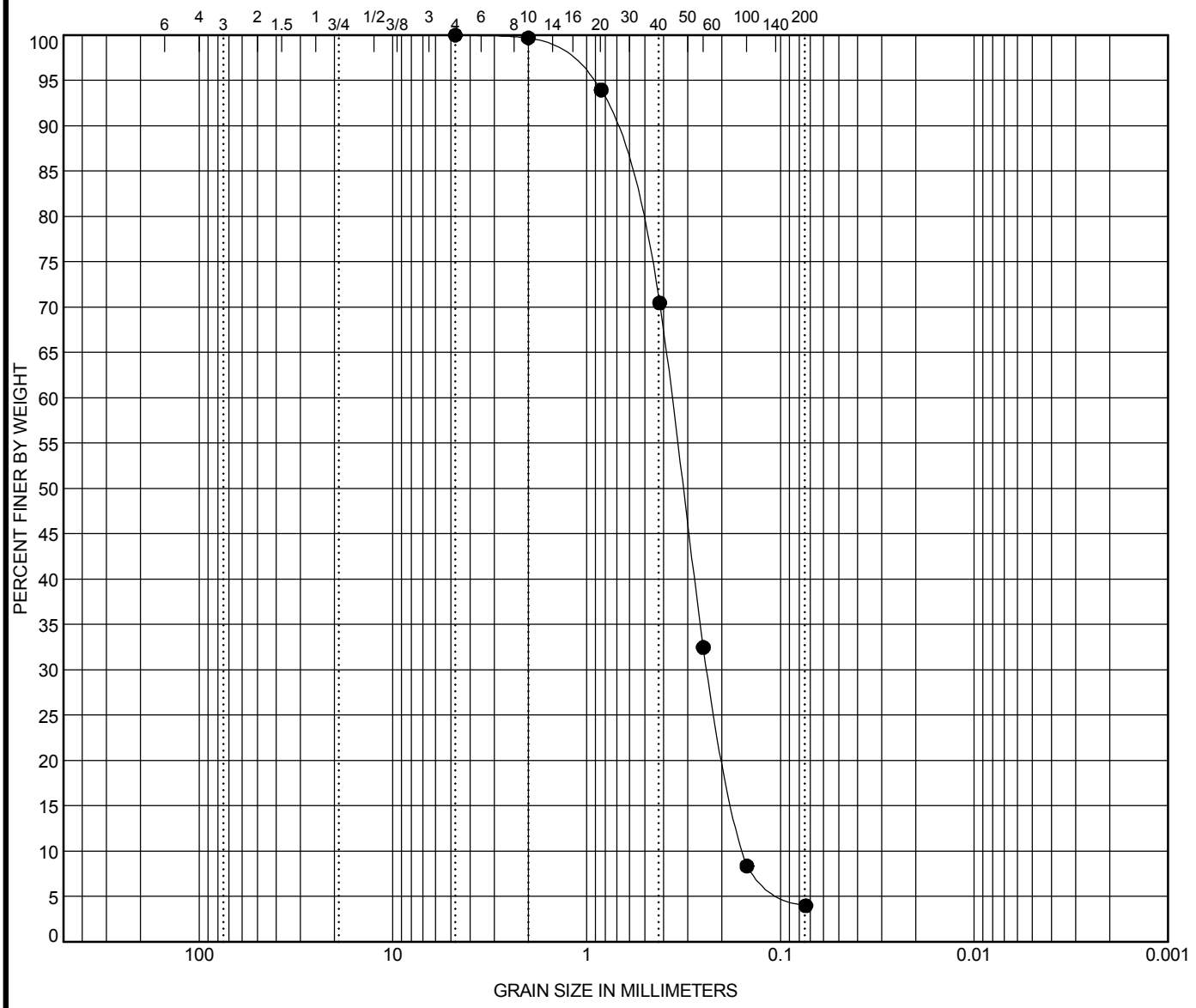
CATLIN Engineers and Scientists

GEOTECHNICAL LABORATORY
Wilmington, NC

CATLIN NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CATLIN NUMBER: 220161

SUMMARY OF LABORATORY RESULTS

PROJECT NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CITY, STATE: WILMINGTON, NC
PREPARED FOR: MOFFAT NICHOL



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Depth	Classification	LL	PL	PI	Cc	Cu
●	CPT-05-GEO	4.0	SP	NP	NP	NP	1.00	2.36

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	CPT-05-GEO	4.0	4.76	0.364	0.237	0.154	0.0	95.9	4.1	

CATLIN Engineers and Scientists

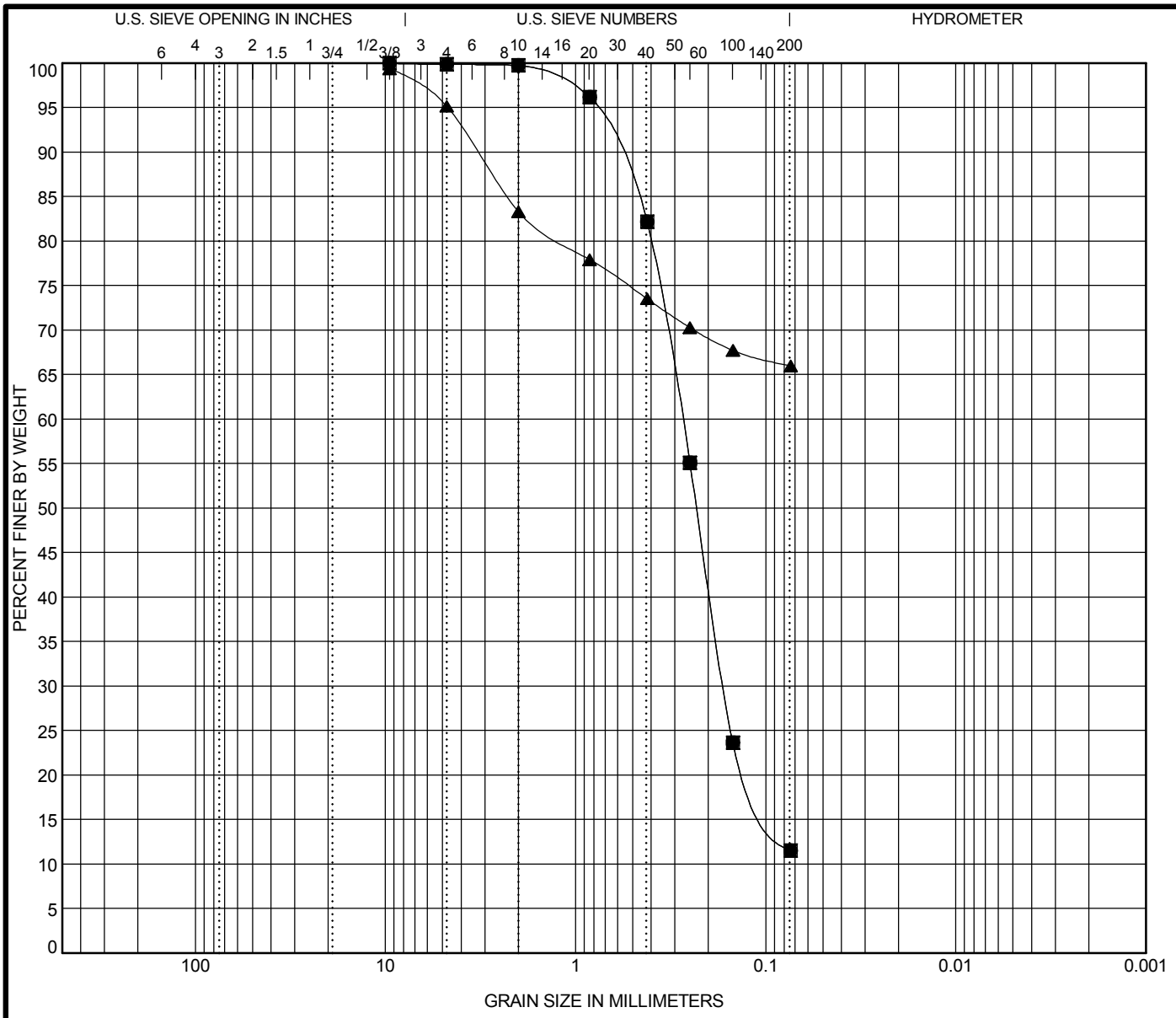
GEOTECHNICAL LABORATORY
Wilmington, NC

CATLIN NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CATLIN NUMBER: 220161

GRAIN SIZE DISTRIBUTION

PROJECT NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CITY, STATE: WILMINGTON, NC
PREPARED FOR: MOFFAT NICHOL

US_GRAIN_SIZE_220161_M&N_BATTLESHIP.NC.GPJ_CATLIN.GDT_02/15/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Depth	Classification	LL	PL	PI	Cc	Cu
●	CPT-09-GEO	0.0	SP-SM	NP	NP	NP	1.47	4.05
⊠	CPT-09-GEO	3.0	SP-SM	NP	NP	NP	1.47	4.05
▲	CPT-09-GEO	7.0						

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	CPT-09-GEO	0.0	9.51	0.275	0.165		0.1	88.1	11.8	
⊠	CPT-09-GEO	3.0	9.51	0.275	0.165		0.1	88.1	11.8	
▲	CPT-09-GEO	7.0	9.51				4.2	29.1	66.0	

