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PORTS of GENOA
THE SOUTHERN GATEWAY TO EUROPE.

PROGETTO DI FATTIBILITA' TECNICA ED ECONOMICA

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TITOLO PROGETTO

NUOVA DIGA FORANEA DEL PORTO DI GENOVA
AMBITO BACINO SAMPIERDARENA

TITOLO ELABORATO:

RAPPORTO INDAGINE GEOTECNICA A MARE
FACTUAL REPORT

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D.E.C.	VERIFICATO	VALIDATO R.U.P.	IL RESP. DELL'ATTUAZIONE
Ing. Francesca Arena	RINA CHECK	Ing. Marco Vaccari	Dott. Umberto Benezzoli
.....	.....	.....	.....

VOLUME II – MEASURED AND DERIVED GEOTECHNICAL PARAMETERS AND FINAL RESULTS

Genoa Port Extension Geotechnical Survey (PFTE)

Prepared for: TECHNITAL S.p.A and Modimar S.r.l

Geoquip Marine Ref:	GMOP20-G-013-FAC-01
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Geoquip Marine Operations AG
Multergasse 1-3
P.O. Box 743
9001 St. Gallen
Switzerland
Tel +41 71 227 40 00
Fax +41 71 227 40 04
geoquip-marine.com

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Signatory Legend:

JWD	Josh Davies
CBL	Chris Brandish-Lowe
TJP	Torran Purchase
RBB	Ryan Benjamin Bates

Geoquip Marine Operations AG designated contact for any queries regarding this document:

Name	Job Title	Telephone	Email
Torran Purchase	Project Manager	+44 7980 611379	torran.purchase@geoquip-marine.com

EXECUTIVE SUMMARY

Geoquip Marine Operations AG (GEOQUIP) has been contracted by TECHNITAL S.p.A and Modimar S.r.l (COMPANY), for the provision of an interim geotechnical investigation close to the entrance to the Port of Genoa, Italy. The objective of the project is to determine the technical and economic feasibility to construct a new breakwater.

The purpose of the site investigation was to determine soil stratigraphy, classification, engineering parameters and depth to rockhead for a planned offshore breakwater extension.

Fieldwork operations for this project commenced on 10 December 2020 in the port of Genoa, Italy and were conducted from the GEOQUIP owned and operated vessel MV Geoquip Saentis, on which the GEOQUIP owned and operated GMR600 drill rig is installed. Details of the operations completed during the fieldworks, including preliminary in situ results, positioning and water depth data, daily logs, and equipment calibrations and verifications are outlined in the Field report (GMOP20-G-013-FLD-01).

Water depth measurements were conducted at the start of each location by measuring the drill string length from the Seabed Frame (SBF) on the seabed to the Drill Floor on the vessel with compensation (minimal weight) to ensure that both accurate water depth measurements and undisturbed samples could be obtained from mudline. The measurements are then reduced to sea level at Lowest Astronomical Tide (LAT).

The nominal Scope of Work (SOW) consisted of 14 boreholes. An additional alternating borehole was later requested during the fieldwork operations and agreed by the COMPANY totalling 15 boreholes. The proposed borehole locations were in close proximity to the existing breakwater which required close coordination with the local harbour authority to ensure the safety of the operations given marine traffic entering and exiting the existing port. The completed scope of works included:

- 7 x continuous PCPT (PCPT)
- 5 x continuous sampling (CC)
- 5 x alternating to 80m (PCPT/CC) incl. 2 bumpover locations

Due to adverse weather conditions some locations were investigated by more than one attempt, for the purpose of this report, all data collected at these locations have been presented on combined plots in Appendix A.

The onshore laboratory testing has been contracted to COMPANY contractor SOCOTEC ITALIA, therefore no results of any onshore testing will be included in this report.

The geology at the site under Order No.204/2020 for the purpose of Geotechnical Investigation consists of an extremely variable stratigraphy ranging from loose gravels to very high strength clays with the isolated presence of competent rock. Six preliminary primary soil units have been identified, unitised in correspondence with the existing onshore investigation (L1, Ch1, S1, L2, A and G), two rock units (MR and F) and one made ground unit for human activity (MG). These have been subdivided based on changing geotechnical and geological properties and are presented below and in more detail in Table 2.2.

Soil Unit	Description
L1A	Extremely low to low strength sandy CLAY with rare fibrous organic matter and rare shell fragments.
L1B	Interbedded very low to medium strength CLAY with occasional pockets of fibrous organic matter and rare shell fragments and rare closely spaced thin beds of sand.
Ch1	Low to high strength sandy SILT with occasional closely spaced thin beds of silty sand.
S1A	Extremely loose to medium dense silty fine SAND with rare mica and rare shell fragments with very closely spaced thick laminations of medium to coarse sand.
S1B	Dense to very dense clayey gravelly fine to coarse SAND. Gravel is fine to coarse and subangular to rounded.
L2	High to very high strength CLAY with occasional pockets of fine to coarse sand and rare shell fragments.
A	Interbedded very high to extremely high strength sandy CLAY with rare shell fragments and occasional closely spaced thin to thick laminations of dark grey fine sand and clayey SAND with frequent extremely closely to very closely spaced thin laminations of clay.
G	Fine to coarse angular to rounded GRAVEL with rare sand and rare clay. Sand is medium to coarse.
MR	Extremely weak thinly laminated fissured weathered fine grained MUDROCK with occasional closely to medium spaced thin to medium beds of strong black marlstone, occasional calcite pockets.
F	Medium strong to strong weathered fine grained MARLSTONE with occasional thin laminations and pockets of calcite.
MG	MADE GROUND with silty fine to medium SAND with rare gravel, rare pockets of decayed wood, rare textile material (clothes and threads) and rare shell fragments. Gravel is fine to coarse and angular.

The site investigation correlates with the wider geological understanding that during a period of lateral extension, normal faulting occurred in a general SSW-NNE trend resulting in the formation of a horst and graben structure. The borehole logs and fence diagrams demonstrate these dramatic lateral changes in unit depth below seabed and successfully depicted the expected structure. The geology can be generally split between 'horst' geology and 'graben' geology with typical properties of basin style deposits.

From mudline (ML) the site is generally dominated by up to 18.00m thick sandy CLAYS (L1A) overlaying silty fine SAND (S1A). Below Units L1 & S1 the geology is characterised predominantly stratigraphic sequence of CLAY (L2) found at depths of 9.00m to 45.00m bml and in some instances a thick >24.10m bed of GRAVEL (G). This stratigraphy structure dominates the general trend across most of the site, particularly in the southern and western parts. However, as expected, the geology is significantly different in the raised horst sections where competent rock is encountered.

Location CC-5 is positioned on the western horst and dominated by 7.95m of fissured and weathered CLAYSTONE (MR) and 15.00m of overlying silty fine SAND (S1A). Similar geology was experienced at location PCPT-7, south of CC-5 but with the introduction of 4.90m of GRAVEL overlying competent MARLSTONE (F) and weathered MUDSTONE (MR).

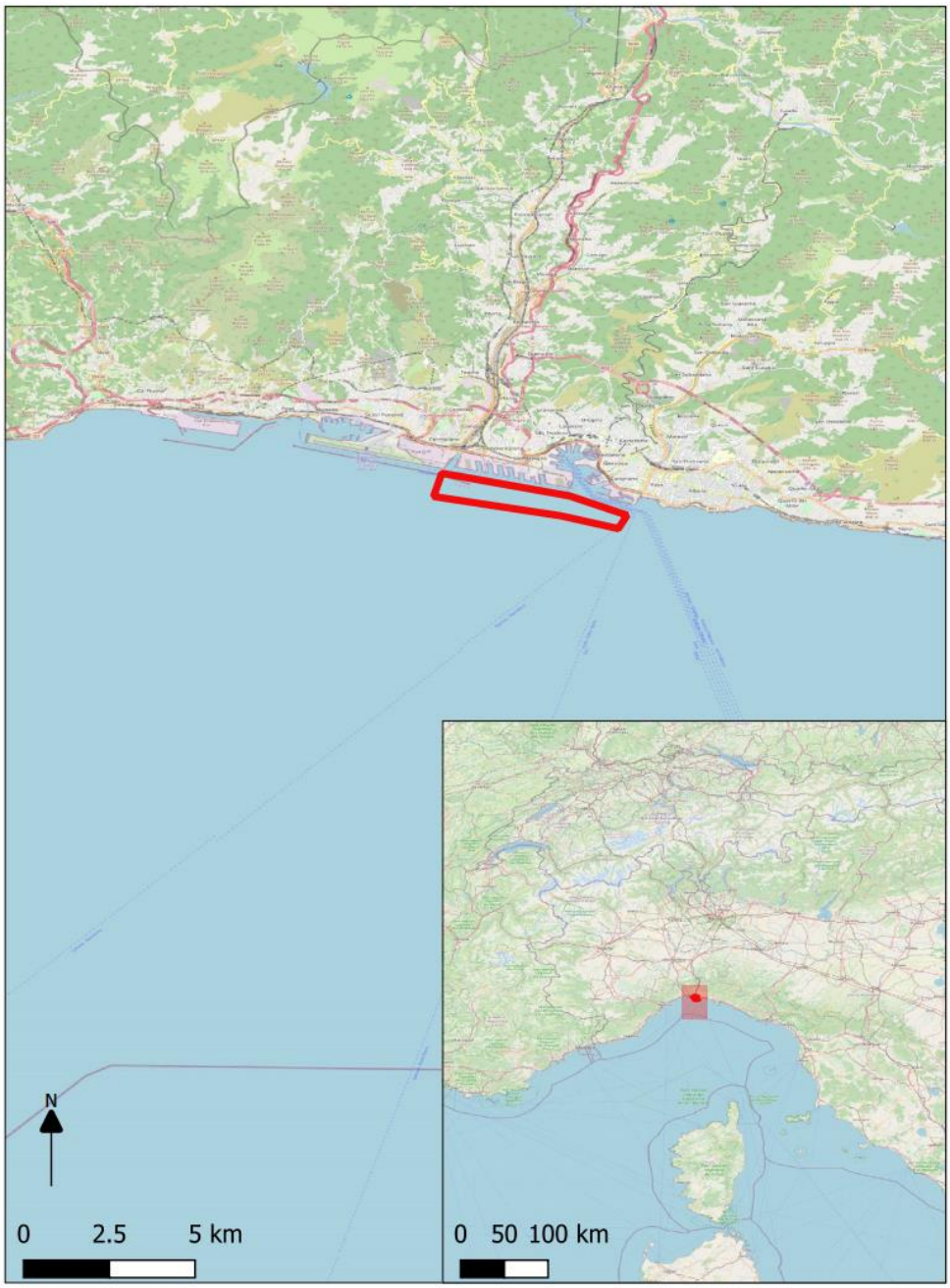
Locations PCPT-1, CC-1 and PCPT-8 located on the eastern horst along the eastern extremity of the site and are also dominated by up to 7.80m of weathered fine grained MARLSTONE (F) overlaid by a series of L1A, S1A and L2. The deeper locations experienced GRAVEL which is thought to be of the same lithology as Unit F.

In northern part of the site in both the western and central graben, 4 channels (2 in CC-6 and 2 in CC-2) of sandy SILT (Ch1) experienced between depths 2.60m and 19.00m bml. In addition, location CC-3 encountered MADE GROUND (MG) at depth 0.50m bml.

The interpreted soil behaviour type from in situ PCPT data has a good correlation with the logged descriptions of recovered samples.

OVERVIEW MAP

Genoa Port Extension Geotechnical Survey (PFTE)



Map 1 Map showing General Location of Site

REPORTING STRUCTURE

Volume I – Field Report	**Volume II – Factual Report**
Field operations and preliminary results	**Measured and derived geotechnical parameters and final results**
Cover Page	Cover Page
Revision status and QA/QC	Revision status and QA/QC
	Summary of main report modifications from previous revision
Executive summary, including an overview map of investigated points	Executive summary, including an overview map of investigated points
Table of contents	Table of contents
List of symbols and terms used	List of symbols and terms used
Chapter 1: Scope of field operations with description of the soil investigation platform (vessel/rig), overview over investigated points, with maps and coordinates, HSE, and organisation of work	**Chapter 1:** Scope of field operations
Chapter 2: Log of drilling operations	**Chapter 2: S**ummary of soil conditions and material overview
Chapter 3: In situ testing operations, procedures and preliminary results	**Chapter 3:** Final geotechnical borehole logs,, lateral variation and PCPT results
Chapter 4: Sampling operations, procedures and preliminary results, including inventory of recovered samples	**Chapter 4:** Final in situ test results, including discussion on validity of results
Chapter 5: Field laboratory operations, procedures and test results	**Chapter 5:** Laboratory test procedures and final results including commentary on the results
Chapter 6: Preliminary geotechnical borehole logs	References
Chapter 7: Log of daily field operations	**Appendix A-C**
Chapter 8: Positioning and survey. including water depth and tidal measurements	
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*Current report is highlighted

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LIST OF SYMBOLS AND ABBREVIATIONS

English

B_q	pore pressure ratio
D_r	relative density
e_{max}	maximum voids ratio
e_{min}	minimum voids ratio
f_s	sleeve friction
h	depth (below seabed) at start of test
m	metre
q_c	measured cone resistance
q_{net}	net cone resistance
q_t	corrected cone resistance
R_f	friction ratio
s_u	undrained shear strength
u_2	measured pore pressure
z	test depth below bottom of the borehole

Greek

α	net area ratio of cone
Δu	excess pore pressure
γ'	submerged unit weight
γ_w	unit weight of water, assumed to be 9.81kN/m^3
σ'_0	In situ vertical effective stress
σ_{v0}	in situ vertical total stress

Abbreviations

ASTM	American Society for Testing and Material
BHA	Bottom Hole Assembly
bml	Below Mud Line
CC	Continuous Coring/Sampling Boreholes
COMPANY	TECHNITAL S.p.A and Modimar S.r.l
DGPS	Differential Geographical Positioning System
DOR	Daily Operations Report
DP	Dynamic Positioning
GEOQUIP	Geoquip Marine Operations AG
GMR	Geoquip Marine Derrick Rig
GSI	Geological Strength Index
HSE	Health Safety and Environment
ITRF	International Terrestrial Reference Frame

LAT	Lowest Astronomical Tide
LT	Local Time
ML	Mud Line
PCPT	Piezocone Penetration Test with pore pressure measurement
PLI	Point Load Index
PLT	Point Load Test
PM	Project Manager
RMR	Rock Mass Rating
SBF	Seabed Frame
USBL	Ultra-short baseline
UU	Unconsolidated Undrained Triaxial

1. SCOPE OF FIELD OPERATIONS

1.1 Overview

Geoquip Marine Operations AG (GEOQUIP) were contracted by TECHNITAL S.p.A and Modimar S.r.l (COMPANY) to complete a geotechnical investigation, located in close proximity to the Port of Genoa, Italy. The purpose of the site investigation was to determine soil stratigraphy, classification, engineering parameters and depth to rockhead for a planned breakwater extension.

COMPANY required the completion of a series of boreholes across the site. The completed scope of work is summarised in Table 1.1.

The site for the proposed Port Extension/Breakwater is located south of the current breakwater between the western and eastern entrances to the Port of Genoa. The site is approximately 5.50km long by 1.00km wide south of the Port of Genoa, Italy, in water depths ranging between 26.07m to 54.76m LAT as calculated by recording drill string measurements at the start of each location from the compensated SBF on the seabed to the Drill Floor on the vessel and then reduced to sea level at LAT.

Fieldwork operations for this project commenced on 10 December 2020 in the port of Genoa, Italy and were conducted from the GEOQUIP owned and operated vessel MV Geoquip Saentis, on which the GEOQUIP owned and operated GMR600 drill rig is installed. Details of the operations completed during the fieldworks, including preliminary in situ results, positioning and water depth data, daily logs, and equipment calibrations and verifications are outlined in the Field report (GMOP20-G-013-FLD-01).