CATLIN Engineers and Scientists

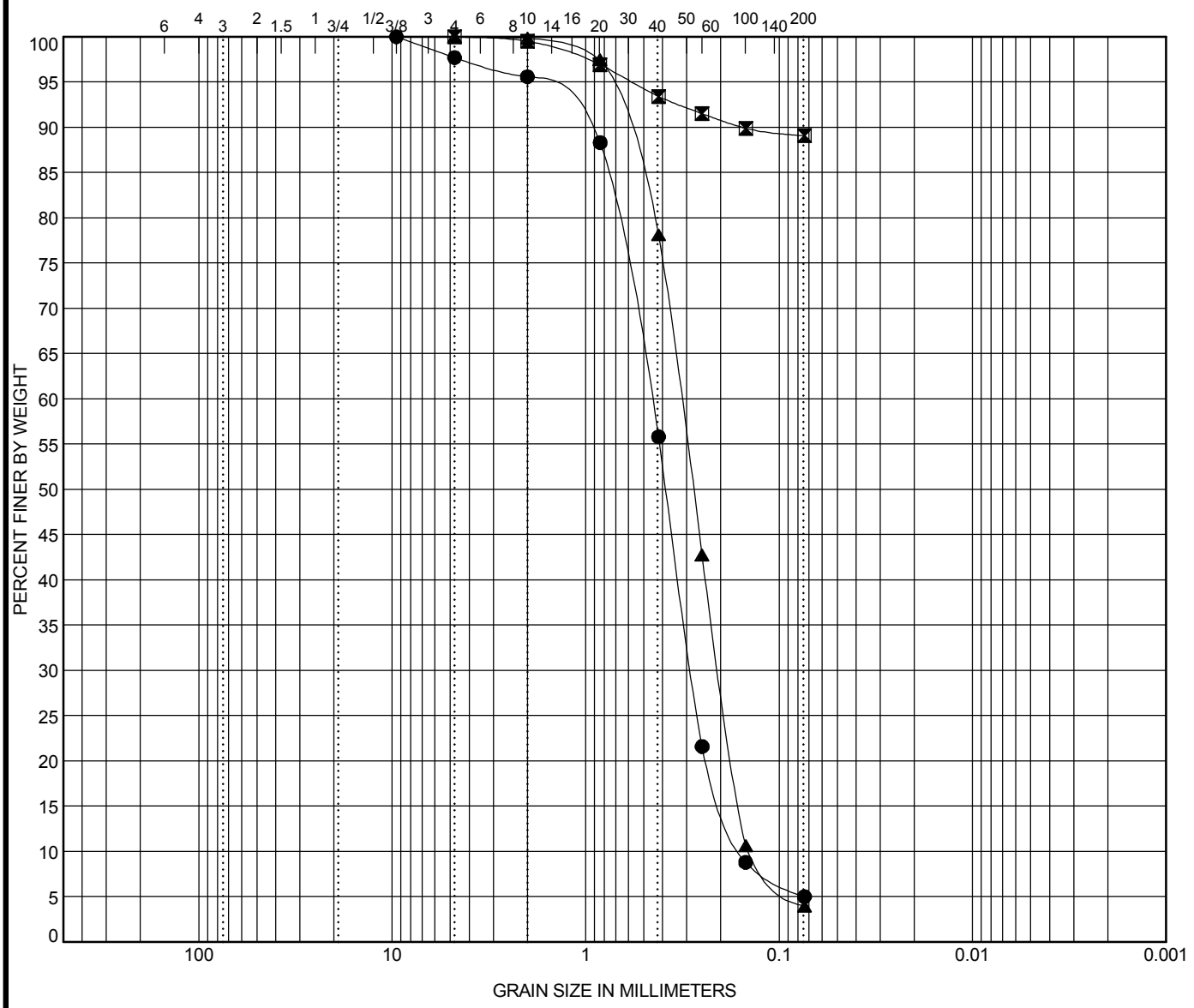
GEOTECHNICAL LABORATORY
Wilmington, NC

CATLIN NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CATLIN NUMBER: 220161

GRAIN SIZE DISTRIBUTION

PROJECT NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CITY, STATE: WILMINGTON, NC
PREPARED FOR: MOFFAT NICHOL

US_GRAIN_SIZE_220161_M&N_BATTLESHIP.NC.GPJ_CATLIN.GDT_02/15/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Depth	Classification	LL	PL	PI	Cc	Cu
●	CPT-14-GEO	3.0	SP-SM	NP	NP	NP	1.12	2.94
⊠	CPT-14-GEO	6.0	MH	73	46	27		
▲	CPT-14-GEO	7.0	SP	NP	NP	NP	0.92	2.31

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	CPT-14-GEO	3.0	9.51	0.459	0.284	0.156	2.3	92.6	5.1	
⊠	CPT-14-GEO	6.0	4.76				0.0	10.9	89.1	
▲	CPT-14-GEO	7.0	4.76	0.322	0.204	0.14	0.0	95.9	4.1	

CATLIN Engineers and Scientists

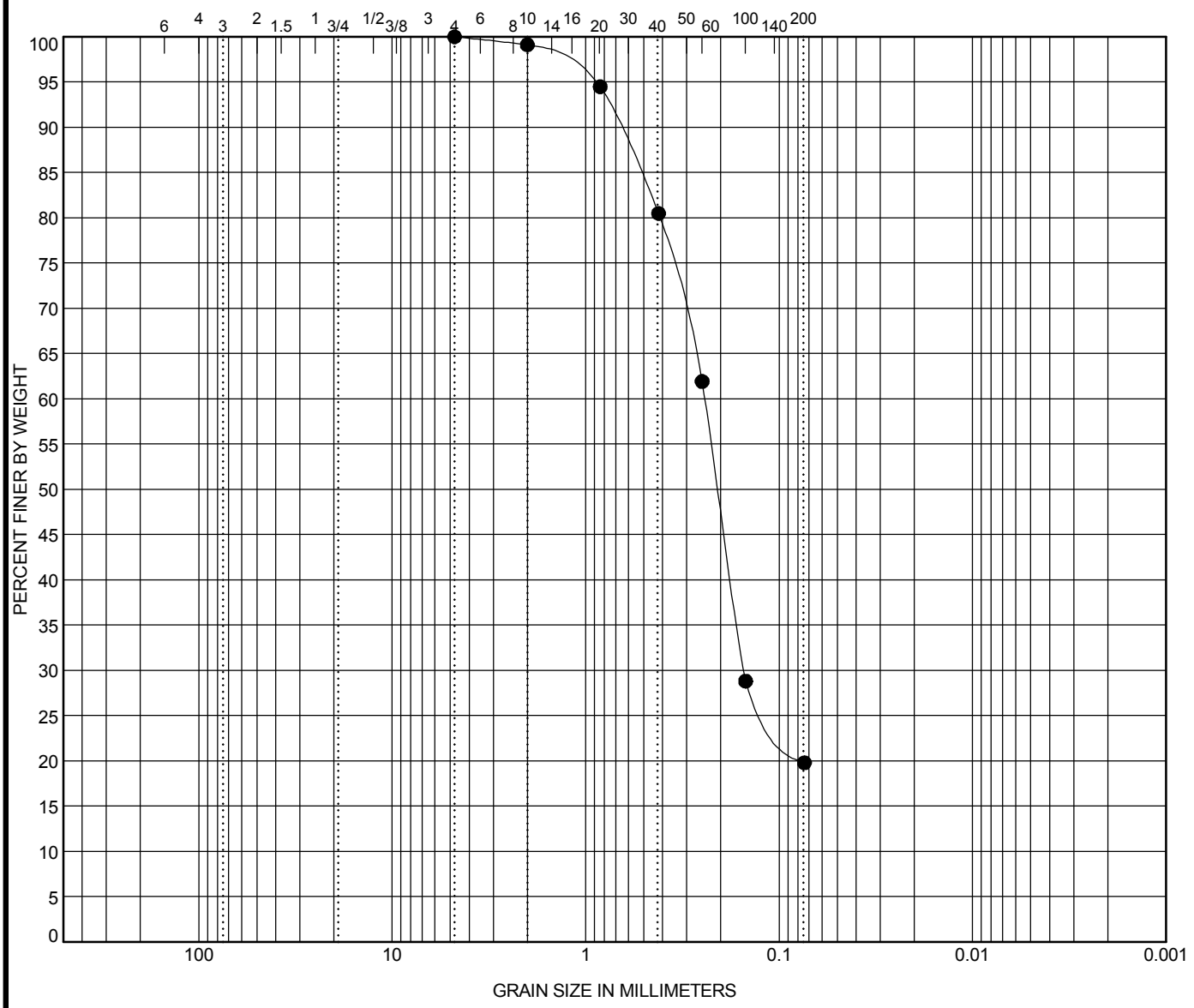
GEOTECHNICAL LABORATORY
Wilmington, NC

CATLIN NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CATLIN NUMBER: 220161

GRAIN SIZE DISTRIBUTION

PROJECT NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CITY, STATE: WILMINGTON, NC
PREPARED FOR: MOFFAT NICHOL

US_GRAIN_SIZE_220161_M&N_BATTLESHIP.NC.GPJ_CATLIN.GDT_02/15/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Depth	Classification	LL	PL	PI	Cc	Cu
●	**CPT-18-GEO**	**0.0**	**SM**	**NP**	**NP**	**NP**		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**CPT-18-GEO**	**0.0**	**4.76**	**0.243**	**0.152**		**0.0**	**80.0**	**20.0**	

CATLIN Engineers and Scientists

GEOTECHNICAL LABORATORY
Wilmington, NC

CATLIN NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CATLIN NUMBER: 220161

GRAIN SIZE DISTRIBUTION

PROJECT NAME: USS BATTLESHIP NORTH CAROLINA - LIVING WITH WATER
CITY, STATE: WILMINGTON, NC
PREPARED FOR: MOFFAT NICHOL

US_GRAIN_SIZE_220161_M&N_BATTLESHIP.NC.GPJ_CATLIN.GDT_02/15/21

COMPACTION TEST

(Standard Proctor ASTM D 698, Method B)

Project:	Battleship NC	Job No.:	220161
Location of Project:	Camp Lejeune, NC	Sample No.:	CBR-01
		Boring No.:	
Description of Soil:	Light brown to light gray poorly graded SAND, SP	Tested By:	MDMASON
		Date of Testing:	1/29/2021

Natural Moisture Content (ASTM D 2216)

Mcws	Mcds	Mc	Mw	Ms	w%
628.04	569.15	237.67	58.89	331.48	17.77

Blows/layer: 56 No. of Layers: 3 Wt. of Hammer : 5.5 lbs

Mold Dimensions:

Diam.: 6 in. Ht. in. Vol. 0.075 $ft.^3$

Water Content Determination

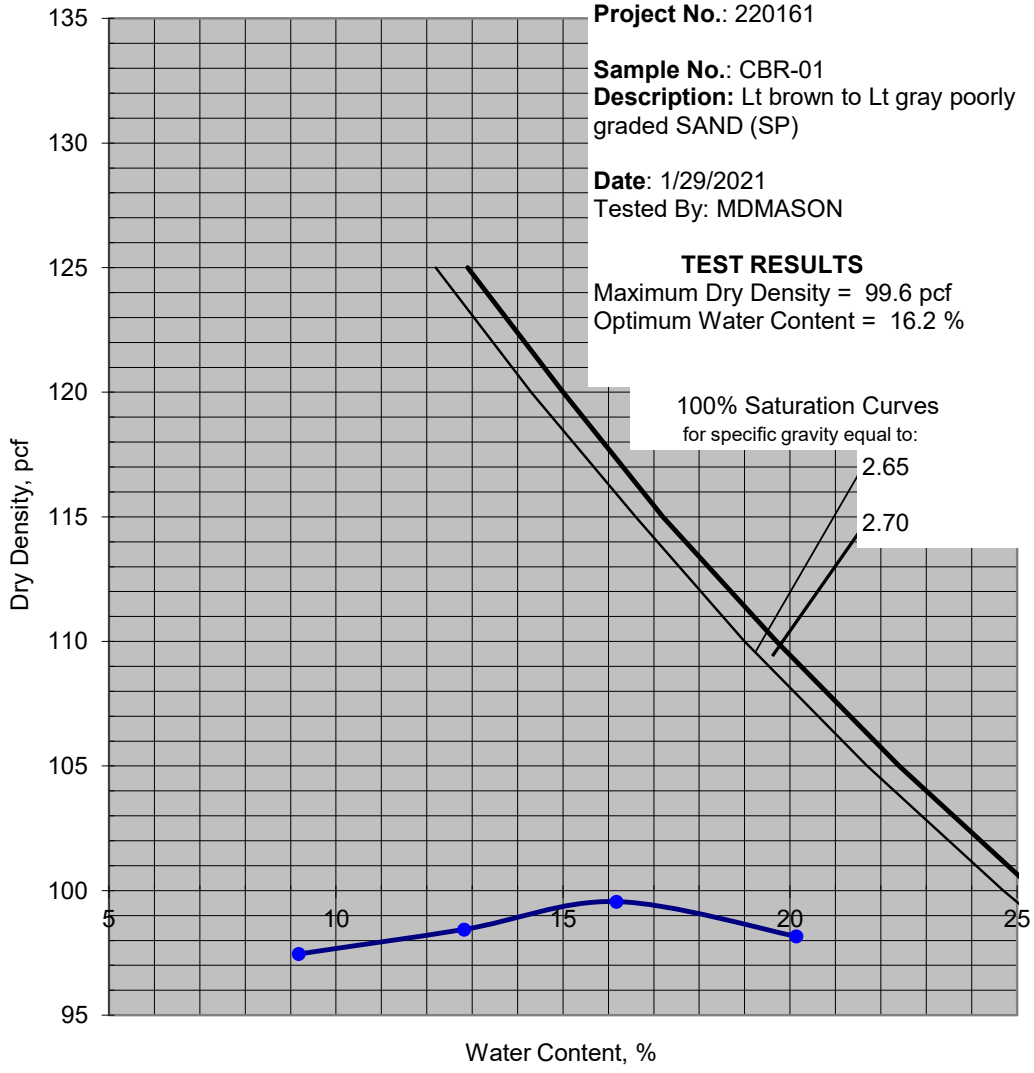
Sample No.	1	2	3	4	5	6
Can No.	P67	P203	P25	P302		
Mcws	299.67	322.70	422.48	287.18		
Mcds	294.42	309.68	396.31	273.44		
Mw	5.25	13.02	26.17	13.74		
Mc	237.20	208.14	234.52	205.21		
Ms	57.22	101.54	161.79	68.23		
w%	9.18	12.82	16.18	20.14		

Density Determination

Ave. w%	9.18	12.82	16.18	20.14		
Mms	17.16	17.52	17.845	18.025		
Mm	9.18	9.19	9.17	9.18		
Ms	7.98	8.33	8.68	8.85		
Wet Den.	106.40	111.07	115.67	117.93		
Dry Den.	97.46	98.44	99.56	98.17		

MOISTURE-DENSITY RELATIONSHIP

ASTM D698 - Standard Proctor - Method C



ASTM D 1883
CBR TEST

Client	Moffit Nichol	**Boring No.**	CBR-01
Project Name	Battleship NC	**Depth (ft)**	0'-4'
Project Location	Wilmington, Nc	**Sample No.**	CBR-01
Project Number	220161	**Visual Description**	LG poorly graded SAND
POINT ID	CBR-01-02	**Date**	1/29/2021

			Before Soaking	**After Soaking**
Test Type	Stnd			
Molding Method	C	**Density Measurement**		
Mold ID	CBR-Mold15	Wt. Mold & Wet Soil (lbs)	17.52	18.00
Wt. Of Mold (lbs)	9.17	Wt. Wet Soil (lbs)	8.35	8.83
Mold Volume (ft^3)	0.0749	Sample Volume (ft3)	0.0749	0.0749
Piston Area (in^2)	3			
Surcharge (lbs)	15			
Sample Height (in)	4.59			
Sample Conditions	Soaked	Wet Density (pcf)	111.5	117.8
Blows per Layer	56	Dry Density (pcf)	99.0	98.2

Water Contents		**As Rec'd**	**Beginning Compaction**	**After Compaction**	**Before Soaking**	**After Soaking**	**Top 1" After Soak**
Can No.		P58	P203	P5	P5	P28	P13
Wt. Of CWS (gm)		628.04	322.7	453.62	453.62	937.36	1293.94
Wt. Of CDS (gm)		569.15	309.68	429.02	429.02	819.49	1115.87
Wt. Of Can (gm)		237.67	208.14	233.28	233.28	231.23	236.43
MC (%)		17.8	12.8	12.6	12.6	20.0	20.2

Piston Diplacement (in.)	**Dial Reading**	**Load (lbs)**	**Penetration Stress (psi)**
0.000	1	9.7	3.2
0.025	5	48.5	16.2
0.050	10	97	32.3
0.075	17	164.9	55.0
0.100	23	223.1	74.4
0.125	30	291	97.0
0.150	37	358.9	119.6
0.175	42	407.4	135.8
0.200	48	465.6	155.2
0.250	58	562.6	187.5
0.300	69	669.3	223.1
0.350	77	746.9	249.0
0.400	83	805.1	268.4
0.450	87	843.9	281.3
0.500	92	892.4	297.5
0.600	99	960.3	320.1

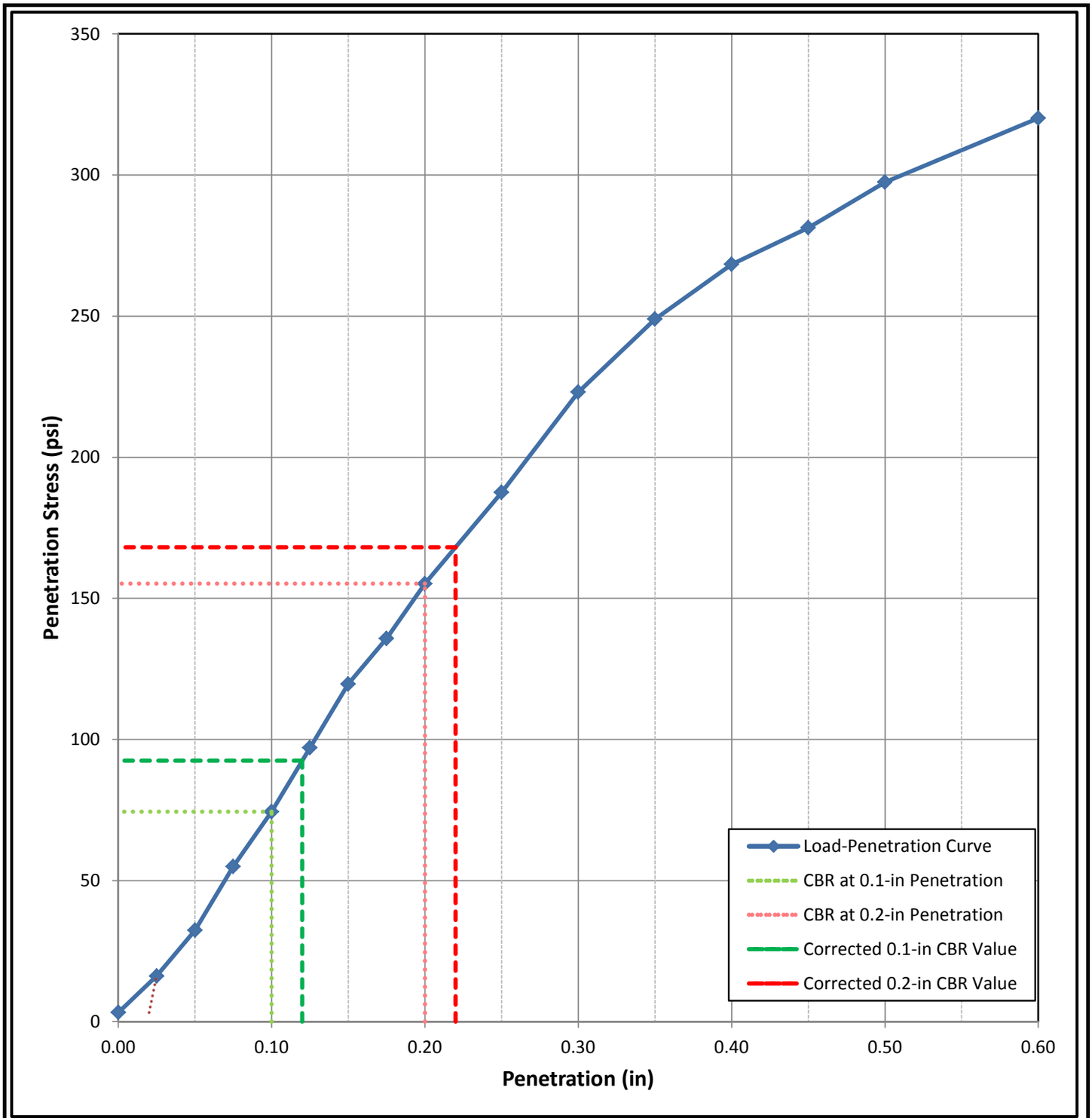
Swell Measurement

Elapsed Time (hrs)	Dial Gauge (Div)	Percent Swell (%)
0	0.215	0
96	0.215	**0.00**