1.2 Related Documents

Further documents that apply to this project, and which may be referenced herein, include:

- Contract between GEOQUIP and COMPANY
- GEOQUIP Group Integrated Management System Documentation
- GEOQUIP Quality Health Safety and Environment Management System
- GEOQUIP Project Safety Plan including Emergency Response Plan (B3-PSP-01)
- GEOQUIP Project Execution Plan (B3-PEP-01)
- GEOQUIP Mobilisation Report (B3-MOB-01)
- GEOQUIP Field Report (B3-FLD-01)

1.3 Summary of Fieldworks

The completed fieldworks are summarised in Table 1.1.

Table 1.1 Summary of Completed Fieldworks

Soil Investigation – Sampling and PCPT			
Borehole No (n.)	Priority	Actual Depth (m)	Type (-)
CC-1	5	16.20	CC
PCPT-1	6	25.00	PCPT
CC-2	8	40.40	CC
PCPT-2	1	41.86	PCPT
CC-3	3	46.15	CC
PCPT-3	2	34.40	PCPT
CC-4	11	80.36	0-40m CC/40-80m CC/PCPT
PCPT-4	7	42.52	PCPT
PCPT-5	4	42.32	PCPT
CC-5	14	22.95	CC
PCPT-7	9	10.85	PCPT
CC-7	10	42.38	CC (1 x PCPT stroke)
PCPT-6	15	47.25	PCPT
PCPT-6A	15a	81.28 (42.20 Drill Out)	PCPT/CC
CC-6	13	47.90	PCPT/CC
PCPT-8	12	4.30	PCPT/CC
PCPT-8A	16	65.05	PCPT/CC
Total	-	648.97	-
Notes: Coring/ Sampling (CC) total length of 168.08m PCPT (PCPT) total length of 244.20m CC/PCPT Alternating total length of 236.69m.			

The addition of PCPT-8 was agreed between GEOQUIP and COMPANY during the campaign. PCPT-6 and PCPT-8 were terminated early due to safety concerns over deteriorating weather conditions. Target depths were not reached and subsequent bump over locations were performed (PCPT-6A and PCPT-8A).

2. SOIL CONDITIONS

2.1 Preliminary Site Overview

The geology at the site under Order No.204/2020 for the purpose of Geotechnical Investigation consists of an extremely variable stratigraphy ranging from loose gravels to very high strength clays with the isolated presence of competent rock. Six preliminary primary soil units have been identified, unitised similarly to the existing onshore investigation (L1, Ch1, S1, L2, A and G), two rock units (MR and F) and one made ground unit for human activity (MG). These have been subdivided based on changing geotechnical and geological properties and are presented in Table 2.2.

The site investigation correlates with the wider geological understanding that during a period of lateral extension, normal faulting occurred in a general SSW-NNE trend resulting in the formation of a horst and graben structure. The cross-sections demonstrate these dramatic lateral changes in unit depth below seabed and successfully depicted the expected structure. The geology can be generally split between 'horst' geology and 'graben' geology with typical properties of basin style deposits.

From mudline (ML) the site is generally dominated by extremely low to low strength very dark greenish grey sandy CLAY (L1A) with thicknesses between 0.50m and 18.00m, overlaying extremely loose to medium dense very dark grey silty fine SAND (S1A) with a thickness of 1.00m to 15.00m.

Below Units L1 & S1, the geology is characterised predominantly by Unit L2 which consists of high to very high strength dark grey CLAY found at depths of 9.00m to 45.00m bml with a thickness of 3.40m and 25.25m. A thick >24.1m bed of greenish grey fine to coarse angular to rounded GRAVEL (G) is observed at 22.05m bml at the projected base of the graben. This stratigraphy structure dominates the general trend across most of the site, particularly in the southern and western parts and are typical of basin deposits within the grabens. However, as expected, the geology is significantly different in horst structures where competent rock is encountered as well as thick gravels in the eastern extents of the site.

Location CC-5 is positioned on the western horst and dominated by 7.95m of very weak to weak dark grey fissured and weathered CLAYSTONE (MR) at 15.00m bml with 15.00m of overlying very dark grey silty fine to coarse SAND (S1A). Relatively similar geology was experienced at location PCPT-7, south of CC-5 but with the introduction of 4.90m of greenish grey fine to coarse angular to rounded GRAVEL overlying competent MARLSTONE (F) and weathered MUDSTONE (MR).

Locations PCPT-1, CC-1 and PCPT-8 located on the eastern horst along the eastern extremity of the site and are also dominated by up to 7.80m of medium strong to strong black and brown weathered fine grained MARLSTONE (F) overlaid by a series of L1A, S1A and L2. The deeper locations experienced very dense black to greyish brown angular to subrounded fine to coarse GRAVEL which is thought to be of the same lithology as Unit F.

In northern part of the site in both the western and central graben, 4 channels (2 in CC-6 and 2 in CC-2) of low to high strength sandy SILT (Ch1) of 1.60m to 6.00m are experienced between depths 2.60m and 19.00m bml. The unit is typical of a channel feature.

At location CC-3, the investigation encountered MADE GROUND (MG) with silty fine to medium sand and rare gravel at depth 0.50m bml. The recovery included rare pockets of decayed wood, rare textile material (clothes and threads) and rare shell fragments.

2.2 Preliminary Material Overview

The materials found at the site can be split into the following broad categories based on finding of the ground investigation. On the absence of further onshore laboratory testing for each soil unit identified the range of PCPT parameters have been provided.

Table 2.2 Material Overview Summary

Soil Unit	Description	Comment	Characteristics (CPT Profile)
L1A	Extremely low to low strength very dark greenish grey (GLEY 1 5GY 3/1) sandy CLAY with rare fibrous organic matter and rare shell fragments	- Seabed sediment	Qnet (MPa): -0.079 to 1.557 Rf (%): 0.278 to 12.256 Bq: -0.266 to 1.034
L1B	Interbedded very low to medium strength greenish grey (GLEY 1 10GY 4/1) CLAY with occasional pockets of fibrous organic matter and rare shell fragments and rare closely spaced thin beds of sand	- Slightly higher strength than unit L1A - Less sand content - Rare interbedded CLAY/sandy CLAY/beds of sand	Qnet (MPa): 0.001 to 0.901 Rf (%): 0.000 to 4.941 Bq: 0.301 to 2.575
Ch1	Low to high strength sandy SILT with occasional closely spaced thin beds of silty sand	- Shallow and thin channel of silt rarely encountered in the northern part of the site	Qnet (MPa): 0.354 to 1.733 Rf (%): 0.918 to 2.760 Bq: -0.096 to 0.270
S1A	Extremely loose to medium dense very dark grey (GLEY 1 N 3/) silty fine SAND with rare mica and rare shell fragments with very closely spaced thick laminations of medium to coarse sand	- Sand underlying unit L1A	Qnet (MPa): -0.167 to 80.720 Rf (%): 0.000 to 5.111 Bq: -0.195 to 0.223
S1B	Dense to very dense dark greyish brown (2.5Y 4/2) to light olive brown (2.5Y 5/3) clayey gravelly fine to coarse SAND. Gravel is grey to black, fine to coarse and subangular to rounded	- Denser than unit S1A, coarse grains and gravelly	Qnet (MPa): 8.616 to 80.183 Rf (%): 0.000 to 1.349 Bq: -0.015 to 0.007
L2	High to very high strength dark grey (GLEY 1 N 4/) CLAY with occasional pockets of fine to coarse sand and rare shell fragments	- High to very high strength layers of clay mostly underlying B units	Qnet (MPa): -0.371 to 56.919 Rf (%): 0.000 to 6.951 Bq: -0.068 to 0.843
A	Interbedded very high to extremely high strength dark greenish grey (GLEY 1 10Y 4/1) sandy CLAY with rare shell fragments and occasional closely spaced thin to thick laminations of dark grey fine sand and dark greenish grey (GLEY 1 10Y 4/1) clayey SAND with frequent extremely closely to very closely spaced thin laminations of clay	- Higher strength than L2A, underlying L2A, sometimes with gravel - Interbedded sandy CLAY/clayey SAND. Only encountered once in the south-western part of the site	Qnet (MPa): -0.556 to 31.604 Rf (%): 0.000 to 2.457 Bq: 0.000 to 0.745
G	Very dark grey (GLEY1 10Y 3/1), olive (5Y 5/4) and greenish grey (GLEY1 10Y 6/1) fine to coarse angular to rounded GRAVEL with rare sand and rare clay. Sand is medium to coarse	- Rare layers of gravel, sometimes between B and C or overlying Rock layers	Qnet (MPa): -0.072 to 70.212 Rf (%): 0.000 to 9.913 Bq: -0.166 to 0.029
MR	Extremely weak to weak thinly laminated fissured weathered fine-grained grey (GLEY1 N 5/) to dark grey (GLEY 1 N4/) MUDROCK with occasional closely to medium	- Rare and very thin layer of Mudstone encountered in the northern and southern parts of the site	N/A

	spaced thin to medium beds of strong black marlstone and occasional pockets of calcite. RMR=N/A, GSI=10, FI=N/A		
F	Medium strong to strong black (5Y 2.5/1) and brown (7.5YR 4/6) weathered fine grained MARLSTONE with occasional thin laminations and pockets of calcite. RMR=12-13, GIS=20-35, FI=2-6	- Marlstone mostly encountered in eastern part of the site	N/A
FG	Very dense black (GLEY 1 N 2.5/) to greyish brown (2.5Y 4/2) angular to subrounded fine to coarse GRAVEL of marlstone with rare thin laminations of calcite and rare light brown clay	- Likely to be drilling induced. Mostly encountered in eastern part of the site	Qnet (MPa): -0.163 to 70.658 Rf (%): 0.000 to 3.554 Bq: -0.004 to 0.001
MG	Dark grey (GLEY1 N 4/1) MADE GROUND (silty fine to medium SAND) with rare gravel, rare pockets of decayed wood, rare textile material (clothes and threads) and rare shell fragments. Gravel is fine to coarse and angular	- Made Ground (from human activity) encountered once in the northern part of the site	N/A

3. FIELD BOREHOLE LOGS

The field borehole logs are based on the field descriptions, and in situ and offshore laboratory tests outlined in Sections 4 and 5. Further onshore testing should be completed to confirm the soil type and characteristics.

3.1 Overview

All combined PCPT and sampling data are presented on the borehole logs available in Appendix A. The water depths shown on logs are as measured by the drill string at commencement of the borehole and reduced to Lowest Astronomical Tide (LAT).

Raw and derived in situ test logs along with acquisition parameters and observation summaries are presented in Appendix A.

The following are presented respective logs and reports:

1. Combined Borehole Log for Sampling and PCPT locations:
    a. PCPT and Sampling key
    b. Depth
    c. Legend (including geological unit designation)
    d. Soil Layering
    e. Raw Results
        i. Sleeve Friction
    f. Derived Results
        ii. Net Cone Resistance
        iii. Pore Pressure Ratio
        iv. Undrained Shear Strengths derived from q_{net}
        v. Relative Density derived from q_t
    g. Offshore laboratory test results
        vi. Water Content, and Bulk and Dry Densities
        vii. Undrained Shear Strength from UU, Laboratory Vane, Torvane and Pocket Penetrometers
2. Borehole Log for PCPT location
    a. PCPT key
    b. Depth
    c. Legend (including geological unit designation)
    d. Interpreted Soil Layering
    e. Raw Results
        i. Sleeve Friction
    f. Derived Results
        i. Net Cone Resistance
        ii. Pore Pressure Ratio
        iii. Undrained Shear Strengths derived from q_{net}

iv. Relative Density derived from q_t

3. Logs of Raw In Situ Test Results
    a. PCPT key
    b. Depth
    c. Raw Results
        i. Measured Cone resistance
        ii. Sleeve Friction
        iii. Excess Pore Pressure
4. Logs of Derived In Situ Test Results
    a. PCPT key
    b. Depth
    c. Raw Results
        i. Sleeve Friction
    d. Derived Results
        i. Net Cone Resistance
        ii. Pore Pressure Ratio
        iii. Friction Ratio

3.2 Soil Descriptions and Layering

The soil descriptions presented on the combined borehole logs are based on the field descriptions of recovered samples and interpretations of the PCPT data. These have been developed using the results from the offshore laboratory testing and in situ results. Descriptions are in accordance with ISO 19901-8 and the guidelines presented in Appendix C. Preliminary (with the absence of further onshore laboratory testing) borehole stratigraphy descriptions are presented in Table 2A to Table 2N.

3.3 Lateral Variation

Cross sections showing the extent of each geological Unit are presented in Figure 4A to Figure 4F with a cross section plan presented in Figure 3.

3.4 PCPT Results

Raw and derived PCPT results are presented in Appendix A. A summary of these results including details of calculations is presented in Appendix C.

3.4.1 Undrained Shear Strength

Undrained shear strength can be estimated from PCPT data using the following relationship (Lunne et al., 1997).

$$s_u = \frac{q_{net}}{N_{kt}}$$

where:

s_u = Undrained shear strength

q_{net} = net cone resistance

N_{kt} = cone factor

For the purpose of this report a N_{kt} values between 15 and 20 have been used for all cohesive soil units found across the site. These values showed good correlation with the measured offshore undrained shear strength results apart from Unit L2 between 19.75 to 45.00m at location CC-4 where the derived shear strength is higher than the measured values. On completion of further onshore laboratory strength testing it is suggested these N_{kt} values are reviewed and amended if appropriate.

A graphical representation of the derived undrained shear strength alongside measured laboratory data is presented on the borehole logs presented in Appendix A.

3.4.2 Relative Density

In situ relative density was determined from the results of PCPTs based on the cone resistance as follows (Jamiolkowski et al., 2003):

$$D_r(dry) = \frac{1}{0.0296} \cdot ln\left[q_c / \left[2.494 \cdot \left[\frac{\sigma'_{v0} \cdot \left[\frac{1+2\cdot K_0}{3}\right]}{100}\right]^{0.46}\right]\right]$$

$$D_r(saturated) = \left[\frac{-1.87 + 2.32 \cdot ln\frac{1000 \cdot q_c}{(100 \cdot \sigma'_{v0})^{0.5}}}{100} + 1\right] \cdot D_r(dry)$$

where:

	D_r (dry)	=	Estimated dry relative density (%)
	D_r (saturated)	=	Estimated saturated relative density (%)
	q_c	=	Measured cone resistance (MPa)
	σ'_{v0}	=	Vertical effective overburden stress (kPa)
	K_0	=	Coefficient of lateral earth pressure

A graphical representation of the relative density for K0=1.0 is presented on the borehole logs presented in Appendix A.

4. IN SITU TEST RESULTS

4.1 Overview

A total of 13 boreholes involving in situ testing were completed at 10 locations during this campaign. The completed boreholes and subsequent testing regimes are presented below.

A total of 3 continuous PCPT boreholes:

- PCPT-2
- PCPT-3
- PCPT-4

A total of 4 primarily continuous PCPT boreholes with sample collection where necessary:

- PCPT-1
- PCPT-5
- PCPT-6
- PCPT-7

A total of 4 alternating sampling/PCPT boreholes:

- CC-6
- PCPT-6A (bumpover)
- PCPT-8
- PCPT-8A (bumpover)

1 borehole involving continuous sampling from seabed to 40 m, followed by alternating sampling/PCPT to 80 m:

- CC-4

1 primarily continuous sampling borehole with the exception of 1 PCPT stroke:

- CC-7

4.2 Equipment Calibrations and Verifications

All relevant offshore laboratory equipment and PCPT equipment were calibrated during the mobilisation phase of the project. Calibration certificates and verification data for PCPT cones are presented in “Volume I – Field Operations and Preliminary Results” (B3-FLD-01).

4.3 Downhole PCPT Tests

4.3.1 Equipment and Results Overview

All PCPT testing was completed using the GEOQUIP downhole PCPT tool. Several PCPT cones were made available during the project which included both 10cm² compression and subtraction cones. Two tool lengths were available; 1.6m and 3.0m.

A summary of the cones used during this project are presented in “Volume I – Field Operations and Preliminary Results” (B3-FLD-01).

During testing, all data was observed topside in real time. The following channels were recorded during testing:

- Penetration depth

- Cone resistance
- Local friction
- Pore water pressure

Presentation of PCPT results is presented in Appendix A.

4.3.2 Downhole PCPT Testing Procedure

All PCPT testing was conducted by the Tool Operators with direction from the Shift Engineers. PCPT testing was conducted with a rate of penetration of approximately 2cm/s. All tests were taken to full stroke unless the Tool Operator terminated the test early. Refusal of the test may occur for a variety of reasons including but not limited to avoidance of equipment damage and to ensure data integrity.

The testing was conducted in accordance with ISO 22476-1 and with GEOQUIP procedures. Nominally all PCPT tests aimed to recover ISO 19901-8 (2014) application class 1 for soft or loose soil and application class 2 in stiff clays and sands. PCPT data acquired are presented graphically against depth in Borehole logs in Appendix A including Raw and Derived results.

4.3.3 Commentary on Downhole PCPT Tests

All the tests achieved application class 1 as set out in ISO 19901-8 (2014). A summary of PCPT test results including deck to deck offset is presented in Table 3 of the “Volume I – Field Operations and Preliminary Results” (B3-FLD-01) report. A good correlation has been found between the logged descriptions of recovered samples and of the interpreted soil behaviour from PCPT data.

The PCPT baselines and calculated application classes are presented in “Volume I – Field Operations and Preliminary Results” (B3-FLD-01).

4.3.4 Dissipation Tests

The dissipation test measures the decay of pore water pressure over a specified amount of time.

A PPDT was undertaken during PCPT at a selected depth as directed by the onboard client representative. To start the test the penetration during the selected PCPT was stopped and the initial pore pressure was recorded. The pore water pressure (u2) was then continuously measured against time in seconds. When the required dissipation value has been met, in this case it was at least 60% dissipation, the dissipation test is deemed complete and the PCPT penetration resumes to complete the PCPT as required.

Dissipation results are presented in Appendix A.

4.3.5 Commentary on Dissipation Tests

The majority of the dissipation tests performed yielded good results. A few tests performed in granular soils and very soft clays near mudline, did not produce successful results due to little or no excess pressure at the start of the test.

5. LABORATORY TEST RESULTS

5.1 Overview

A total of 14 boreholes involving sampling were completed at 12 locations during this campaign. The completed boreholes and subsequent testing regimes are presented below. Presentation of recovered sample results is discussed in Section 6.

A total of 4 continuous sampling boreholes:

- CC-1
- CC-2
- CC-3
- CC-5

A total of 4 primarily continuous PCPT boreholes with sample collection where necessary:

- PCPT-1
- PCPT-5
- PCPT-6
- PCPT-7

A total of 4 alternating sampling/PCPT boreholes:

- CC-6
- PCPT-6A (bumpover)
- PCPT-8
- PCPT-8A (bumpover)

1 borehole involving continuous sampling from seabed to 40 m, followed by alternating sampling/PCPT to 80 m:

- CC-4

1 primarily continuous sampling borehole with the exception of 1 PCPT stroke:

- CC-7

It has been agreed between GEOQUIP and COMPANY that no onshore laboratory testing shall be conducted by GEQOUIP. No onshore laboratory testing results have been included in this report.

Offshore laboratory testing was completed in the offshore laboratory mobilised for the project.

Table 5.1 details the standards to which all testing for offshore testing were to be conducted to, with the quantities of completed tests outlined in Table 5.2.

Table 5.1 Offshore Laboratory Testing Standards

Test	Standard
Density Tests	ISO 17892-02 (2004) (as per GEOQUIP procedures[1])
Miniature Vane Tests	ASTM D4648-05 (as per GEOQUIP procedures[1])
Pocket Penetrometer	NGI (1989) (as per GEOQUIP procedures[1])
Point Load	ISRM (1985) (as per GEOQUIP procedures[2])
Torvane Tests	BS1377 (as per GEOQUIP procedures[1])
Unconsolidated Undrained Triaxial Test	ISO 17892-08 (2004) (as per GEOQUIP procedures[1])
Water Content	ISO 17892-01 (2004) (as per GEOQUIP procedures[1])

[1] Offshore Sample Handling, Soil Description & Laboratory Testing (GM-MSP-OI-5-3-3)

[2] Offshore Sample Handling, Rock Description & Laboratory Testing (GM-MSP-OI-5-3-4)

Table 5.2 Summary of Tests Completed Offshore

BH ID	Density tests	Water Content Tests	Pocket Penetrometer Tests	Torvane Tests	Miniature Vane Tests	Unconsolidated Undrained Triaxial Tests	Point Load
CC-1	12	14	9	6	2	-	5
PCPT-1	-	-	1	-	-	-	5
CC-2	49	49	54	50	7	1	-
PCPT-2	-	-	-	-	-	-	-
CC-3	37	22	26	22	4	1	-
PCPT-3	-	-	-	-	-	-	-
CC-4	95	21	92	49	5	-	-
PCPT-4	-	-	-	-	-	-	-
PCPT-5	-	2	-	-	-	-	-
CC-5	27	12	-	-	-	-	3
PCPT-7	-	7	-	-	-	-	-
CC-7	66	8	68	60	6	-	1
PCPT-6	1	3	-	-	-	-	-
PCPT-6A	8	-	11	-	-	-	-
CC-6	18	10	16	6	-	-	-
PCPT-8	3	1	-	6	1	-	-
PCPT-8A	17	8	13	-	3	-	-
Total	333	157	290	199	28	2	14

5.2 Soil Classification Tests

5.2.1 Water Content

Moisture content tests were carried out shortly after extrusion on samples recovered in the field and alongside strength and consolidation tests on undisturbed clay samples in accordance with ISO 17989-1. The results are ranging between 11% and 84%.

The results are plotted against depth on the borehole logs presented in Appendix A and also in tabular form in Appendix B.1.

5.2.2 Density

Bulk (or wet) and dry density was determined on appropriate extruded samples in the field alongside strength tests on undisturbed clay samples in accordance with ISO 17989-1. The results are ranging from 1.45 to 2.25Mg/m^3 (bulk density) and 0.94 to 1.90Mg/m^3 (dry density).

The results are plotted against depth on the borehole logs presented in Appendix A and also in tabular form in Appendix B.1.

5.3 Rock Classification Tests

5.3.1 Water Content

Moisture content tests were carried out shortly after cutting the core barrel in the field and alongside strength in accordance with ISO 17989-1. The results are ranging between 1% and 17%.

The results are plotted against depth on the borehole logs presented in Appendix A and also in tabular form in Appendix B.1.

5.3.2 Density

Bulk (or wet) and dry density was determined on appropriate rock samples in the field alongside strength tests in accordance with ISO 17989-1. The results are ranging from 2.52 to 2.99Mg/m^3 (bulk density) and 2.50Mg/m^3 to 2.50Mg/m^3 (dry density).

The results are plotted against depth on the borehole logs presented in Appendix A and also in tabular form in Appendix B.1.

5.4 Soil Strength Tests

5.4.1 Pocket Penetrometer & Torvane

Pocket penetrometer tests were performed in the field on cohesive soil samples to determine the undrained shear strength. The results are plotted against depth on the borehole logs presented in Appendix A and also in tabular form in Appendix B.2.

5.4.2 Miniature Vane

Miniature laboratory vane tests were completed on cohesive soils in the offshore laboratory in accordance with ASTM D4648. This test is most suitable for extremely soft to medium strength clays especially when the soil is too soft for conventional unconsolidated undrained triaxial tests.

The tests conducted offshore were performed on the sample before it was extruded. The vanes utilised had a diameter of 12.7 or 25.4 mm and the rotation rate was set to 60°/min.

These results are presented on the logs in Appendix A and tabulated in Appendix B.2.

On selected offshore samples remoulded vane tests were performed by completing the undisturbed test then quickly rotating the vane a minimum of 5 times before commencing the test again.

These results are tabulated in Appendix B.2.

5.4.3 Unconsolidated Undrained Triaxial

UU tests have been conducted in the offshore laboratory on cohesive soil samples to determine the undrained shear strength. The triaxial test was completed in line with ISO 17892-08 (2004). The results are plotted against depth on the borehole logs presented in Appendix A. Individual test reports are presented graphically, and results are summarised in tabular form in Appendix B.2.

UU tests ran to generally 15% axial strain and were conducted with confining pressures equal to the total in situ vertical stress or maximum cell pressure of 3000kPa.

5.5 Rock Strength Tests

This group of tests are used to organise the principal strengths of rock as appropriate.

5.5.1 Point Load Tests

Point load testing (PLT) is used to determine rock strength indexes in geotechnical practice. PLTs were conducted in the offshore laboratory on rock samples in accordance with ISRM Suggested Method for Determining Point Load Strength (1985) and ASTM D5731-16. The results are plotted against depth on the borehole logs presented in Appendix A.

The tests conducted offshore were performed on the competent rock samples. The $PLT_{(Is50)}$ results range between 0.5MPa and 4.4MPa.

6. REFERENCES

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ASTM D2974-20e1, Standard Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils, ASTM International, West Conshohocken, PA, 2020, www.astm.org

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ASTM D4254-16, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density, ASTM International, West Conshohocken, PA, 2016, www.astm.org

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Mesri, G., (1975) New design procedure for stability of soft clays: Discussion. ASCE Journal of the Geotechnical Engineering Division, 101(GT4), pp. 409-412.

Schmidt, B., (1966), “Discussion of Earth Pressure at rest related to stress history”, Proc. 8th Int. Conf. on Soil Mechanics and Foundation Engineering, Moscow, Vol. 4, pp. 26-28.

FIGURES

Figure 1 General Location Map

GIS-TEMP-GeneralOverview-RevB1

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port Extension Geotechnical Survey (PFTE)
Project Number: GMOP20-G-013

GEOQUIPMARINE

General Location Plan

Ref.: GMOP20-G-013-FAC-01

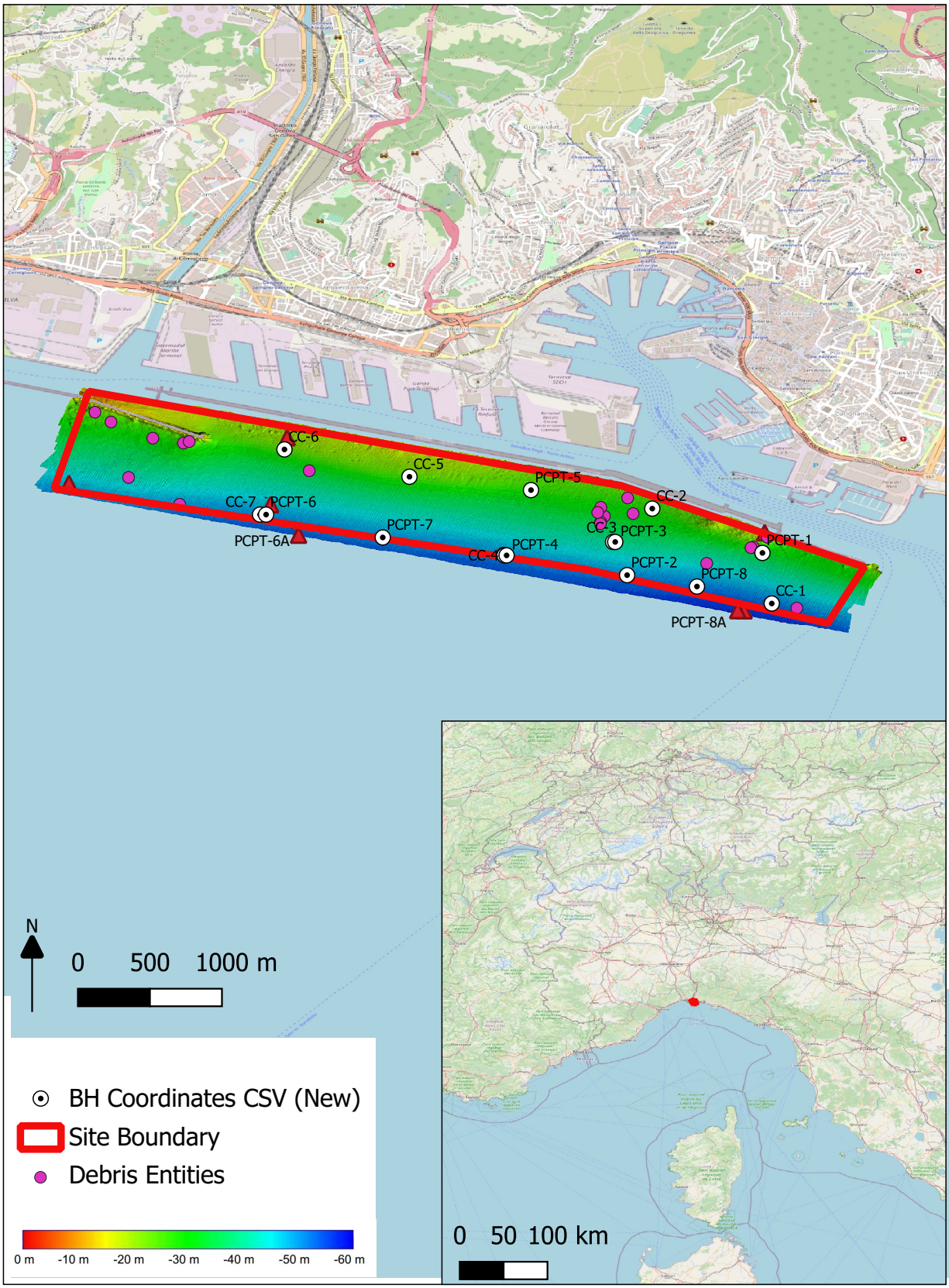
Figure Number: 1

Figure 2 Completed Borehole Location Plan

GIS-TEMP-GeneralOverview-RevB1

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port Extension Geotechnical Survey (PFTE)
Project Number: GMOP20-G-013