Final Swell

CBR Results	
@ 0.1"	**7.4**
@ 0.2"	**10.3**

CATLIN Engineers and Scientists
Geotechnical Laboratory



PENETRATION STRESS vs. PENETRATION

CATLIN Engineers and Scientists

Geotechnical Laboratory
Wilmington, NC

Project Name:	Battleship NC
Project Location:	Wilmington, Nc
Prepared For:	Moffit Nichol
Project Number:	220161 **Date:** 1/29/2021

Sample Number/Depth:	CBR-01 / 0'-4'
Sample Point ID:	CBR-01-02
Description:	LB to LG poorly graded SAND (SP)

CBR VALUES

CBR (0.1"):	7.4%	**CBR (0.2"):**	10.3%
Corr. CBR (0.1"):	9.2%	**Corr. CBR (0.2"):**	11.2%

ASTM D 1883
CBR TEST

Client	Moffit Nichol	**Boring No.**	CBR-01
Project Name	Battleship NC	**Depth (ft)**	0'-4'
Project Location	Wilmington, Nc	**Sample No.**	CBR-01
Project Number	220161	**Visual Description**	LG poorly graded SAND
POINT ID	CBR-01-02	**Date**	1/29/2021

			Before Soaking	**After Soaking**
Test Type	Stnd			
Molding Method	C	**Density Measurement**		
Mold ID	CBR-Mold15	Wt. Mold & Wet Soil (lbs)	17.52	18.00
Wt. Of Mold (lbs)	9.17	Wt. Wet Soil (lbs)	8.35	8.83
Mold Volume (ft^3)	0.0749	Sample Volume (ft3)	0.0749	0.0749
Piston Area (in^2)	3			
Surcharge (lbs)	15			
Sample Height (in)	4.59			
Sample Conditions	Soaked	Wet Density (pcf)	111.5	117.8
Blows per Layer	56	Dry Density (pcf)	99.0	98.2

Water Contents		**As Rec'd**	**Beginning Compaction**	**After Compaction**	**Before Soaking**	**After Soaking**	**Top 1" After Soak**
Can No.		P58	P203	P5	P5	P28	P13
Wt. Of CWS (gm)		628.04	322.7	453.62	453.62	937.36	1293.94
Wt. Of CDS (gm)		569.15	309.68	429.02	429.02	819.49	1115.87
Wt. Of Can (gm)		237.67	208.14	233.28	233.28	231.23	236.43
MC (%)		17.8	12.8	12.6	12.6	20.0	20.2

Piston Diplacement (in.)	**Dial Reading**	**Load (lbs)**	**Penetration Stress (psi)**
0.000	1	9.7	3.2
0.025	5	48.5	16.2
0.050	10	97	32.3
0.075	17	164.9	55.0
0.100	23	223.1	74.4
0.125	30	291	97.0
0.150	37	358.9	119.6
0.175	42	407.4	135.8
0.200	48	465.6	155.2
0.250	58	562.6	187.5
0.300	69	669.3	223.1
0.350	77	746.9	249.0
0.400	83	805.1	268.4
0.450	87	843.9	281.3
0.500	92	892.4	297.5
0.600	99	960.3	320.1

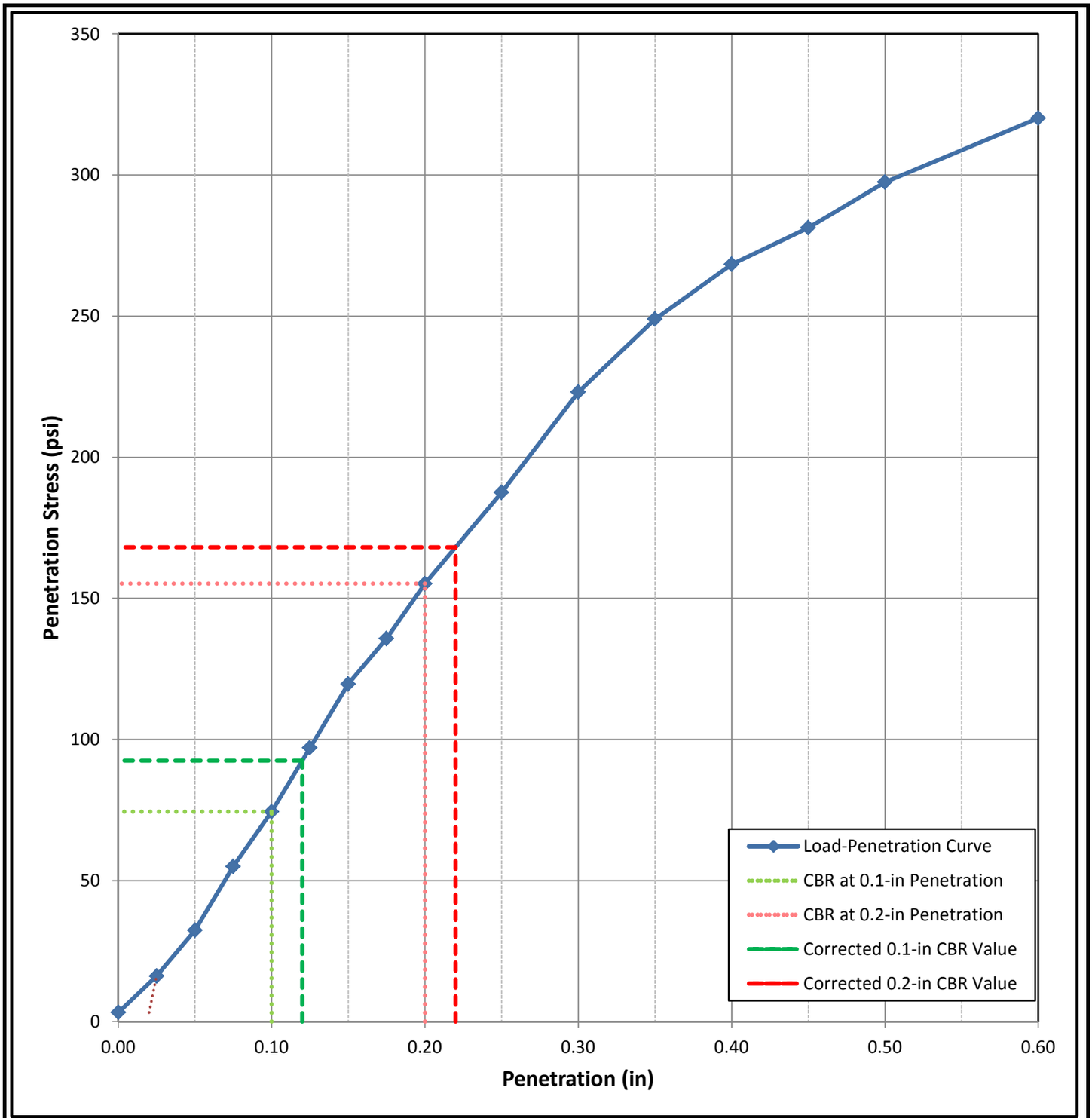
Swell Measurement

Elapsed Time (hrs)	Dial Gauge (Div)	Percent Swell (%)
0	0.215	0
96	0.215	**0.00**

Final Swell

CBR Results	
@ 0.1"	**7.4**
@ 0.2"	**10.3**

CATLIN Engineers and Scientists
Geotechnical Laboratory



PENETRATION STRESS vs. PENETRATION

CATLIN Engineers and Scientists

Geotechnical Laboratory
Wilmington, NC

Project Name:	Battleship NC
Project Location:	Wilmington, Nc
Prepared For:	Moffit Nichol
Project Number:	220161 **Date:** 1/29/2021

Sample Number/Depth:	CBR-01 / 0'-4'
Sample Point ID:	CBR-01-02
Description:	LB to LG poorly graded SAND (SP)

CBR VALUES

CBR (0.1"):	7.4%	**CBR (0.2"):**	10.3%
Corr. CBR (0.1"):	9.2%	**Corr. CBR (0.2"):**	11.2%

ASTM D 1883
CBR TEST

Client	Moffit Nichol	**Boring No.**	CBR-01
Project Name	Battleship NC	**Depth (ft)**	0'-4'
Project Location	Wilmington, Nc	**Sample No.**	CBR-01
Project Number	220161	**Visual Description**	LG poorly graded SAND
POINT ID	CBR-01-03	**Date**	1/29/2021

			Before Soaking	**After Soaking**
Test Type	Stnd			
Molding Method	C	**Density Measurement**		
Mold ID	CBR-Mold16	Wt. Mold & Wet Soil (lbs)	17.85	18.06
Wt. Of Mold (lbs)	9.18	Wt. Wet Soil (lbs)	8.665	8.88
Mold Volume (ft^3)	0.075	Sample Volume (ft3)	0.075	0.075
Piston Area (in^2)	3			
Surcharge (lbs)	15			
Sample Height (in)	4.59			
Sample Conditions	Soaked	Wet Density (pcf)	115.5	118.4
Blows per Layer	56	Dry Density (pcf)	99.5	99.1