GEOQUIPMARINE



Completed Borehole Location Plan

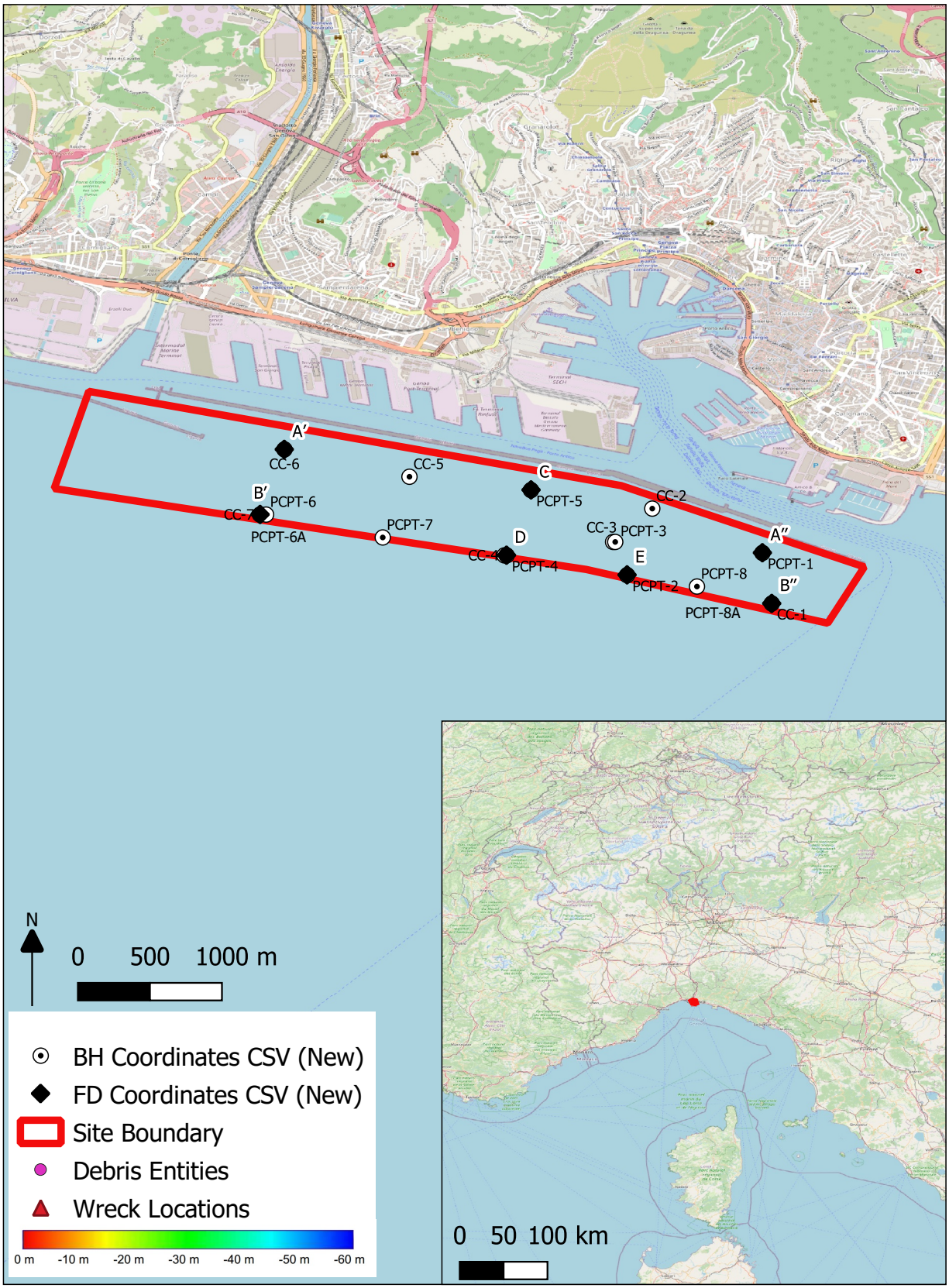
Ref.: GMOP20-G-013-FAC-01

Figure Number: 2

Figure 3 Cross Section Location Plan

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port Extension Geotechnical Survey (PFTE)
Project Number: GMOP20-G-013

GEOQUIPMARINE



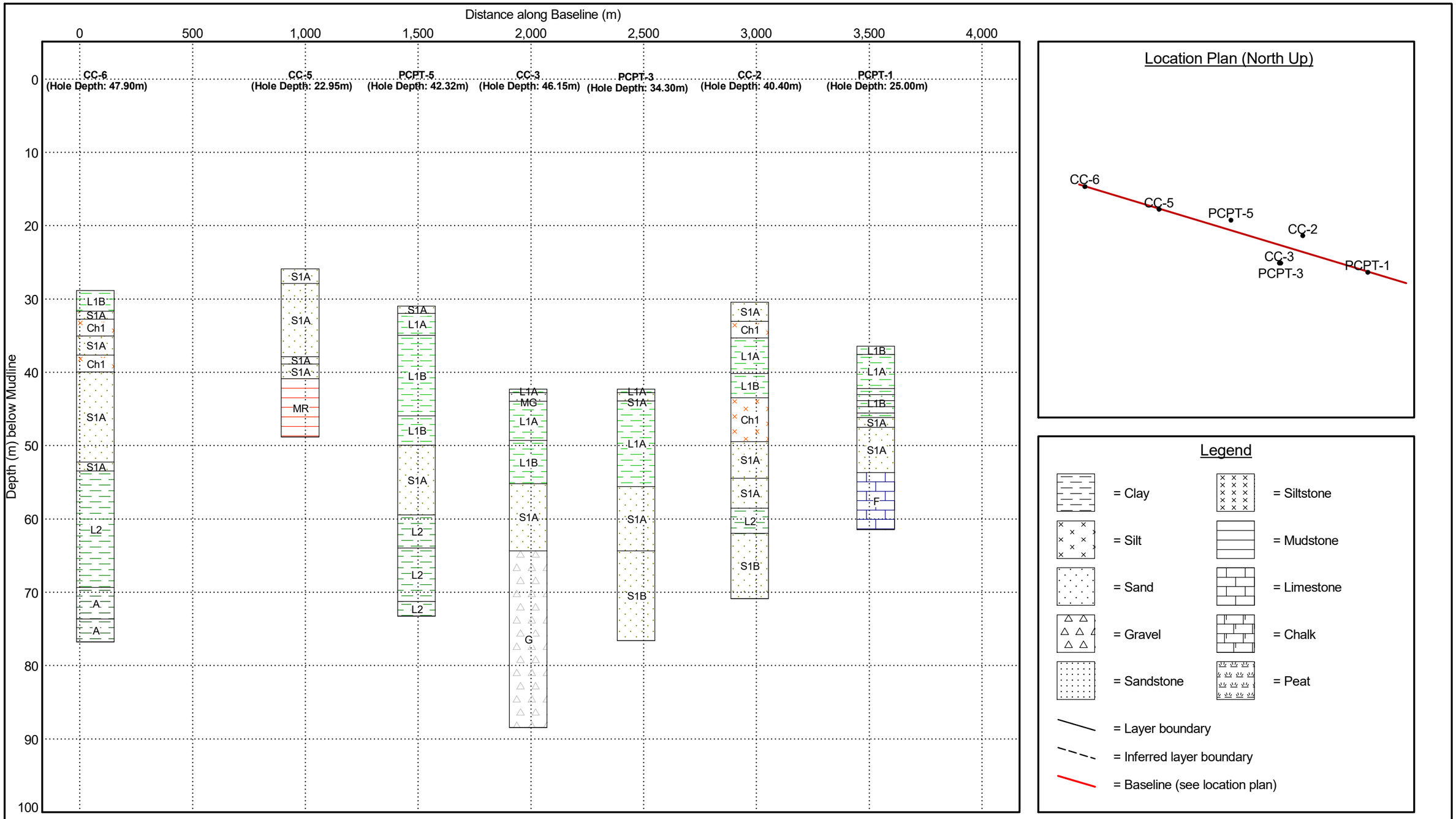
Cross Section Location Plan

Ref.: GMOP20-G-013-FAC-01

Figure Number: 3

Figure 4A Cross Section A'-A''

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project No.: GMOP20-G-013	Location: A'-A"	Coordinates[1] of Baseline: Start of Baseline: 1491022mE 4916194mN End of Baseline: 1494852mE 4915038mN	GEOQUIPMARINE



Local Geodetic Datum: Gauss-Boaga Fuso W

SITE STRATIGRAPHY

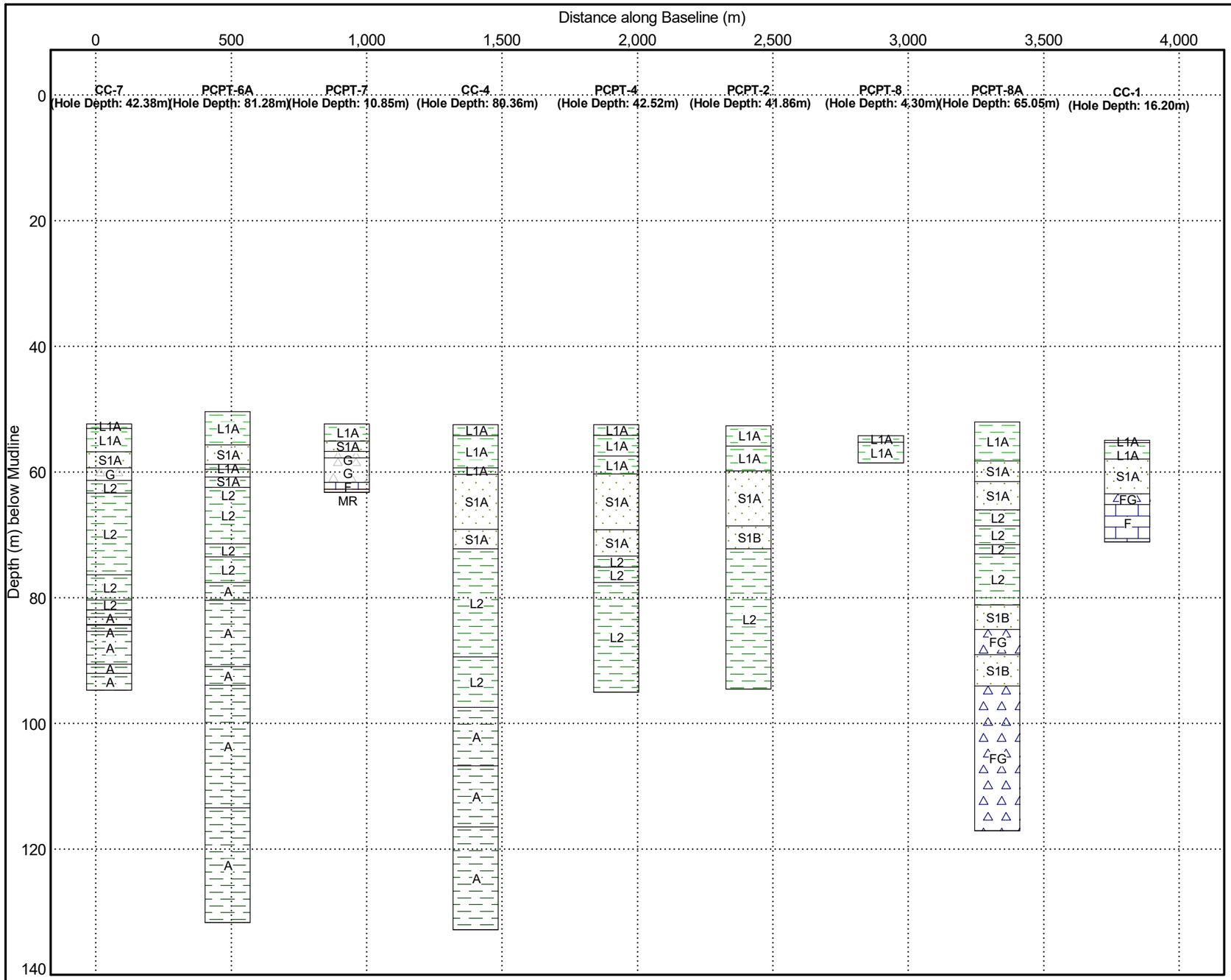
Ref: GMOP20-G-013-FAC-01

Figure Number: 4A

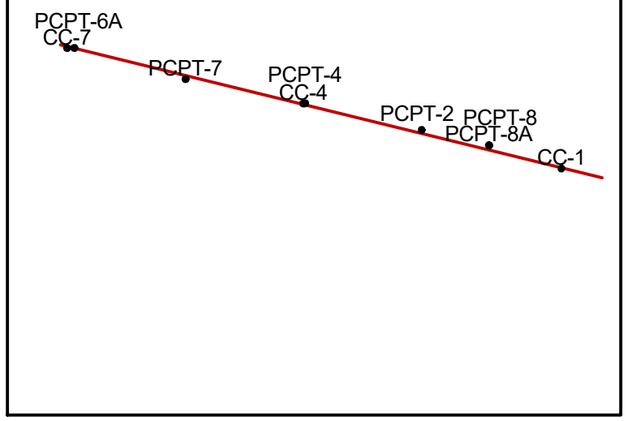
Figure 4B Cross Section B'-B''

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location:	B'-B"	Coordinates[1] of Baseline:	
Project Name:	Genoa Port (PFTE)			Start of Baseline:	1490873mE 4915562mN
Project No.:	GMOP20-G-013			End of Baseline:	1494758mE 4914609mN

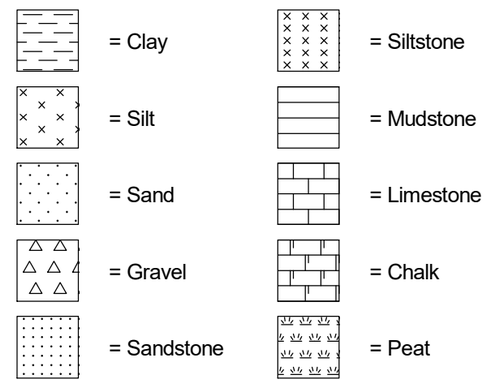
GEOQUIPMARINE



Location Plan (North Up)



Legend



Local Geodetic Datum: Gauss-Boaga Fuso W

SITE STRATIGRAPHY

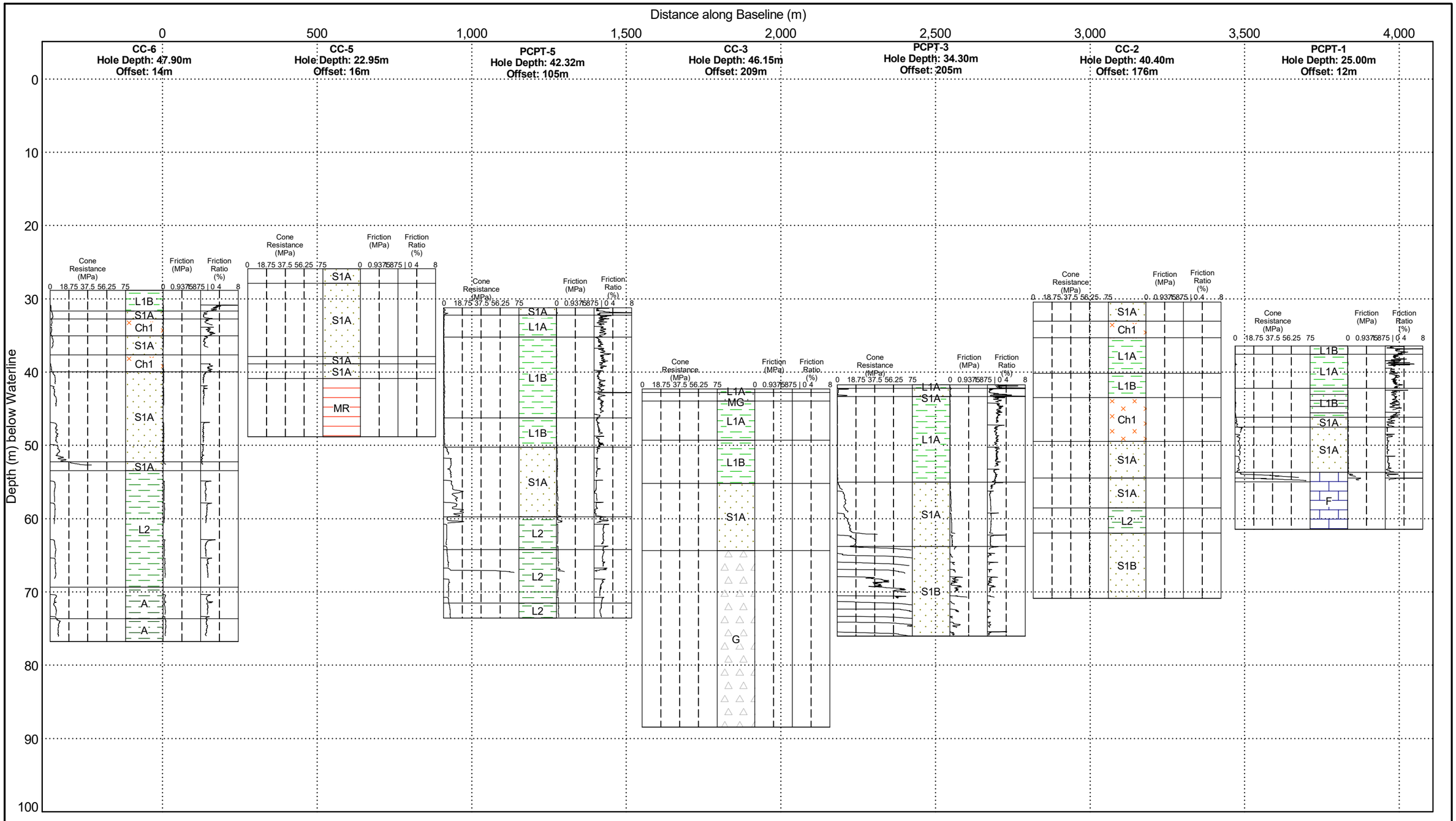
Ref: GMOP20-G-013-FAC-01

Figure Number: 4B

Figure 4C Cross Section A'-A'' with CPT Results

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project No.: GMOP20-G-013	Line Number: A'-A"	Coordinates[1] of Baseline: Start of Baseline: 1491037mE 4916199mN End of Baseline: 1494865mE 4915038mN

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W
[2] Maximum CPTU Tip (MPa): 75

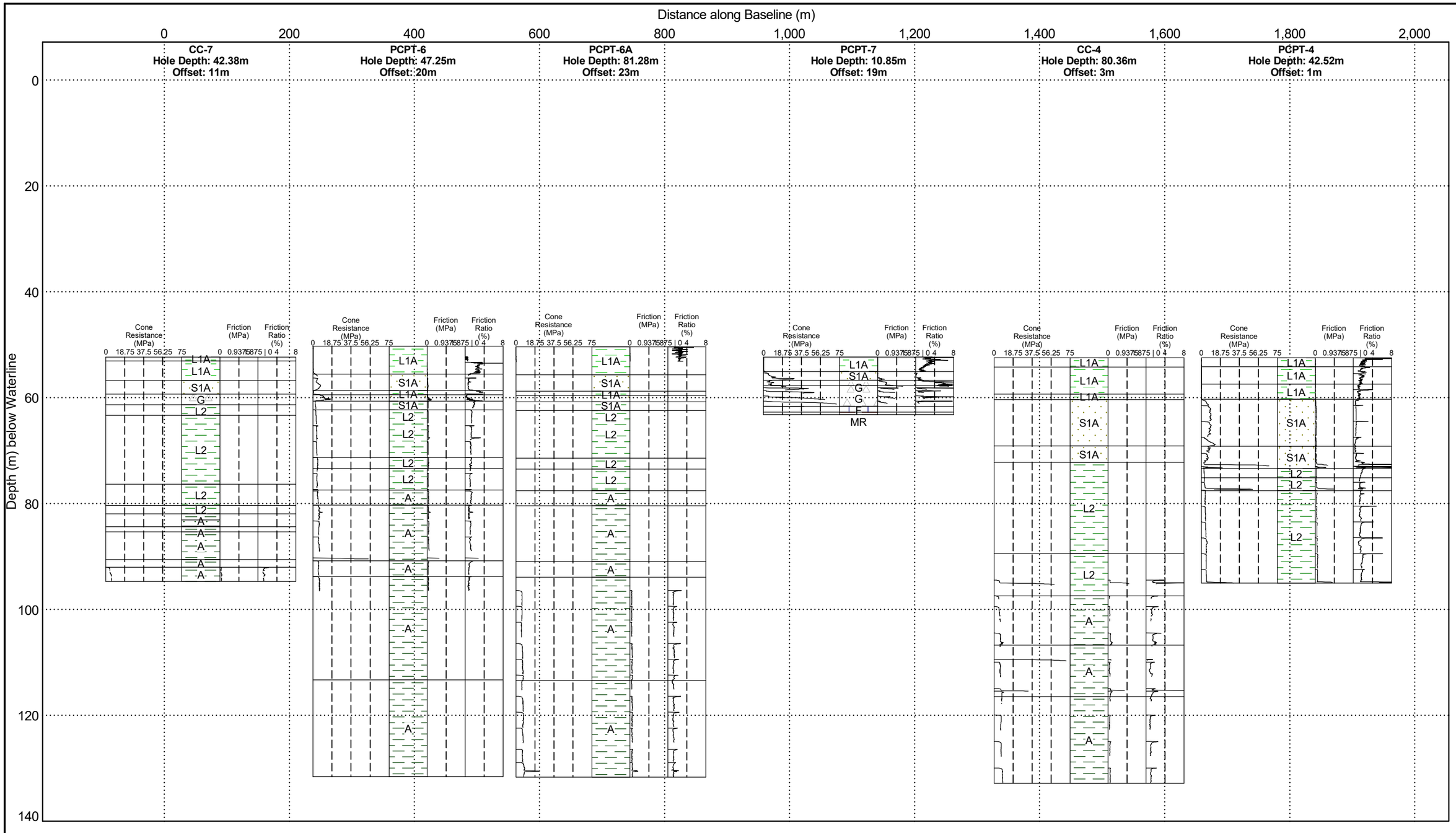
FENCE DIAGRAM

Ref: GMOP20-G-013-FAC-01

Figure Number: 4C

Figure 4D Cross Section B'-D with CPT Results

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project No.: GMOP20-G-013	Line Number: B'-D	Coordinates[1] of Baseline: Start of Baseline: 1490862mE 4915542mN End of Baseline: 1492813mE 4915101mN	GEOQUIPMARINE



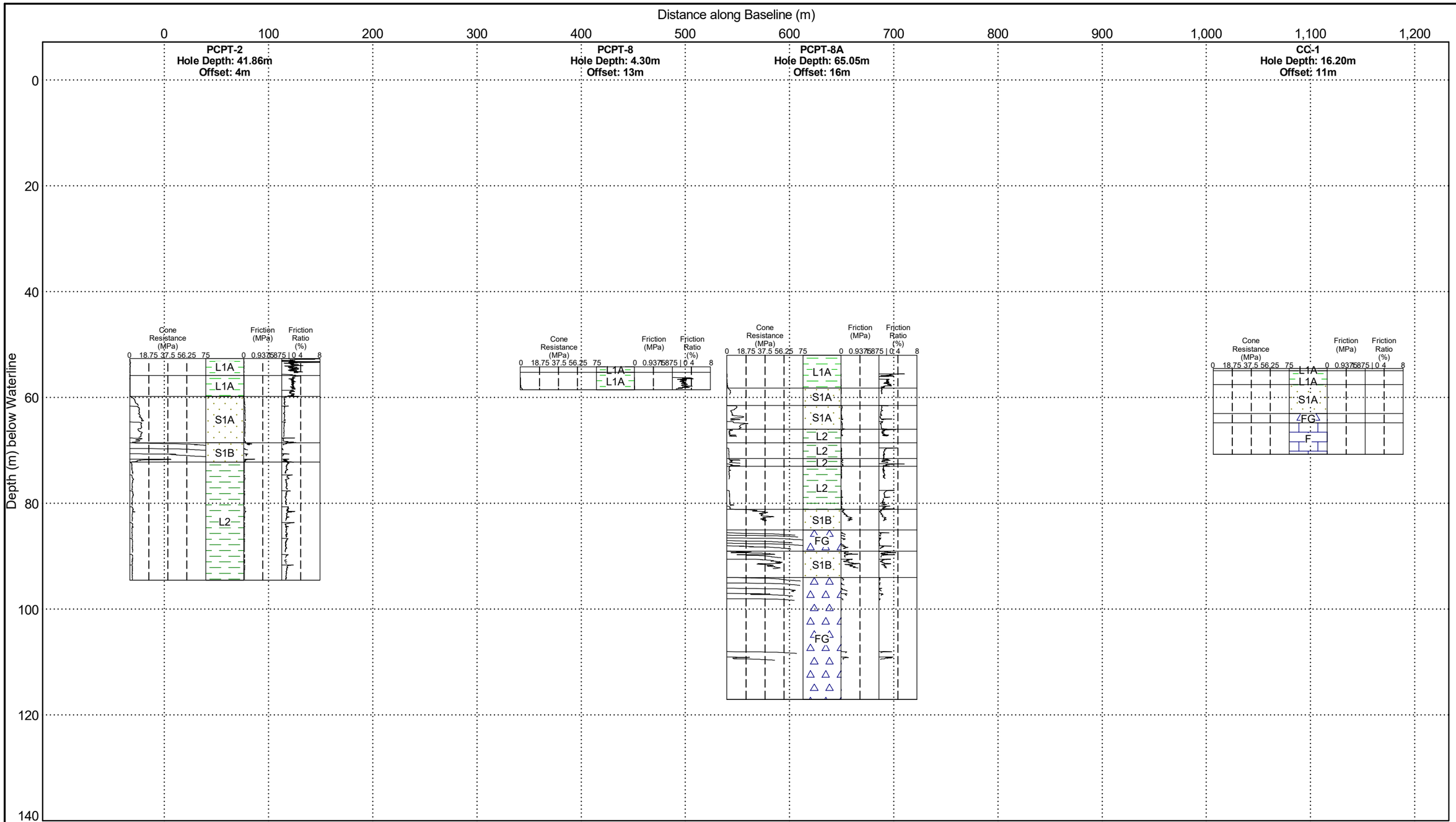
[1] Local Geodetic Datum: Gauss-Boaga Fuso W
[2] Maximum CPTU Tip (MPa): 75

FENCE DIAGRAM

Ref: GMOP20-G-013-FAC-01
Figure Number: 4D

Figure 4E Cross Section C-B' with CPT Results

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project No.: GMOP20-G-013	Line Number: E'-B	Coordinates[1] of Baseline: Start of Baseline: 1493409mE 4914971mN End of Baseline: 1494567mE 4914659mN	GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W
[2] Maximum CPTU Tip (MPa): 75

FENCE DIAGRAM

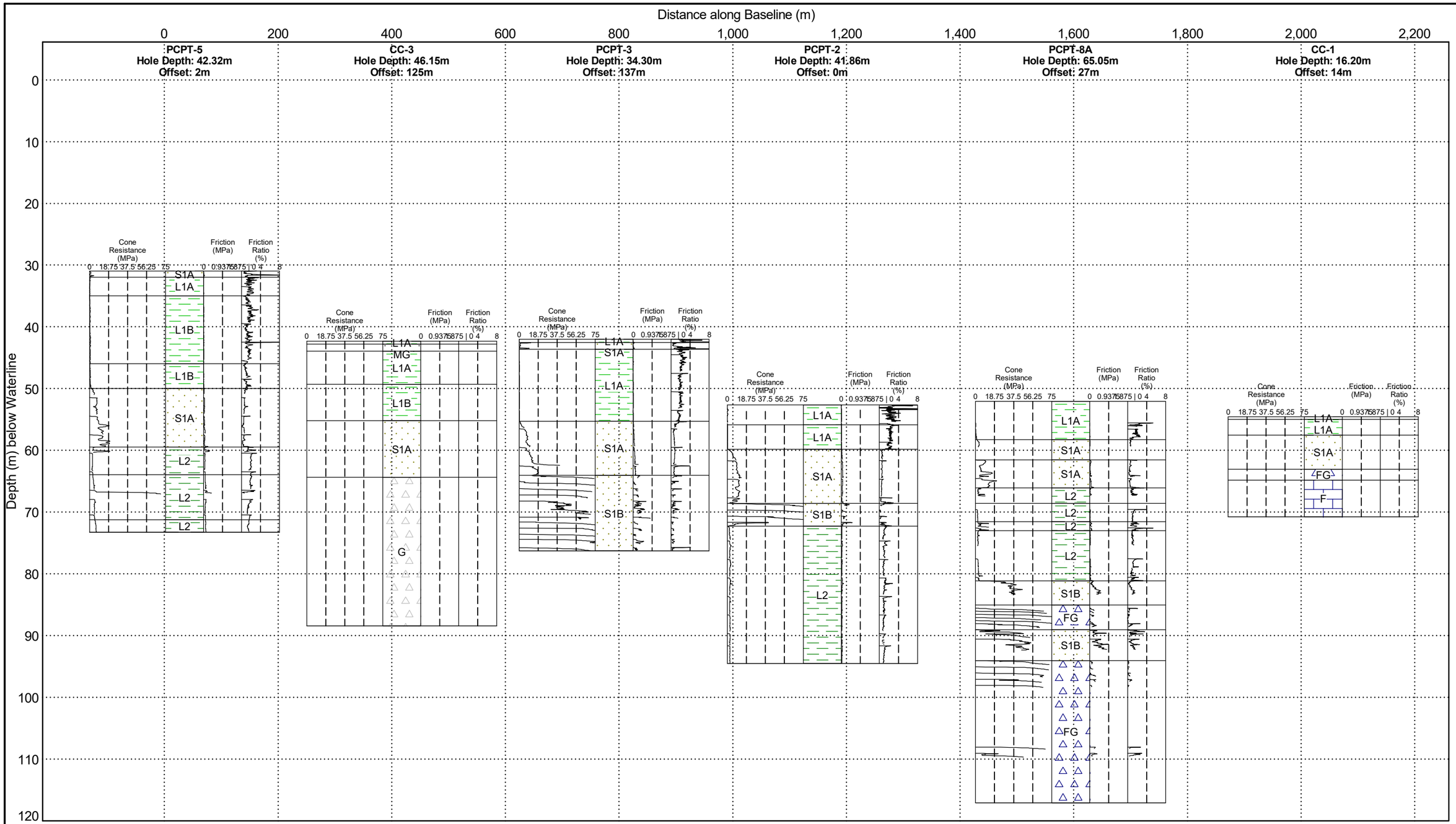
Ref: GMOP20-G-013-FAC-01

Figure Number: 4E

Figure 4F Cross Section C-E-B'' with CPT Results

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project No.: GMOP20-G-013	Line Number: C-E-B	Coordinates[1] of Baseline: Start of Baseline: 1492779mE 4915804mN End of Baseline: 1494529mE 4914674mN

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W
[2] Maximum CPTU Tip (MPa): 75

FENCE DIAGRAM

Ref: GMOP20-G-013-FAC-01

Figure Number: 4F

TABLES

Table 1 Borehole Summary

Location ID	Target		Actual		Depth (m)	Water Depth	
	Easting	Northing	Easting	Northing		Drillstring LAT (m)	Echo Sounder (m)
CC-1	49146575.28	1494466.30	1494465.74	49146575.37	16.20	54.56	53.69
CC-2	1493639.00	4915593.00	1493639.29	4915594.01	40.40	29.76	29.00
CC-3	1493367.00	4915272.00	1493366.57	4915273.48	46.15	42.30	42.00
CC-4	1492614.00	4915142.00	1492614.56	4915142.05	80.36	52.46	52.6
CC-5	1491957.00	4915903.00	1491957.9	4915902.97	22.95	25.87	25.00
CC-6	1491091.00	4916168.00	1491089.76	4916168.30	47.90	28.86	28.00
CC-7	1490921.00	4915539.00	1490921.21	4915539.58	42.38	52.36	52.20
PCPT-1	1494402.16	4915164.12	1494401.45	4915165.63	25.00	36.46	35.50
PCPT-2	1493464.00	4914951.00	1493463.58	4914952.56	41.86	52.66	52.27
PCPT-3	1493382.00	4915272.00	1493381.68	4915273.18	34.30	42.01	41.92
PCPT-4	1492629.00	4915142.00	1492628.33	4915143.62	42.52	52.48	51.45
PCPT-5	1492799.00	4915773.00	1492799.06	4915774.54	42.32	30.96	30.20
PCPT-6	1490971.00	4915539.00	1490970.95	49155347.5	47.25	50.31	50.10
PCPT-6A	1490972.73	4915540.49	1490972.65	49155340.08	81.28	50.43	50.40
PCPT-7	1491771.00	4915317.00	1491770.27	4915316.78	10.85	52.56	51.60
PCPT-8	1493948.14	4914839.86	1493948.25	4914839.38	4.30	54.26	54.40
PCPT-8A	1493946.81	4914843.01	1493946.67	4914843.08	65.05	52.06	52.20