Water Contents		**As Rec'd**	**Beginning Compaction**	**After Compaction**	**Before Soaking**	**After Soaking**	**Top 1" After Soak**
Can No.		P58	P25	P69	P69	P37	P209
Wt. Of CWS (gm)		628.04	422.48	617.02	617.02	863.24	1208.03
Wt. Of CDS (gm)		569.15	396.31	564.55	564.55	761.18	1044.83
Wt. Of Can (gm)		237.67	234.52	237.76	237.76	237.04	206.47
MC (%)		17.8	16.2	16.1	16.1	19.5	19.5

Piston Diplacement (in.)	**Dial Reading**	**Load (lbs)**	**Penetration Stress (psi)**
0.000	1	9.7	3.2
0.025	6	58.2	19.4
0.050	15	145.5	48.5
0.075	24	232.8	77.6
0.100	32	310.4	103.5
0.125	40	388	129.3
0.150	48	465.6	155.2
0.175	55	533.5	177.8
0.200	64	620.8	206.9
0.250	80	776	258.7
0.300	90	873	291.0
0.350	100	970	323.3
0.400	111	1076.7	358.9
0.450	117	1134.9	378.3
0.500	120	1164	388.0
0.600	128	1241.6	413.9

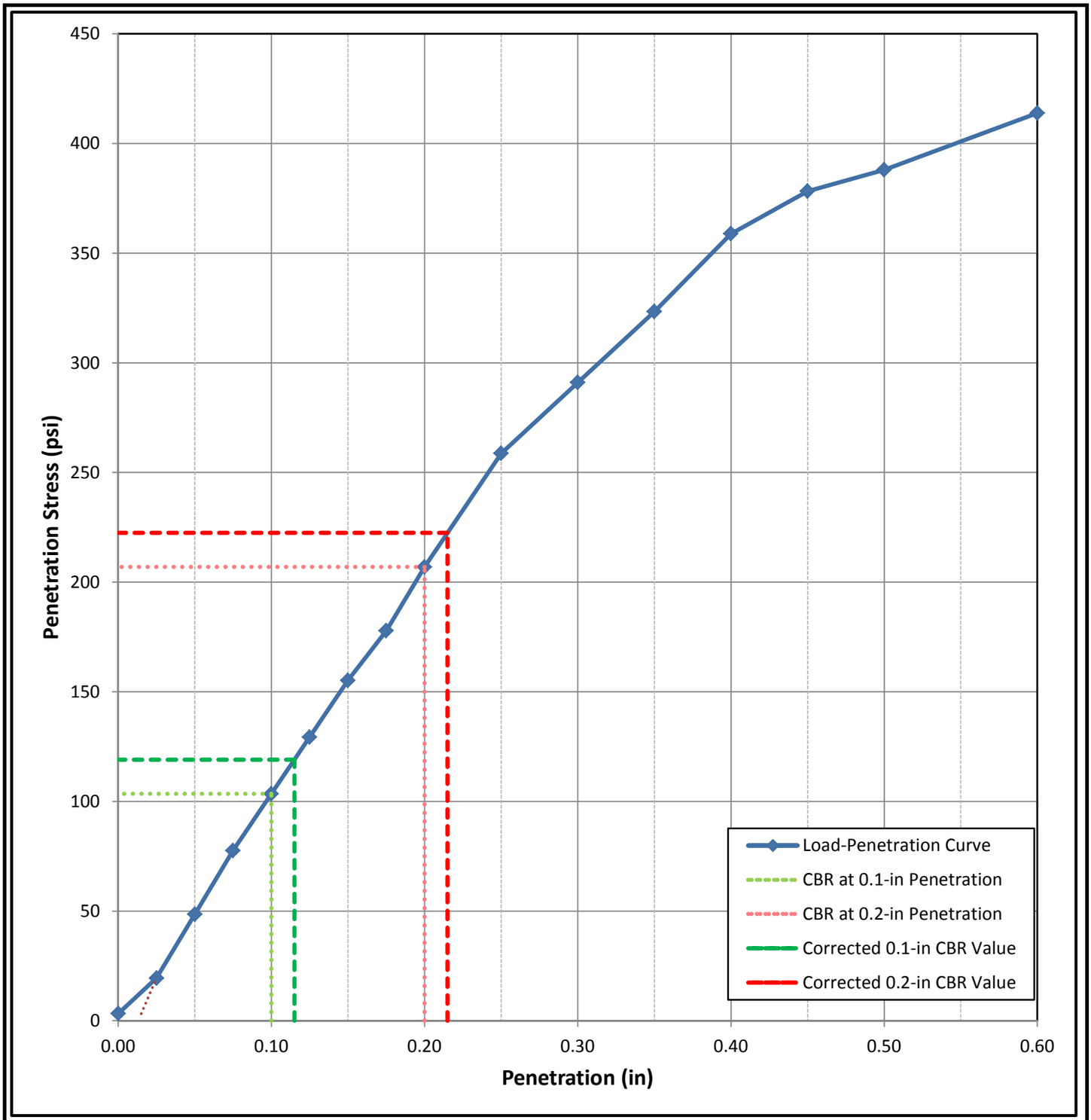
Swell Measurement

Elapsed Time (hrs)	Dial Gauge (Div)	Percent Swell (%)
0	0.394	0
96	0.391	**-0.07**

Final Swell

CBR Results	
@ 0.1"	**10.3**
@ 0.2"	**13.8**

CATLIN Engineers and Scientists
Geotechnical Laboratory



PENETRATION STRESS vs. PENETRATION

CATLIN Engineers and Scientists

Geotechnical Laboratory
Wilmington, NC

Project Name:	Battleship NC
Project Location:	Wilmington, Nc
Prepared For:	Moffit Nichol
Project Number:	220161 **Date:** 1/29/2021

Sample Number/Depth:	CBR-01 / 0'-4'
Sample Point ID:	CBR-01-03
Description:	LB to LG poorly graded SAND (SP)

CBR VALUES

CBR (0.1"):	10.3%	**CBR (0.2"):**	13.8%
Corr. CBR (0.1"):	11.9%	**Corr. CBR (0.2"):**	14.8%

ASTM D 1883
CBR TEST

Client	Moffit Nichol	**Boring No.**	CBR-01
Project Name	Battleship NC	**Depth (ft)**	0'-4'
Project Location	Wilmington, Nc	**Sample No.**	CBR-01
Project Number	220161	**Visual Description**	LG poorly graded SAND
POINT ID	CBR-01-04	**Date**	1/29/2021

			Before Soaking	**After Soaking**
Test Type	Stnd			
Molding Method	C	**Density Measurement**		
Mold ID	CBR-Mold10	Wt. Mold & Wet Soil (lbs)	18.03	18.12
Wt. Of Mold (lbs)	9.19	Wt. Wet Soil (lbs)	8.835	8.93
Mold Volume (ft^3)	0.075	Sample Volume (ft3)	0.075	0.075
Piston Area (in^2)	3			
Surcharge (lbs)	15			
Sample Height (in)	4.59			
Sample Conditions	Soaked	Wet Density (pcf)	117.8	119.0
Blows per Layer	56	Dry Density (pcf)	100.3	100.5

Water Contents		**As Rec'd**	**Beginning Compaction**	**After Compaction**	**Before Soaking**	**After Soaking**	**Top 1" After Soak**
Can No.		P58	P302	T5	T5	P214	P501
Wt. Of CWS (gm)		628.04	287.18	833.64	833.64	1109.86	1125.88
Wt. Of CDS (gm)		569.15	273.44	740.79	740.79	969.68	981.81
Wt. Of Can (gm)		237.67	205.21	207.03	207.03	205.74	232.71
MC (%)		17.8	20.1	17.4	17.4	18.3	19.2

Piston Diplacement (in.)	**Dial Reading**	**Load (lbs)**	**Penetration Stress (psi)**
0.000	1	9.7	3.2
0.025	4	38.8	12.9
0.050	7	67.9	22.6
0.075	12	116.4	38.8
0.100	18	174.6	58.2
0.125	24	232.8	77.6
0.150	30	291	97.0
0.175	36	349.2	116.4
0.200	43	417.1	139.0
0.250	55	533.5	177.8
0.300	68	659.6	219.9
0.350	80	776	258.7
0.400	92	892.4	297.5
0.450	103	999.1	333.0
0.500	113	1096.1	365.4
0.600	128	1241.6	413.9