NOTE
1 Coordinates displayed in local datum, Table 3

Table 2A Generalised Stratigraphy (CC-1)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	0.40	Extremely low strength black (GLEY1 N 2.5/) sandy CLAY with frequent shell fragments and occasional organic matter	L1A
0.40	3.00	Extremely low to very low strength very dark grey (GLEY1 N 3/) becoming dark greenish grey (GLEY1 10Y 4/1) sandy CLAY with occasional shell fragments	L1A
3.00	8.50	Very dark greenish grey (GLEY1 10Y 3/1) becoming very dark grey (GLEY1 N 3/) silty fine to medium SAND with rare fibrous organic matter and medium sand-sized shell fragments and shells	S1A
8.50	10.25	Dark grey (5Y 4/1) to very dark grey (5Y 3/1) fine to coarse angular clayey GRAVEL of fine to coarse grained sandstone and marlstone with occasional calcite veins, with oxidation staining	FG
10.25	16.20	Strong black (5Y 2.5/1) MARLSTONE with occasional veins and pockets (0.5-15.0mm) of calcite, with rare dark yellowish brown (10YR 4/6) areas of surface staining, weathered	F

Table 2B Generalised Stratigraphy (CC-2)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	2.60	Very dark grey (GLEY 1 N 3/) fine SAND with occasional shell fragments, rare widely spaced thin to medium beds of medium to high strength clay and rare angular fine to medium gravel	S1A
2.60	4.85	Very low to low strength very dark greenish grey (GLEY 1 10Y 3/1) sandy SILT with rare angular fine to medium gravel. From 4.45 m - with occasional gravel	Ch1
4.85	9.70	Very low to low strength very dark greenish grey (GLEY 1 10Y 3/1) silty CLAY with rare shell fragments, rare angular fine to coarse gravel	L1A
9.70	13.00	Low to medium strength very dark greenish grey (GLEY 1 10Y 3/1) sandy CLAY with rare shells and shell fragments and rare closely spaced thin laminations and pockets (<10mm) of fibrous organic matter	L1B
13.00	19.00	Low to medium strength very dark greenish grey (GLEY 1 10Y 3/1) clayey SILT with rare pockets (2-4mm) of fine sand, rare pockets (<2mm) of organic matter and rare shell fragments	Ch1
19.00	24.00	Very dark greenish grey (GLEY 1 10Y 3/1) silty fine SAND with rare shell fragments, rare mica and rare pockets (<10mm) of organic matter	S1A
24.00	28.10	Very dark greenish grey (GLEY 1 10Y 3/1) fine SAND with rare shells and shell fragments and rare mica	S1A
28.10	31.50	High to very high strength very dark grey (5Y 3/1) sandy CLAY with frequent extremely closely to very closely spaced thin to thick laminations of black (5Y 2.5/1) medium to coarse sand, frequent shell fragments and rare subrounded fine gravel	L2
31.50	40.40	Black (GLEY 1 N 2.5/) medium to coarse SAND with occasional pockets (10-50mm) of very dark greenish grey firm clay, occasional subangular to subrounded fine to medium gravel and rare shells and shell fragments	S1B

Table 2C Generalised Stratigraphy (CC-3)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	0.50	Dark grey (GLEY1 N 4/1) silty CLAY with rare gravel. Gravel is angular fine to medium	L1A
0.50	1.65	Dark grey (GLEY1 N 4/1) MADE GROUND (silty fine to medium SAND) with rare gravel, rare pockets of decayed wood, rare textile material (clothes and threads) and rare shell fragments. Gravel is angular fine to coarse	MG
1.65	7.00	Extremely low to very low strength very dark greenish grey (GLEY1 5GY 3/1) silty CLAY with frequent pockets of decayed wood and organic matter, rare shell fragments	L1A
7.00	12.90	Low to medium strength very dark greenish grey (GLEY1 5GY 3/1) silty CLAY with frequent shell fragments and rare pockets of organic matter	L1B
12.90	22.05	Greenish black (GLEY1 10Y 2.5/1) silty fine to medium SAND with frequent mica and occasional shell fragments	S1A
22.05	46.15	Very dark grey (GLEY1 10Y 3/1), olive (5Y 5/4) and greenish grey (GLEY1 10Y 6/1) angular to rounded fine to coarse GRAVEL with rare sand and rare clay. Sand is medium to coarse	G

Table 2D Generalised Stratigraphy (CC-4)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	1.75	Extremely low strength very dark greenish grey (GLEY 1 5GY 3/1) sandy CLAY with rare fibrous organic matter and decayed wood, and rare shell fragments	L1A
1.75	6.90	Extremely low to low strength very dark greenish grey (GLEY 1 5GY 3/1) CLAY with rare pockets of fibrous organic material, rare shell fragments and rare pockets and extremely closely spaced thin laminations of sandy clay	L1A
6.90	7.90	Low strength very dark greenish grey (GLEY 1 10Y 3/1) sandy CLAY with intact shells	L1A
7.90	16.70	Medium dense very dark grey (GLEY 1 N 3/) silty fine SAND with rare mica and rare shell fragments	S1A
16.70	19.75	Loose to medium dense very dark grey (GLEY 1 N 3/) fine to medium SAND with rare rounded fine gravel	S1A
19.75	37.00	High to very high strength greenish grey (GLEY 1 10Y 5/1) CLAY with occasional shell fragments	L2
37.00	45.00	High to very high strength dark olive grey (5Y 3/2) CLAY with occasional closely spaced thin laminations of silty fine sand and rare shell fragments	L2
45.00	54.30	Very high to extremely high strength dark olive grey (5Y 3/2) CLAY with rare shell fragments	A
54.30	64.00	Extremely high strength olive grey (5Y 4/2) CLAY with rare shell fragments and rare mica	A
64.00	80.36	Extremely high strength olive grey (5Y 4/2) CLAY with rare shell fragments and rare pockets of yellowish red silt	A

Table 2E Generalised Stratigraphy (CC-5)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	2.00	Very dark grey (GLEY 1 N 3/) fine SAND with rare shell fragments and rare fibrous organic material	S1A
2.00	12.00	Very dark grey (GLEY 1 N 3/) silty fine SAND with rare shells and shell fragments and rare mica	S1A
12.00	13.00	Very dark grey (GLEY 1 N 3/) clayey fine to medium SAND with rare shells and shell fragments, rare pockets of fibrous organic matter and wood fragments, and rare mica	S1A
13.00	15.00	Dark grey (GLEY 1 N 4/1) silty coarse SAND with occasional subrounded fine gravel, occasional shell fragments and rare fibrous organic matter	S1A
15.00	22.95	Very weak to weak dark grey (GLEY 1 N 4/) fissured weathered CLAYSTONE with occasional closely to medium spaced thin to medium beds of strong black marlstone, occasional calcite pockets and occasional closely spaced thin laminations of clay. RMR=15; GSI=25 ; FI=7-10	MR

Table 2F Generalised Stratigraphy (CC-6)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	2.80	Low to medium strength very dark grey (GLEY 1 N 3/) sandy CLAY with rare shell fragments and rare organic material. Sand is fine	L1B
2.80	3.90	Very loose to loose silty SAND	S1A
3.90	6.20	Medium to high strength sandy SILT with occasional closely spaced thin beds of silty sand	Ch1
6.20	8.80	Loose very dark grey (GLEY 1 N 3/) silty fine SAND with rare shell fragments	S1A
8.80	11.10	Low to medium strength very dark grey (GLEY 1 N 3/) sandy SILT with rare shells and shell fragments. Sand is fine	Ch1
11.10	23.40	Loose to medium dense very dark grey (GLEY 1 N 3/) silty fine SAND with rare shell fragments and rare mica	S1A
23.40	24.60	Dense to very dense dark grey (GLEY 1 N 4/) gravelly medium to coarse SAND. Gravel is subangular to rounded fine to coarse	S1A
24.60	40.50	Very high to extremely high strength greenish grey (GLEY 1 10Y 5/1) CLAY with rare dark grey fine sand and rare shell fragments	L2
40.50	44.80	Extremely high strength greenish grey (GLEY 1 10Y 5/1) CLAY with rare pockets of shell fragments	A
44.80	47.90	Extremely high strength greenish grey (GLEY 1 5G_/1 6/1) CLAY with rare fine sand, rare pockets of black fine sand and rare shell fragments	A

Table 2G Generalised Stratigraphy (CC-7)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	0.75	Extremely low strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shells and shell fragments	L1A
0.75	4.45	Extremely low strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shells and shell fragments and rare pockets of fibrous organic material	L1A
4.45	7.00	Dark greenish grey (GLEY 1 4/1) silty fine SAND with occasional shells and shell fragments, rare pockets of fibrous organic matter and wood fragments	S1A
7.00	9.00	Light grey (GLEY 1 N 7/), dark greenish grey (GLEY 1 10Y 4/1) and dark grey (2.5Y 4/1) sandy silty subrounded fine to coarse GRAVEL with rare shell fragments. Sand is fine	G
9.00	11.00	Medium to high strength olive grey (5Y 5/2) CLAY with rare shell fragments	L2
11.00	24.00	High to very high strength olive grey (5Y 4/2) CLAY with rare shell fragments	L2
24.00	28.00	Very high strength greenish grey (GLEY 1 5GY 5/1) CLAY with occasional extremely closely spaced thin laminations of silt and rare shell fragments	L2
28.00	29.60	Very high strength greenish grey (GLEY 1 5GY 5/1) CLAY with rare pockets of organic matter, rare extremely closely spaced thin laminations of silt	L2
29.60	32.00	Interbedded very high to extremely high strength dark greenish grey (GLEY 1 10Y 4/1) sandy CLAY with occasional closely spaced thin to thick laminations of dark grey fine sand and dark greenish grey (GLEY 1 10Y 4/1) clayey SAND with frequent extremely closely to very closely spaced thin laminations of clay	A
32.00	33.00	Extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with occasional closely spaced thin laminations and pockets of fine sand, and occasional pockets of organic matter	A
33.00	38.20	Very high to extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shell fragments	A
38.20	39.70	Medium to high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with occasional subrounded fine gravel and rare pockets of shell fragments	A
39.70	42.38	Very high to extremely high strength CLAY	A

Table 2H Generalised Stratigraphy (PCPT-1)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	1.10	Low strength sandy CLAY	L1B
1.10	5.75	Extremely low strength CLAY with occasional closely to medium spaced very thin to thin beds of clayey sand	L1A
5.75	9.70	Interbedded very low to low strength CLAY and clayey SAND	L1B
9.70	11.05	Very loose to loose silty SAND with very thin beds of clay	S1A
11.05	17.20	Loose SAND	S1A
17.20	25.00	Medium strong to strong black (5Y 2.5/1) and brown (7.5YR 4/6) weathered fine grained MARLSTONE with occasional thin laminations and pockets of calcite. RMR=12-13, GIS=20-35, FI=2-6	F

Table 2I Generalised Stratigraphy (PCPT-2)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	3.20	Extremely low strength CLAY with rare medium spaced thin beds of silty sand	L1A
3.20	7.15	Extremely low to very low strength CLAY	L1A
7.15	15.90	Medium dense SAND	S1A
15.90	19.60	Very dense SAND	S1B
19.60	41.86	High to very high strength CLAY	L2

Table 2J Generalised Stratigraphy (PCPT-3)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	0.50	Extremely low strength CLAY	L1A
0.50	1.60	Loose gravelly SAND	S1A
1.60	13.30	Extremely low to very low strength CLAY with rare medium spaced thin beds of clayey sand	L1A
13.30	22.05	Medium dense SAND	S1A
22.05	34.30	Very dense SAND	S1B

Table 2K Generalised Stratigraphy (PCPT-4)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	1.70	Extremely low strength CLAY with rare closely spaced very thin beds of clayey sand	L1A
1.70	5.00	Very low strength CLAY with rare medium spaced thin to medium beds of clayey sand	L1A
5.00	7.85	Extremely to very low strength CLAY with rare medium to widely spaced thin beds of clayey sand	L1A
7.85	16.70	Medium dense SAND	S1A
16.70	20.90	Loose to medium dense SAND with rare closely to medium spaced thin to medium beds of sandy clay	S1A
20.90	22.70	High to very high strength CLAY	L2
22.70	25.10	Very high strength CLAY	L2
25.10	42.52	Very high to extremely high strength CLAY	L2

Table 2L Generalised Stratigraphy (PCPT-5)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	1.00	Medium dense SAND	S1A
1.00	4.00	Very low to low strength CLAY with rare closely to medium spaced very thin to thin beds of sandy clay	L1A
4.00	15.00	Low to medium strength CLAY with occasional medium spaced thin to medium beds of sandy clay	L1B
15.00	19.00	Low to medium strength CLAY	L1B
19.00	28.50	Loose to medium dense SAND	S1A
28.50	33.00	Very high strength CLAY	L2
33.00	40.30	Very high to extremely high strength greenish grey (GLEY1 10Y 5/1) silty CLAY with rare pockets of dark grey staining	L2
40.30	42.32	Extremely high strength CLAY	L2

Table 2M Generalised Stratigraphy (PCPT-6 & 6A)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	5.25	Extremely low to very low strength CLAY with rare closely to medium spaced thin to medium beds of sandy clay	L1A
5.25	8.35	Loose to medium dense SAND	S1A
8.35	9.15	Very low to low strength CLAY	L1A
9.15	10.40	Medium dense SAND	S1A
10.40	12.00	High to very high strength CLAY	L2
12.00	21.00	Very high strength CLAY	L2
21.00	23.05	Very high strength CLAY with rare medium spaced thin beds of sandy clay	L2
23.05	27.15	Very high strength CLAY	L2
27.15	30.00	Very high to extremely high strength CLAY	A
30.00	40.50	Extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY	A
40.50	43.50	Very high strength to extremely high strength CLAY	A
43.50	63.00	Extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shell fragments and rare pockets of black silt	A
63.00	81.28	Extremely high strength dark greenish grey (GLEY 1 10Y4/1) CLAY with rare shell fragments and rare pockets of black silt	A

Table 2N Generalised Stratigraphy (PCPT-7)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	2.70	Very low strength CLAY with occasional closely to medium spaced thin beds of sandy clay	L1A
2.70	4.40	Medium dense SAND	S1A
4.40	5.40	Medium dense GRAVEL	G
5.40	9.30	Very dense light grey (GLEY1 N 7/) to dark grey (GLEY1 N 3/) clayey angular fine to coarse GRAVEL with subangular cobbles	G
9.30	10.40	Weak to medium strong grey (GLEY1 N 6/) to greenish grey (GLEY1 5GY 5/1) fine grained MARLSTONE. Discontinuities 50 to 80 deg, very closely to medium spaced, planar to stepped, infilled with clay, rarely stained dark greenish grey. RMR=51, GSI=60, FI=3	F
10.40	10.85	Extremely weak thinly laminated weathered fine grained grey (GLEY1 N 5/) to dark grey (GLEY 1 N4/) MUDSTONE. RMR=N/A, GSI=10, FI=N/A	MR

Table 2O Generalised Stratigraphy (PCPT-8 & 8A)

Depth from (m)	Depth to (m)	Description	Geological Unit
0.00	6.20	Extremely low to very low strength very dark greenish grey (GLEY 1 10Y 3/1) CLAY with occasional angular fine to medium gravel and rare pockets of fibrous organic matter and wood fragments	L1A
6.20	9.50	Loose dark grey (GLEY 1 N 4/) silty fine SAND with rare shell fragments and rare mica	S1A
9.50	14.00	Loose to medium dense SAND with rare medium spaced thin to medium beds of sandy clay	S1A
14.00	16.50	High to very high strength dark grey (GLEY 1 N 4/) CLAY with occasional pockets of fine to coarse sand and rare shell fragments	L2
16.50	19.50	High strength dark grey (GLEY 1 N 4/) CLAY with rare shell fragments	L2
19.50	20.95	Very high strength gravelly CLAY	L2
20.95	29.10	High to very high strength dark grey (GLEY 1 N 4/) CLAY with rare shell fragments, rare rounded fine gravel and rare pockets and widely spaced thin laminations and beds of silty sand	L2
29.10	33.00	Dense dark greyish brown (2.5Y 4/2) to light olive brown (2.5Y 5/3) clayey gravelly fine to coarse SAND. Gravel is grey to black subangular to rounded fine to coarse	S1B
33.00	37.00	Very dense black (GLEY 1 N 2.5/) to greyish brown (2.5Y 4/2) angular to subrounded fine to coarse GRAVEL of marlstone with rare thin laminations of calcite and rare light brown clay	FG
37.00	42.00	Dense to very dense very dark greyish brown (2.5Y 3/2) fine to coarse SAND with rare pockets of light brown clay and rare subrounded fine to medium gravel	S1B
42.00	65.05	Dense to very dense black (2.5Y 2.5/1) subrounded coarse GRAVEL of marlstone with occasional cobbles and occasional pockets of calcite	FG

Table 3 Project Geodetics

Working Spheroid	
Datum:	Roma 40
Spheroid:	WGS84
Semi-major, a:	6378388
Semi-minor, b:	TBC
Inverse flattening, 1/f:	297.00000000

Working Projection	
Grid:	UTM 32N
Projection Type:	Transverse Mercator
Zone:	32N
Central Meridian:	09° 00’00.00’’
Latitude Origin:	00° 00’00.00’’
Grid Easting:	1500000.00
Grid Northing:	0.00
Scale Factor on CM:	0.9996
Units:	Meter

Table 4 Fence Diagram Coordinates

Location ID	Easting	Northing
A’	1491089.76	4916168.30
A’’	1494401.45	4915165.63
B’	1490921.21	4915539.58
B’’	1494465.74	4914675.37
C	1492799.06	4915774.54
D	1492628.33	4915143.62
E	1493463.58	4914952.56

NOTE
1 Coordinates displayed in local datum, Table 3
2 Water depths reduced to LAT and recorded at commencement of borehole

APPENDIX A IN SITU TEST RESULTS

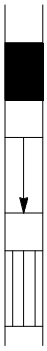
Appendix A.1 Borehole Log Legend

Genoa Port Extension Geotechnical Survey (PFTE)

Client: TECHNITAL S.p.A and Modimar S.r.l	Project Number: GMOP20-G-013	Report Reference: GMOP20-G-013-FAC-01

GEOQUIPMARINE

Samples and Tests



Soil Sample

In Situ PCPT

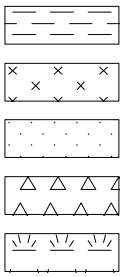
Core Run

Sampling/Testing Method

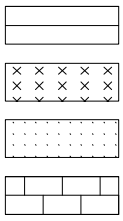
PS/P	Push/piston with Shelby Tube
H	Hammer
CR	Core Run
C	PCPT

All lengths of sample or test represent actual recovery or tested depth range

Legend of Soil Types

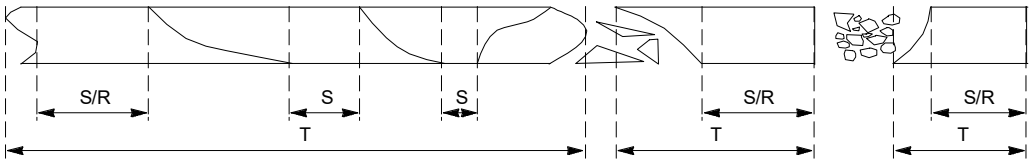


CLAY
SILT
SAND
GRAVEL
PEAT



MUDSTONE
SILTSTONE
SANDSTONE
LIMESTONE / CALCAREOUS / CARBONATE ROCKS

Rock Core Recovery
(based on ASTM Vol 04.08)



Term	*Definition*
TCR	Core Recovered (ΣT) / Length Drilled
SCR	Core Recovered at Full Diam. (ΣS) / Length Drilled
RQD	Core Recovered at Full Diam., >0.1m in length (ΣR) / Length Drilled

Strength	*UCS(MPa)*
Very Weak	< 1.25
Weak	1.25 - 5
Moderately Weak	5 - 12.5
Moderately Strong	12.5 - 50
Strong	50 - 100
Very Strong	100 - 200
Extremely Strong	> 200

Strength of Fine Grained Soils

Strength	*Su(kPa)*
Very Soft	< 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very Stiff	100 - 200
Hard	200 - 400
Very Hard	> 400

Relative Density of Coarse Grained Soils
(based on Lunne and Chrstoffersen, 1983)

Density	*Relative Density (%)*
Very Loose	< 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	> 85

Borehole Log Legend

Appendix A.2 Borehole Logs

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project No.: GMOP20-G-013
Location: Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-1	16/12/2020	1494466mE	4914675mN	54.56m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION | FRACTURE STATE (RQD / SCR / TCR) | CONE PENETROMETER TEST | POINT LOAD STRENGTH INDEX[4] (MPa) | UNDRAINED SHEAR STRENGTH[4] (kPa) | DENSITY[4] (Mg/m[3]) | CLASSIFICATION[4] (%)

CONE PENETROMETER TEST: Net Cone Resistance q_{inet} (MPa); Sleeve Friction f_s (MPa)

POINT LOAD STRENGTH INDEX[4] (MPa): Axial, Diametrel, Irregular Lump

UNDRAINED SHEAR STRENGTH[4] (kPa): Torvane, Pocket Penetrometer, Undrained Triaxial Test, Laboratory Vane, CIU Triaxial, S_u from q_{inet}, For N_k values please see the report

DENSITY[4] (Mg/m[3]): Bulk Density, Dry Density

CLASSIFICATION[4] (%): Water Content, Carbonate Content, Fines Content, Plasticity Index, Relative Density[3]

Depth (m)	Sample	Strata Description
0	P01	00.00m Extremely low strength black (GLEY1 N 2.5/) sandy CLAY with frequent shell fragments and occasional organic matter
1	P02	00.40m Extremely low to very low strength very dark grey (GLEY1 N 3/) becoming dark greenish grey (GLEY1 10Y 4/1) sandy CLAY with occasional shell fragments
2	P03	01.60m - with frequent organic matter (poorly decayed plant and wood)
3	P04	03.00m Very dark greenish grey (GLEY1 10Y 3/1) becoming very dark grey (GLEY1 N 3/) silty fine to medium SAND with rare fibrous organic matter and medium sand-sized shell fragments and shells
4	P05	
5	P06	
6	P07	
7	P08	07.00m to 07.30m - with occasional very closely spaced thin laminations of coarse sand
8	P09	07.30m to 07.55m - medium bed of black (GLEY1 N 2.5/) gravelly sand with rare shells and shell fragments. Gravel is subangular fine to medium
9	PU09A, PU09B, PU10, H10A, H10B, H11	08.50m Dark grey (5Y 4/1) to very dark grey (5Y 3/1) fine to coarse angular clayey GRAVEL of fine to coarse grained sandstone and marlstone with occasional calcite veins, with oxidation staining
10	H11A, H12, H13, H14	
11	CR14A, CR15	10.25m Strong black (5Y 2.5/1) MARLSTONE with occasional veins and pockets (0.5-15.0mm) of calcite, with rare dark yellowish brown (10YR 4/6) areas of surface staining, weathered
12	CR16, CR16A	11.10m to 11.30m - medium bed of strong grey (5Y 6/1) medium grained sandstone with frequent veins of calcite (0.5-15.0mm)
13	CR17	11.30m to 11.40m - thin bed of olive grey (5Y 4/3) gravelly clay. Gravel is subangular fine to coarse
14	CR18	
15	CR19	
16		16.05m to 16.10m - very thin bed of weak very dark grey (5Y 3/1) mudstone
17		End of borehole at 16.20m
18		
19		

[1] : Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-2	18/12/2020	1493639mE	4915594mN	29.76m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

P01 — 00.00m Very dark grey (GLEY 1 N 3/) fine SAND with occasional shell fragments, rare widely spaced thin to medium beds of medium to high strength clay and rare angular fine to medium gravel

P02

P03 — 02.20m - becoming clayey

P04 — 02.60m Very low to low strength very dark greenish grey (GLEY 1 10Y 3/1) sandy SILT with rare angular fine to medium gravel. From 4.45 m - with occasional gravel

P04A

P05

P06 — 04.85m Very low to low strength very dark greenish grey (GLEY 1 10Y 3/1) silty CLAY with rare shell fragments, rare angular fine to coarse gravel

P07

P08 — 07.00m to 07.80m - with rare pockets (2-3mm) of organic matter

P09 — 08.00m to 08.75m - very dark greenish grey (GLEY 1 3/1) silty fine sand with occasional shell fragments

P10

P11 — 09.70m Low to medium strength very dark greenish grey (GLEY 1 10Y 3/1) sandy CLAY with rare shells and shell fragments and rare closely spaced thin laminations and pockets (<10mm) of fibrous organic matter

P12

P13 — 12.80m - with rare gravel

P14 — 13.00m Low to medium strength very dark greenish grey (GLEY 1 10Y 3/1) clayey SILT with rare pockets (2-4mm) of fine sand, rare pockets (<2mm) of organic matter and rare shell fragments

P15

P16

P17

P18

P19

P20 — 19.00m Very dark greenish grey (GLEY 1 10Y 3/1) silty fine SAND with rare shell fragments, rare mica and rare pockets (<10mm) of organic matter

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa): 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa): 0.375 0.750 1.125
Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report"
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4](%)
Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-2	18/12/2020	1493639mE	4915594mN	29.76m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa)
Sleeve Friction f_s (MPa)
10 20 30 40 50 60 70
0.375 0.750 1.125
Pore Pressure Ratio, Bq
-0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane
Pocket Penetrometer
CIU Triaxial Test
CAU Triaxial Test
UU Triaxial Test
Laboratory Vane
DSS
S_u from q_{net}, For N_k values please see the report"
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density
Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4](%)
Water Content
Carbonate Content
Fines Content
Relative Density[3]
Plastic Limit
Liquid Limit
Plasticity Index
20 40 60 80

P21 P22 P23 P24 P25 P26 P27 P28 P29 P29A P30 P31 P32 P33 P34 P35 P36 P37 P38 P39 P40 P41

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

24.00m Very dark greenish grey (GLEY 1 10Y 3/1) fine SAND with rare shells and shell fragments and rare mica

28.00m - black cobble of marlstone

28.10m High to very high strength very dark grey (5Y 3/1) sandy CLAY with frequent extremely closely to very closely spaced thin to thick laminations of black (5Y 2.5/1) medium to coarse sand, frequent shell fragments and rare subrounded fine gravel

31.50m Black (GLEY 1 N 2.5/) medium to coarse SAND with occasional pockets (10-50mm) of very dark greenish grey firm clay, occasional subangular to subrounded fine to medium gravel and rare shells and shell fragments

37.00m to 37.30m - medium bed of olive yellow (5Y 6/6) fine to medium sand with black (GLEY 1 N 2.5/) coarse sand and occasional subangular to subrounded fine gravel

38.10m to 38.80m - very closely to closely spaced thick laminations to very thin beds of very high strength dark grey (5Y 4/1) sandy clay

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-2	18/12/2020	1493639mE	4915594mN	29.76m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa)
Sleeve Friction f_s (MPa)
10 20 30 40 50 60 70
0.375 0.750 1.125
Pore Pressure Ratio, Bq
-0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane
Pocket Penetrometer
CIU Triaxial Test
CAU Triaxial Test
UU Triaxial Test
Laboratory Vane
DSS
S_u from q_{net}, For N_k values please see the report"
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density
Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4](%)
Water Content
Carbonate Content
Fines Content
Relative Density[3]
Plastic Limit
Liquid Limit
Plasticity Index
20 40 60 80

DEPTH (m)	SAMPLE	STRATA DESCRIPTION
	P42	
41		End of borehole at 40.40m
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-3	14/12/2020	1493367mE	4915273mN	42.3m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

P01 — 00.00m Dark grey (GLEY1 N 4/1) silty CLAY with rare gravel. Gravel is angular fine to medium

P02 — 00.50m Dark grey (GLEY1 N 4/1) MADE GROUND (silty fine to medium SAND) with rare gravel, rare pockets of decayed wood, rare textile material (clothes and threads) and rare shell fragments. Gravel is angular fine to coarse

P03 — 01.65m Extremely low to very low strength very dark greenish grey (GLEY1 5GY 3/1) silty CLAY with frequent pockets of decayed wood and organic matter, rare shell fragments

P04

P05

P06 — 05.00m - becoming very low to medium strength

P07

P08 — 07.00m Low to medium strength very dark greenish grey (GLEY1 5GY 3/1) silty CLAY with frequent shell fragments and rare pockets of organic matter

P09

P10 — 09.00m - with frequent pockets of decayed wood, organic matter and rare shell fragments

P11

P12

P13

P14 — 12.90m Greenish black (GLEY1 10Y 2.5/1) silty fine to medium SAND with frequent mica and occasional shell fragments

P15

P16 — 15.00m - with rare shell fragments

P17

P18

P19

P20 — 19.00m - becoming absent of silt

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa): 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa): 0.375 0.750 1.125
Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report"; CAU Triaxial Test; UU Triaxial Test
20.0 40.0 60.0 80.0 100.0

DENSITY[4] (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4](%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-3	14/12/2020	1493367mE	4915273mN	42.3m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

P21
21 — P22
22 — P23, PU23A, PU24, PU24A
23 — H24B, PU25, H25A
24 — CR25B, H26
25 — H27
26 — H28, PU29
27 — H30
28 — H31
29 — H32
30 — H33
31 — H34
32 — H35
33 — H36, H36A
34 — H37
35 — H38
36 — PU39, H39A, PU40
37 — H41, H42
38 — H43, PU44
39 — H45, H46

20.35m to 20.55m - medium bed of black (GLEY1 N 2.5/) very gravelly coarse sand. Gravel is subangular to subrounded fine to medium

20.55m - becoming olive grey (5Y 4/2)

21.70m - with occasional very closely spaced thin laminations of calcite, occasional gravel and rare shells. Gravel is subrounded to subangular medium

22.05m Very dark grey (GLEY1 10Y 3/1), olive (5Y 5/4) and greenish grey (GLEY1 10Y 6/1) angular to rounded fine to coarse GRAVEL with rare sand and rare clay. Sand is medium to coarse

35.50m to 35.70m - medium bed of olive (5Y 5/4) silty clay with rare thick laminations of yellowish red (5YR 5/6) clay

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa): 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa): 0.375 0.750 1.125
Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report"; CAU Triaxial Test; UU Triaxial Test
20.0 40.0 60.0 80.0 100.0

DENSITY[4] (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4](%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-3	14/12/2020	1493367mE	4915273mN	42.3m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH[4] (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report"

DENSITY[4] (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION[4](%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

DEPTH (m)	SAMPLE	STRATA DESCRIPTION
41	PU47, PU47A, PU48, PU49, PU49A, H49B, H50, PU50A	
42		
43		
44		
45	PU51A, PU51	45.00m to 45.15m - thin bed of olive grey (5Y 5/2) sandy clay with occasinal gravel. Gravel is subangular to subrounded fine to medium
46	PU52	End of borehole at 46.15m
47		
48		
49		
50		
51		
52		
53		
54		
55		
56		
57		
58		
59		

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

P01 L1A
00.00m Extremely low strength very dark greenish grey (GLEY 1 5GY 3/1) sandy CLAY with rare fibrous organic matter and decayed wood, and rare shell fragments
00.60m - becoming clay with rare pockets of greenish grey sandy clay

P02 P03 C01
01.75m Extremely low to low strength very dark greenish grey (GLEY 1 5GY 3/1) CLAY with rare pockets of fibrous organic material, rare shell fragments and rare pockets and extremely closely spaced thin laminations of sandy clay
02.70m - without sandy clay and with rare pockets of silt