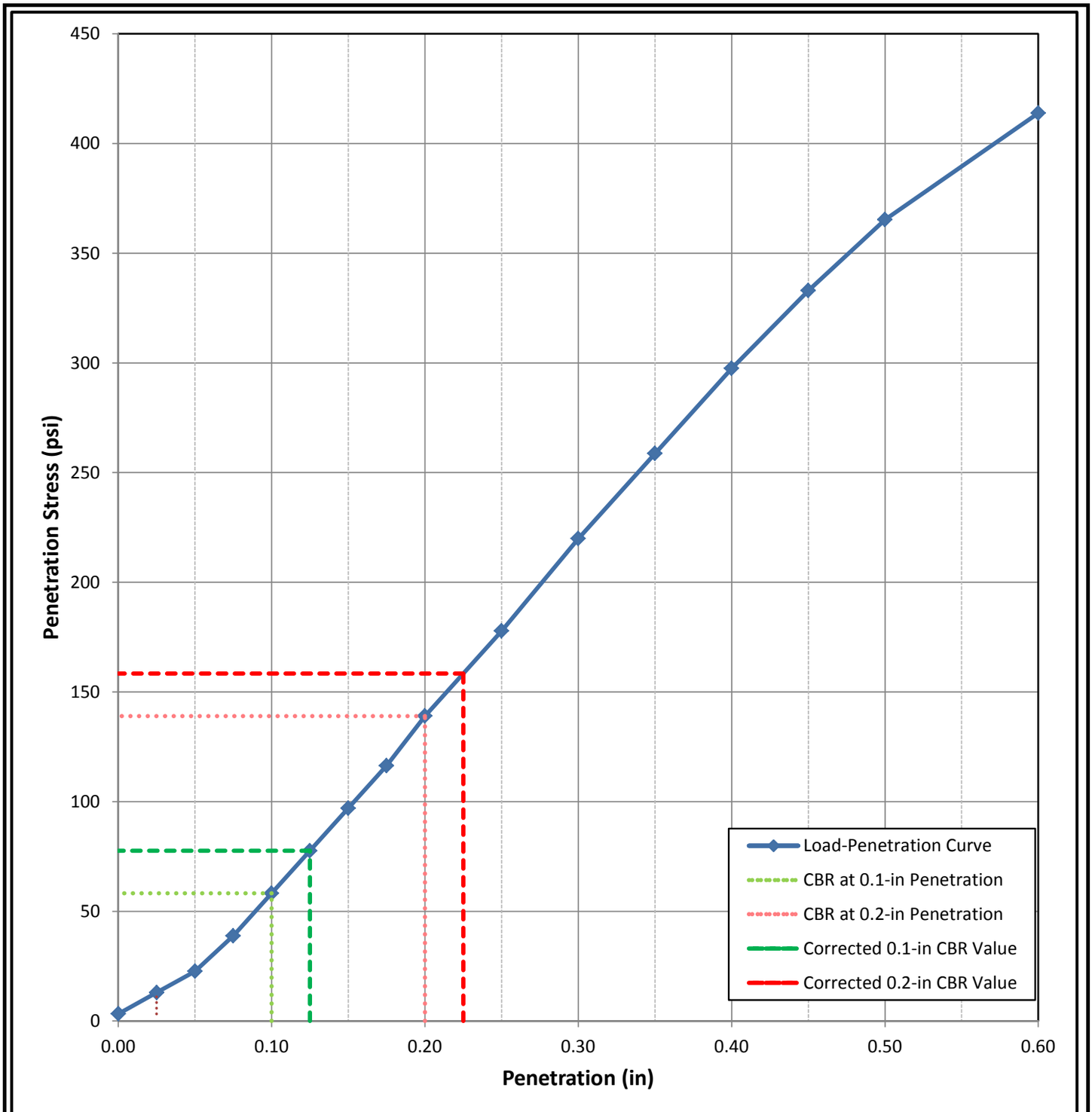
Swell Measurement

Elapsed Time (hrs)	Dial Gauge (Div)	Percent Swell (%)
0	0.521	0
96	0.520	**-0.02**

Final Swell

CBR Results	
@ 0.1"	**5.8**
@ 0.2"	**9.3**

CATLIN Engineers and Scientists
Geotechnical Laboratory



PENETRATION STRESS vs. PENETRATION

CATLIN Engineers and Scientists

Geotechnical Laboratory
Wilmington, NC

Project Name:	Battleship NC
Project Location:	Wilmington, Nc
Prepared For:	Moffit Nichol
Project Number:	220161 **Date:** 1/29/2021

Sample Number/Depth:	CBR-01 / 0'-4'
Sample Point ID:	CBR-01-04
Description:	LB to LG poorly graded SAND (SP)

CBR VALUES

CBR (0.1"):	5.8%	**CBR (0.2"):**	9.3%
Corr. CBR (0.1"):	7.8%	**Corr. CBR (0.2"):**	10.6%

COMPACTION TEST

(Standard Proctor ASTM D 698, Method B)

Project: Battleship NC
Location of Project: Camp Lejeune, NC
Description of Soil: Dark gray to brown Clayey SAND, SC

Job No.: 220161
Sample No.: CBR-02
Boring No.:
Tested By: ODAYNES
Date of Testing: 1/29/2021

Natural Moisture Content (ASTM D 2216)

Mcws	Mcds	Mc	Mw	Ms	w%
589.08	539.30	208.47	49.78	330.83	15.05

Blows/layer: 56 No. of Layers: 3 Wt. of Hammer : 5.5 lbs

Mold Dimensions:

Diam.: 6 in. Ht. in. Vol. 0.075 $ft.^3$

Water Content Determination

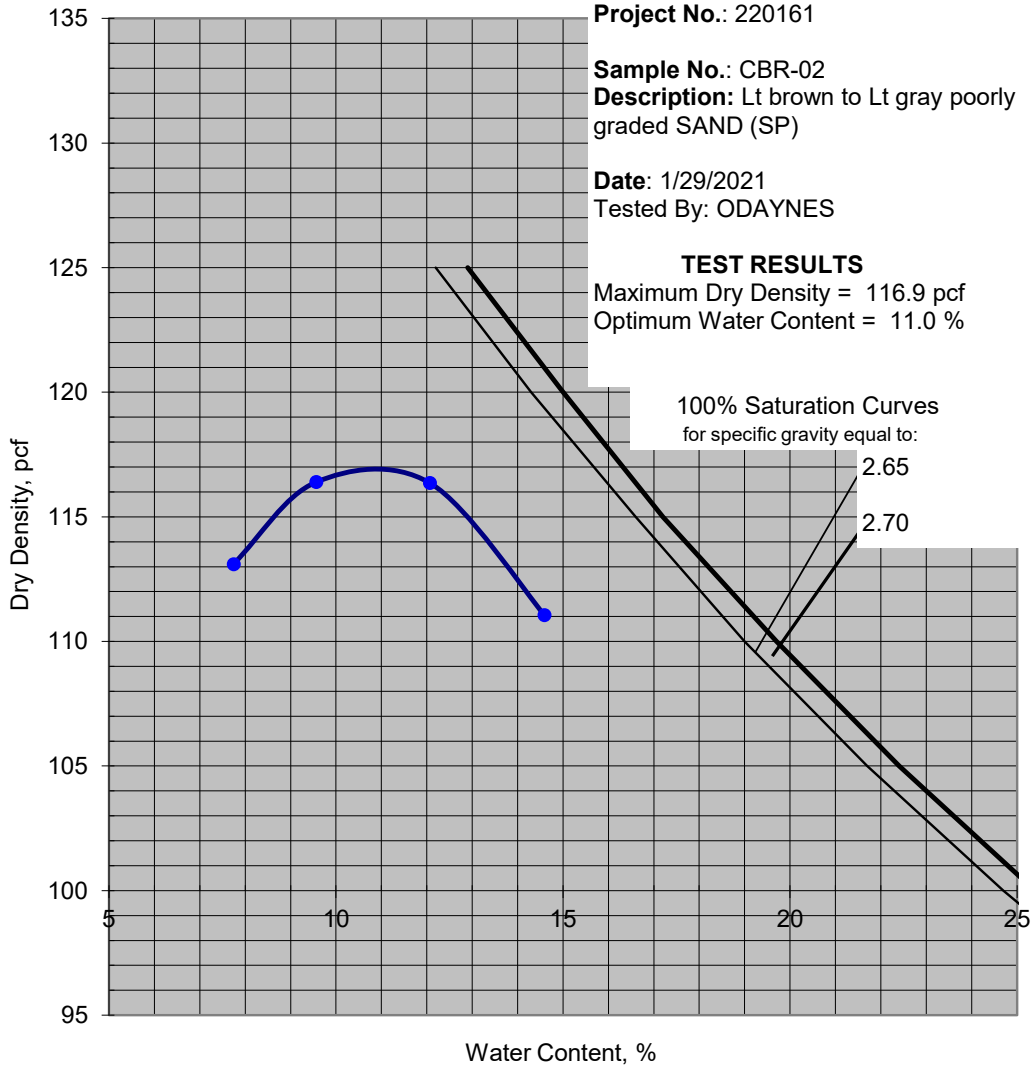
Sample No.	1	2	3	4	5	6
Can No.	P58	P315	P319	P24		
Mcws	521.07	455.29	483.19	450.81		
Mcds	500.70	433.50	453.37	423.04		
Mw	20.37	21.79	29.82	27.77		
Mc	237.65	205.75	206.27	232.73		
Ms	263.05	227.75	247.10	190.31		
w%	7.74	9.57	12.07	14.59		

Density Determination

Ave. w%	7.74	9.57	12.07	14.59		
Mms	18.33	18.76	18.950	18.725		
Mm	9.19	9.19	9.17	9.18		
Ms	9.14	9.57	9.78	9.55		
Wet Den.	121.87	127.53	130.40	127.27		
Dry Den.	113.11	116.40	116.36	111.06		

MOISTURE-DENSITY RELATIONSHIP

ASTM D698 - Standard Proctor - Method C



ASTM D 1883
CBR TEST

Client	Moffit Nichol	**Boring No.**	CBR-02
Project Name	Battleship NC	**Depth (ft)**	0'-4'
Project Location	Wilmington, NC	**Sample No.**	CBR-02
Project Number	220161	**Visual Description**	to Brown Clayey SAND (
POINT ID	CBR-02-01	**Date**	1/29/2021

			Before Soaking	**After Soaking**
Test Type	Stnd			
Molding Method	C	**Density Measurement**		
Mold ID	CBR-Mold5	Wt. Mold & Wet Soil (lbs)	18.33	18.81
Wt. Of Mold (lbs)	9.19	Wt. Wet Soil (lbs)	9.14	9.62
Mold Volume (ft^3)	0.075	Sample Volume (ft3)	0.075	0.075
Piston Area (in^2)	3			
Surcharge (lbs)	15			
Sample Height (in)	4.59			
Sample Conditions	Soaked	Wet Density (pcf)	121.9	128.2
Blows per Layer	56	Dry Density (pcf)	113.1	112.7

Water Contents		**As Rec'd**	**Beginning Compaction**	**After Compaction**	**Before Soaking**	**After Soaking**	**Top 1" After Soak**
Can No.		P400	P58	P17	P17	P311	P501
Wt. Of CWS (gm)		589.08	521.07	531.59	531.59	1003.28	1258.45
Wt. Of CDS (gm)		539.3	500.7	510.14	510.14	907.26	1134.63
Wt. Of Can (gm)		208.47	237.65	233.66	233.66	208.24	232.2
MC (%)		15.0	7.7	7.8	7.8	13.7	13.7

Piston Diplacement (in.)	**Dial Reading**	**Load (lbs)**	**Penetration Stress (psi)**
0.000	1	9.7	3.2
0.025	6	58.2	19.4
0.050	12	116.4	38.8
0.075	17	164.9	55.0
0.100	21	203.7	67.9
0.125	26	252.2	84.1
0.150	31	300.7	100.2
0.175	35	339.5	113.2
0.200	39	378.3	126.1
0.250	47	455.9	152.0
0.300	55	533.5	177.8
0.350	62	601.4	200.5
0.400	68	659.6	219.9
0.450	74	717.8	239.3
0.500	81	785.7	261.9
0.600	91	882.7	294.2

Swell Measurement

Elapsed Time (hrs)	Dial Gauge (Div)	Percent Swell (%)
0	0.628	0
	0.068	
96	0.632	**0.09**

Final Swell

CBR Results	
@ 0.1"	**6.8**
@ 0.2"	**8.4**

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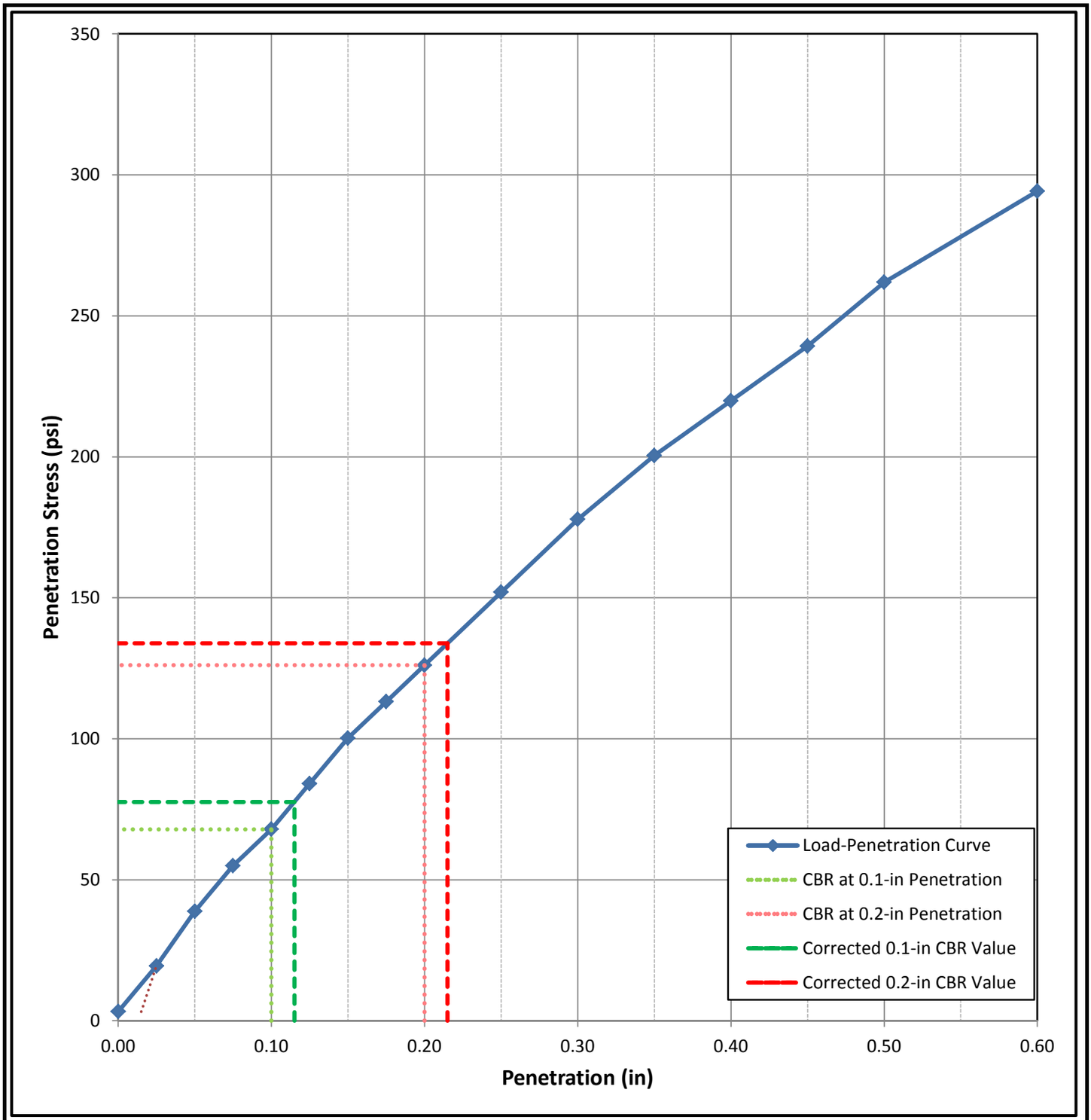
Geotechnical Laboratory



PENETRATION STRESS vs. PENETRATION

CATLIN Engineers and Scientists

Geotechnical Laboratory
Wilmington, NC

Project Name:	Battleship NC
Project Location:	Wilmington, NC
Prepared For:	Moffit Nichol
Project Number:	220161 **Date:** 1/29/2021

Sample Number/Depth:	CBR-02 / 0'-4'
Sample Point ID:	CBR-02-01
Description:	DG to Brown Clayey SAND (SC)

CBR VALUES

CBR (0.1"):	6.8%	**CBR (0.2"):**	8.4%
Corr. CBR (0.1"):	7.8%	**Corr. CBR (0.2"):**	8.9%

ASTM D 1883
CBR TEST

Client	Moffit Nichol	**Boring No.**	CBR-02
Project Name	Battleship NC	**Depth (ft)**	0'-4'
Project Location	Wilmington, Nc	**Sample No.**	CBR-02
Project Number	220161	**Visual Description**	to Brown Clayey SAND (
POINT ID	CBR-02-02	**Date**	1/29/2021

			Before Soaking	**After Soaking**
Test Type	Stnd			
Molding Method	C	**Density Measurement**		
Mold ID	CBR-Mold6	Wt. Mold & Wet Soil (lbs)	18.76	18.96
Wt. Of Mold (lbs)	9.19	Wt. Wet Soil (lbs)	9.565	9.77
Mold Volume (ft^3)	0.0749	Sample Volume (ft3)	0.0749	0.0749
Piston Area (in^2)	3			
Surcharge (lbs)	15			
Sample Height (in)	4.59			
Sample Conditions	Soaked	Wet Density (pcf)	127.7	130.4
Blows per Layer	56	Dry Density (pcf)	116.5	115.8

Water Contents		**As Rec'd**	**Beginning Compaction**	**After Compaction**	**Before Soaking**	**After Soaking**	**Top 1" After Soak**
Can No.		P400	P315	P22	P22	P19	P202
Wt. Of CWS (gm)		589.08	455.29	451.47	451.47	1006.1	1335.43
Wt. Of CDS (gm)		539.3	433.5	432.4	432.4	919.38	1211.62
Wt. Of Can (gm)		208.47	205.75	234.7	234.7	234	207.48
MC (%)		15.0	9.6	9.6	9.6	12.7	12.3

Piston Diplacement (in.)	**Dial Reading**	**Load (lbs)**	**Penetration Stress (psi)**
0.000	1	9.7	3.2
0.025	6	58.2	19.4
0.050	15	145.5	48.5
0.075	24	232.8	77.6
0.100	34	329.8	109.9
0.125	42	407.4	135.8
0.150	52	504.4	168.1
0.175	60	582	194.0
0.200	70	679	226.3
0.250	87	843.9	281.3
0.300	104	1008.8	336.3
0.350	119	1154.3	384.8
0.400	133	1290.1	430.0
0.450	145	1406.5	468.8
0.500	152	1474.4	491.5
0.600	163	1581.1	527.0

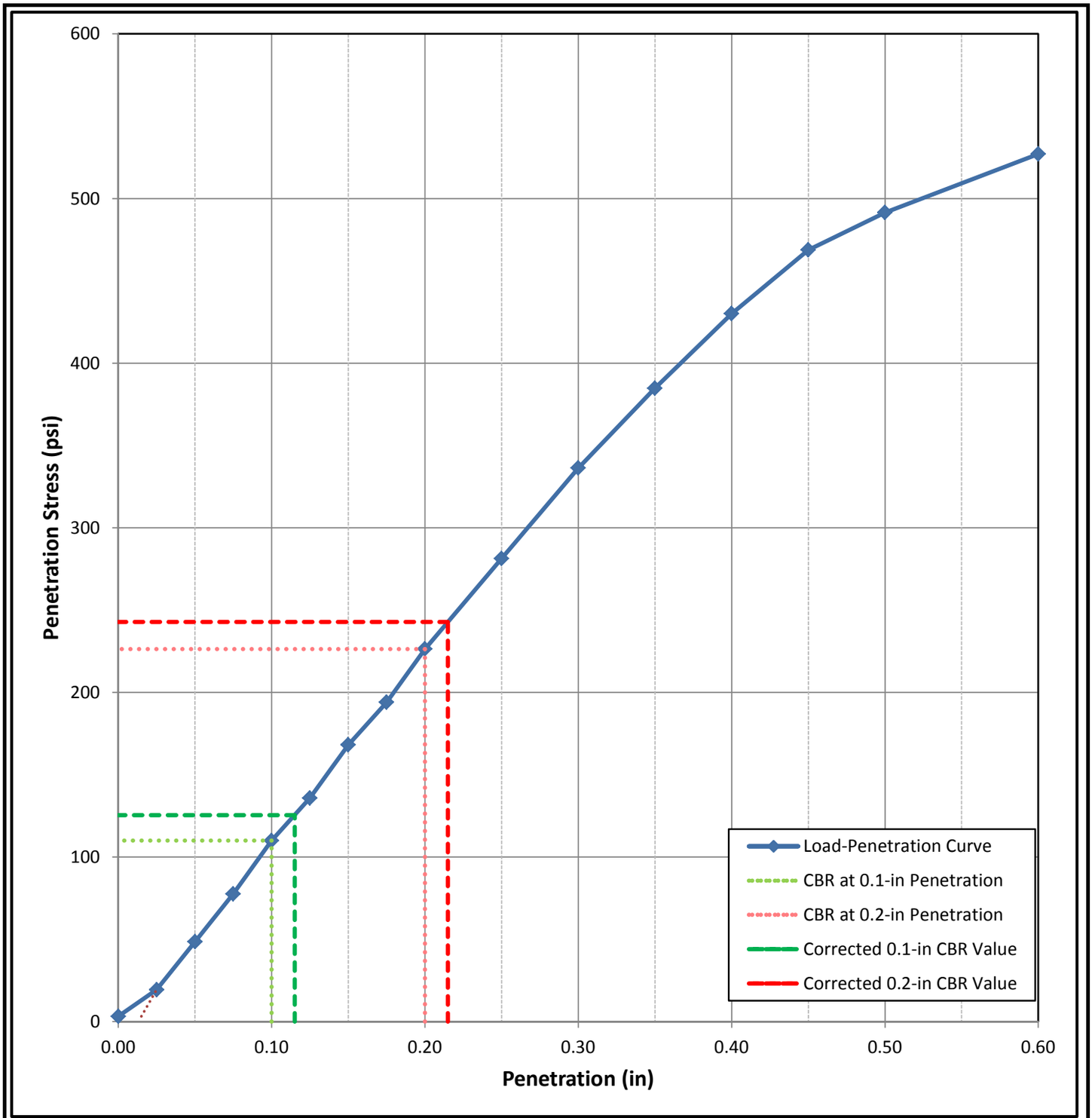
Swell Measurement

Elapsed Time (hrs)	Dial Gauge (Div)	Percent Swell (%)
0	0.554	0
	0.110	
96	0.550	**-0.09**

Final Swell

CBR Results	
@ 0.1"	**11.0**
@ 0.2"	**15.1**

CATLIN Engineers and Scientists
Geotechnical Laboratory



PENETRATION STRESS vs. PENETRATION

CATLIN Engineers and Scientists

Geotechnical Laboratory
Wilmington, NC

Project Name:	Battleship NC
Project Location:	Wilmington, Nc
Prepared For:	Moffit Nichol
Project Number:	220161 **Date:** 1/29/2021

Sample Number/Depth:	CBR-02 / 0'-4'
Sample Point ID:	CBR-02-02
Description:	DG to Brown Clayey SAND (SC)

CBR VALUES

CBR (0.1"):	11.0%	**CBR (0.2"):**	15.1%
Corr. CBR (0.1"):	12.5%	**Corr. CBR (0.2"):**	16.2%

ASTM D 1883
CBR TEST

Client	Moffit Nichol	**Boring No.**	CBR-02
Project Name	Battleship NC	**Depth (ft)**	0'-4'
Project Location	Wilmington, Nc	**Sample No.**	CBR-02
Project Number	220161	**Visual Description**	to Brown Clayey SAND (
POINT ID	CBR-02-03	**Date**	1/29/2021

			Before Soaking	**After Soaking**
Test Type	Stnd			
Molding Method	C	**Density Measurement**		
Mold ID	CBR-Mold9	Wt. Mold & Wet Soil (lbs)	18.95	19.01
Wt. Of Mold (lbs)	9.17	Wt. Wet Soil (lbs)	9.78	9.84
Mold Volume (ft^3)	0.0749	Sample Volume (ft3)	0.0749	0.0749
Piston Area (in^2)	3			
Surcharge (lbs)	15			
Sample Height (in)	4.59			
Sample Conditions	Soaked	Wet Density (pcf)	130.6	131.4
Blows per Layer	56	Dry Density (pcf)	116.9	116.7

Water Contents		**As Rec'd**	**Beginning Compaction**	**After Compaction**	**Before Soaking**	**After Soaking**	**Top 1" After Soak**
Can No.		P400	P319	P26	P26	P34	P215
Wt. Of CWS (gm)		589.08	483.19	444.1	444.1	1206.18	1193.9
Wt. Of CDS (gm)		539.3	453.37	422.17	422.17	1097.62	1083.1
Wt. Of Can (gm)		208.47	206.27	234.82	234.82	236.47	208.1
MC (%)		15.0	12.1	11.7	11.7	12.6	12.7

Piston Diplacement (in.)	**Dial Reading**	**Load (lbs)**	**Penetration Stress (psi)**
0.000	1	9.7	3.2
0.025	3	29.1	9.7
0.050	6	58.2	19.4
0.075	10	97	32.3
0.100	15	145.5	48.5
0.125	20	194	64.7
0.150	26	252.2	84.1
0.175	31	300.7	100.2
0.200	37	358.9	119.6
0.250	49	475.3	158.4
0.300	62	601.4	200.5
0.350	74	717.8	239.3
0.400	85	824.5	274.8
0.450	97	940.9	313.6
0.500	110	1067	355.7
0.600	136	1319.2	439.7

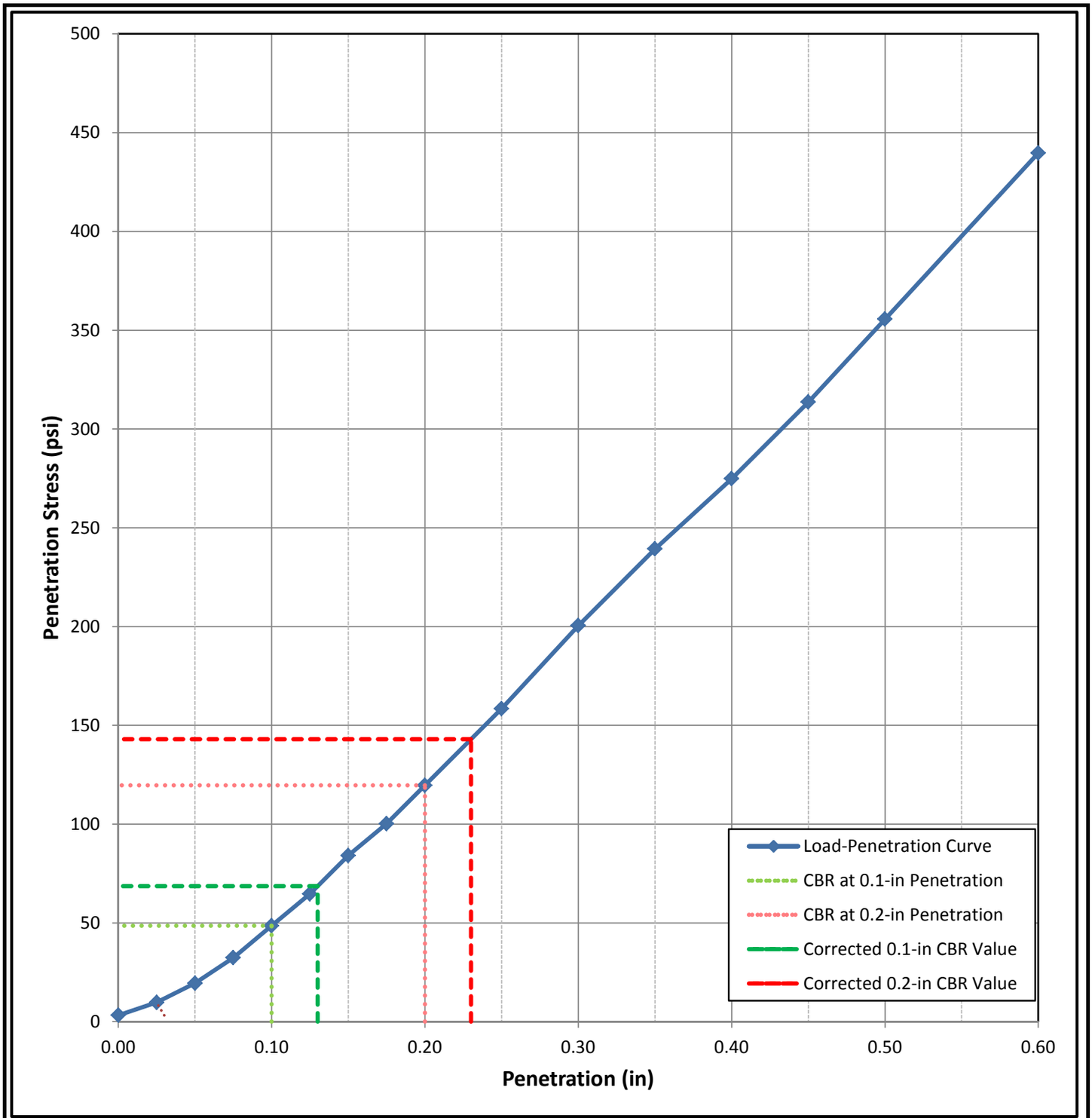
Swell Measurement

Elapsed Time (hrs)	Dial Gauge (Div)	Percent Swell (%)
0	0.483	0
	0.049	
96	0.478	**-0.11**

Final Swell

CBR Results	
@ 0.1"	**4.9**
@ 0.2"	**8.0**

CATLIN Engineers and Scientists
Geotechnical Laboratory



PENETRATION STRESS vs. PENETRATION

CATLIN Engineers and Scientists

Geotechnical Laboratory
Wilmington, NC

Project Name:	Battleship NC
Project Location:	Wilmington, Nc
Prepared For:	Moffit Nichol
Project Number:	220161 **Date:** 1/29/2021

Sample Number/Depth:	CBR-02 / 0'-4'
Sample Point ID:	CBR-02-03
Description:	DG to Brown Clayey SAND (SC)

CBR VALUES

CBR (0.1"):	4.9%	**CBR (0.2"):**	8.0%
Corr. CBR (0.1"):	6.9%	**Corr. CBR (0.2"):**	9.5%