P04 P05 C02 L1A
04.05m to 05.50m - rare pockets of fiborus organic matter becoming occasional medium spaced thick laminations of fibrous organic material

P06 P07

P08 C03 L1A
06.90m Low strength very dark greenish grey (GLEY 1 10Y 3/1) sandy CLAY with intact shells

P09 P10 P11 C04 P12 P13 S1A
07.90m Medium dense very dark grey (GLEY 1 N 3/) silty fine SAND with rare mica and rare shell fragments
12.50m to 13.40m - with rare pockets of organic matter

P14 C05 P15
14.50m - becoming fine to coarse sand with occasional shell fragments

P16 P17 C06
16.70m Loose to medium dense very dark grey (GLEY 1 N 3/) fine to medium SAND with rare rounded fine gravel

P18 P19 S1A
18.00m - becoming silty fine sand with very closely spaced thick laminations of medium to coarse sand

P20 C07 P21 P21A

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa): 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa): 0.375 0.750 1.125
Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4] (%)
Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE

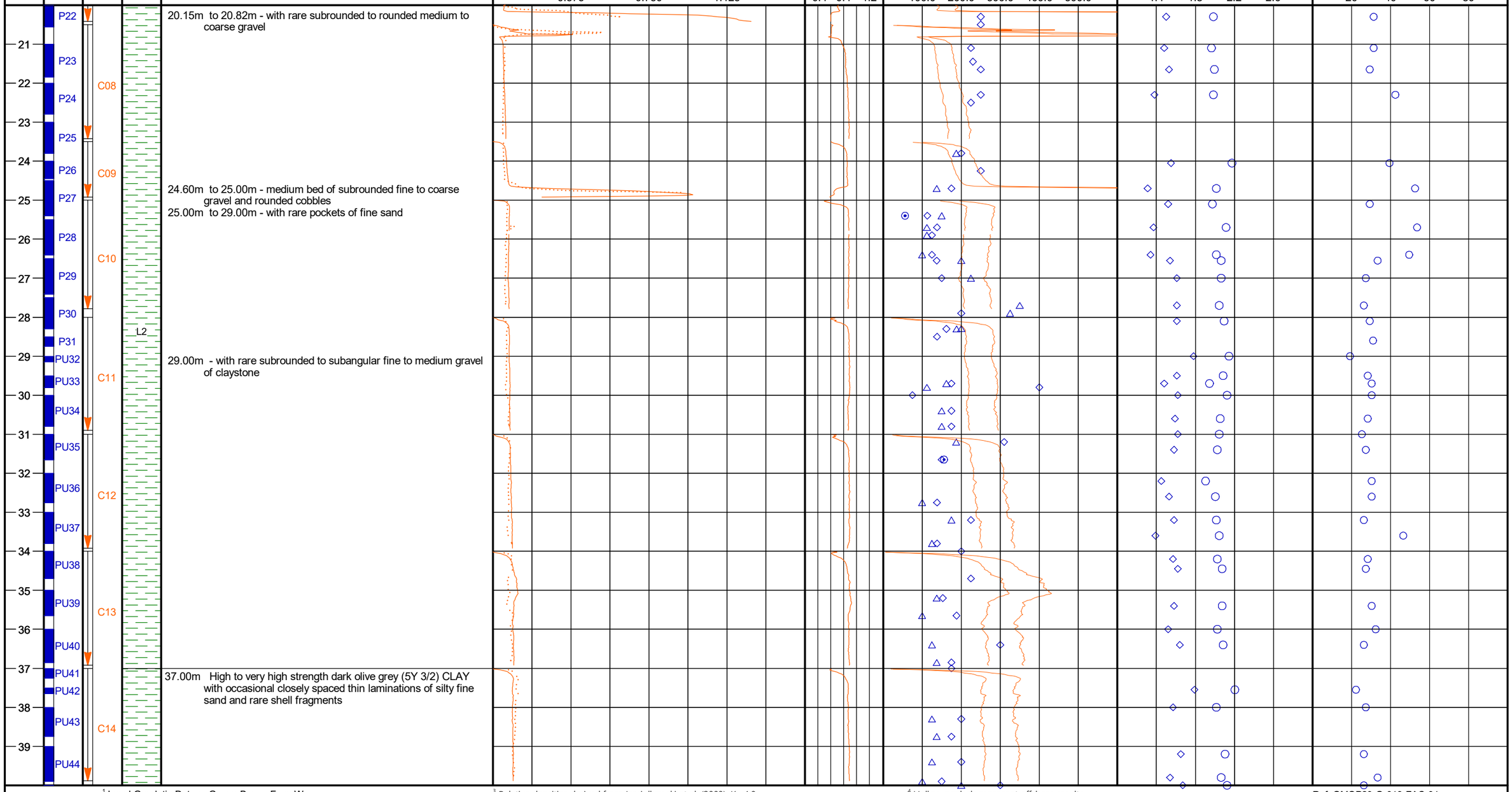
DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH[4] (kPa): Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test

DENSITY[4] (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION[4] (%): Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]



20.15m to 20.82m - with rare subrounded to rounded medium to coarse gravel

24.60m to 25.00m - medium bed of subrounded fine to coarse gravel and rounded cobbles

25.00m to 29.00m - with rare pockets of fine sand

29.00m - with rare subrounded to subangular fine to medium gravel of claystone

37.00m High to very high strength dark olive grey (5Y 3/2) CLAY with occasional closely spaced thin laminations of silty fine sand and rare shell fragments

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST — Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH[4] (kPa) — Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test

DENSITY[4] (Mg/m^3) — Bulk Density; Dry Density

CLASSIFICATION[4] (%) — Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]

Depth (m)	Sample	*In Situ* Test	Legend	Strata Description
41	PU45		L2	
41	PU46			
42		C01		42.40m to 43.70m - with gravel
43				
44	PU47			
45		C03		45.00m Very high to extremely high strength dark olive grey (5Y 3/2) CLAY with rare shell fragments
46	PU48			
47				
48		C04		
49				49.00m - dissipation test
50			A	50.00m to 55.00m - with rare closely to medium spaced thin to thick laminations of shell fragments, organic matter and fine sand
50	PU49			
51	PU50			
52				
53		C05		
54				53.80m to 54.10m - with closely spaced thin beds of clayey sand
54				54.30m Extremely high strength olive grey (5Y 4/2) CLAY with rare shell fragments and rare mica
55	PU51			
56	PU52			56.00m - without mica
57		C06		57.00m to 57.50m - with gravel
58				
59		C07	A	

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

61 — PU53
62 — PU54
63 — C08
64 — C09
65 — PU55
66 — PU56
67 —
68 —
69 — C10
70 —
71 — PU57
72 — PU58
73 —
74 — C11
75 —
76 — PU59
77 — PU60
78 —
79 — C12

62.90m to 63.20m - with gravel

64.00m Extremely high strength olive grey (5Y 4/2) CLAY with rare shell fragments and rare pockets of yellowish red silt

65.00m - dissipation test

71.50m - rare pockets of yellowish red silt becoming rare pockets of silty fine sand

A

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa): 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa): 0.375 0.750 1.125
Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4] (%)
Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W
[2] Water Depth: LAT
[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0
[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa) 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa) 0.375 0.750 1.125
Pore Pressure Ratio, Bq -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4] (%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

End of borehole at 80.36m

81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-5	30/12/2020	1491958mE	4915903mN	25.87m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION | FRACTURE STATE (RQD / SCR / TCR; 25 50 75) | CONE PENETROMETER TEST (Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); 10 20 30 40 50 60 70; 0.375 0.750 1.125; 0.0 0.5 1.0) | POINT LOAD STRENGTH INDEX[4] (MPa) (Axial, Diametrel, Irregular Lump; 5 10) | UNDRAINED SHEAR STRENGTH[4] (kPa) (Torvane, Pocket Penetrometer, Undrained Triaxial Test, Laboratory Vane, CIU Triaxial, S_u from q_{net}, For N_k values please see the report; 20.0 40.0 60.0 80.0 100.0) | DENSITY[4] (Mg/m[3]) (Bulk Density, Dry Density; 1.5 2.0 2.5) | CLASSIFICATION[4] (%) (Water Content, Carbonate Content, Fines Content, Plasticity Index, Relative Density[3]; 25 50 75)

Depth (m)	Sample	Strata description
0	P01	00.00m Very dark grey (GLEY 1 N 3/) fine SAND with rare shell fragments and rare fibrous organic material
1	P02	01.00m - with rare subangular to subrounded fine to medium gravel and rare fibrous organic matter
2	P03	02.00m Very dark grey (GLEY 1 N 3/) silty fine SAND with rare shells and shell fragments and rare mica
3	P04	
4	P05	04.00m to 05.00m - with rare fibrous organic matter
5	P06	
6	P07	
7	P08	
8	P09	08.00m - becoming very dark greenish grey (GLEY 1 5GY 3/1) 08.00m to 08.55m - fine to medium
9	P10	
10	P11	
11	P12	
12	P13	12.00m Very dark grey (GLEY 1 N 3/) clayey fine to medium SAND with rare shells and shell fragments, rare pockets of fibrous organic matter and wood fragments, and rare mica
13	P14	13.00m Dark grey (GLEY 1 N 4/1) silty coarse SAND with occasional subrounded fine gravel, occasional shell fragments and rare fibrous organic matter
14	P15	
15	P16	
15	P17	15.00m Very weak to weak dark grey (GLEY 1 N 4/) fissured weathered CLAYSTONE with occasional closely to medium spaced thin to medium beds of strong black marlstone, occasional calcite pockets and occasional closely spaced thin laminations of clay. RMR=15; GSI=25 ; FI=7-10
16	PU18 CR19	
17	PU20 PU21 PU21A H21B CR21C	
18	CR22 PU23	
19	PU24 PU25 CR26	

[1] : Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-5	30/12/2020	1491958mE	4915903mN	25.87m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION | FRACTURE STATE (RQD / SCR / TCR; 25 50 75) | CONE PENETROMETER TEST (Net Cone Resistance q_{inet} (MPa); Sleeve Friction f_s (MPa); 10 20 30 40 50 60 70; 0.375 0.750 1.125; 0.0 0.5 1.0) | POINT LOAD STRENGTH INDEX[4] (MPa) (Axial, Diametrel, Irregular Lump; 5 10) | UNDRAINED SHEAR STRENGTH[4] (kPa) (Torvane, Pocket Penetrometer, Undrained Triaxial Test, Laboratory Vane, CIU Triaxial, S_u from q_{inet}, For N_k values please see the report; 20.0 40.0 60.0 80.0 100.0) | DENSITY[4] (Mg/m[3]) (Bulk Density, Dry Density; 1.5 2.0 2.5) | CLASSIFICATION[4] (%) (Water Content, Carbonate Content, Fines Content, Plasticity Index, Relative Density[3]; 25 50 75)

CR27
CR28
CR29
CR30
CR31
CR32

End of borehole at 22.95m

[1] : Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l	Borehole No.: CC-6	Date Commenced: 25/12/2020	Coordinates[1]: 1491090mE 4916168mN	Water Depth[2]: 28.86m
Project Name:	Genoa Port (PFTE)				
Project No.:	GMOP20-G-013				
Location:	Genoa Port				

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST — Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH (kPa) — Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report

DENSITY (Mg/m^3) — Bulk Density; Dry Density

CLASSIFICATION (%) — Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

Depth (m)	Sample	In Situ Test	Legend	Strata Description
0.00	P01		L1B	00.00m Low to medium strength very dark grey (GLEY 1 N 3/) sandy CLAY with rare shell fragments and rare organic material. Sand is fine
1	P02			
2				
3		C01	S1A	02.80m Very loose to loose silty SAND
4			Ch1	03.90m Medium to high strength sandy SILT with occasional closely spaced thin beds of silty sand
5				
6				05.65m to 06.10m - becoming low to medium strength
7		C02	S1A	06.20m Loose very dark grey (GLEY 1 N 3/) silty fine SAND with rare shell fragments 07.00m - dissipation test
8	P03			
9	P04		Ch1	08.80m Low to medium strength very dark grey (GLEY 1 N 3/) sandy SILT with rare shells and shell fragments. Sand is fine
10				10.45m - becoming medium to high strength
11		C03		11.10m Loose to medium dense very dark grey (GLEY 1 N 3/) silty fine SAND with rare shell fragments and rare mica
12				
13				
14		C04		
15				15.00m - dissipation test
16	P05			
17	P06		S1A	
18				
19		C05		19.00m - dissipation test

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report

DENSITY (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION (%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

Depth (m)	Sample	*In Situ* Test	Legend	Strata Description
21				
22		C06		22.00m - dissipation test
23				
24	P07, P07A		S1A	23.40m Dense to very dense dark grey (GLEY 1 N 4/) gravelly medium to coarse SAND. Gravel is subangular to rounded fine to coarse
25	P08, P09			24.50m - becoming clayey 24.60m Very high to extremely high strength greenish grey (GLEY 1 10Y 5/1) CLAY with rare dark grey fine sand and rare shell fragments
26				
27		C07		
28				
29				
30		C08		
31				30.70m to 33.00m - with rare pockets of dark grey silty fine sand
32	P10		L2	
33	P11			
34				
35		C09		
36				
37				
38		C10		
39				
	P12			

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

41 — P13

40.50m Extremely high strength greenish grey (GLEY 1 10Y 5/1) CLAY with rare pockets of shell fragments

42 —

42.50m to 42.60m - thin bed of gravel

43 — C11

44 —

45 —

44.80m Extremely high strength greenish grey (GLEY 1 5G_/1 6/1) CLAY with rare fine sand, rare pockets of black fine sand and rare shell fragments

46 — C12

47 —

P14

48 — End of borehole at 47.90m

49 —

50 —

51 —

52 —

53 —

54 —

55 —

56 —

57 —

58 —

59 —

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa)
Sleeve Friction f_s (MPa)
10 20 30 40 50 60 70
0.375 0.750 1.125
Pore Pressure Ratio, Bq
-0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)
Torvane
Pocket Penetrometer
CIU Triaxial Test
CAU Triaxial Test
UU Triaxial Test
Laboratory Vane
DSS
S_u from q_{net}, For N_k values please see the report
100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3)
Bulk Density
Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION (%)
Water Content
Carbonate Content
Fines Content
Relative Density[3]
Plastic Limit
Liquid Limit
Plasticity Index
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report

DENSITY (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION (%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

Depth (m)	Sample	Legend	Strata Description
0	P01	L1A	00.00m Extremely low strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shells and shell fragments
1	P02	L1A	00.75m Extremely low strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shells and shell fragments and rare pockets of fibrous organic material
2	P03	L1A	
3	P04	L1A	
4	P05	L1A	04.00m - becoming medium strength sandy with rare coral fragments
5	P06	S1A	04.45m Dark greenish grey (GLEY 1 4/1) silty fine SAND with occasional shells and shell fragments, rare pockets of fibrous organic matter and wood fragments
6	P07	S1A	
7	P08	S1A	
7	P08A	G	07.00m Light grey (GLEY 1 N 7/), dark greenish grey (GLEY 1 10Y 4/1) and dark grey (2.5Y 4/1) sandy silty subrounded fine to coarse GRAVEL with rare shell fragments. Sand is fine
8	PU08B	G	
8	PU09	G	
8	PU10	G	
8	PU11	G	
9	PU12	L2	09.00m Medium to high strength olive grey (5Y 5/2) CLAY with rare shell fragments
9	PU13	L2	
10	P14	L2	10.10m to 10.20m - thin bed of white subrounded coarse gravel
11	P15	L2	11.00m High to very high strength olive grey (5Y 4/2) CLAY with rare shell fragments
12	P16	L2	
13	P17	L2	
14	P18	L2	
15	P19	L2	
16	P20	L2	
17	P21	L2	
18	P22	L2	18.70m - with rare pockets of fine sand
19	P23	L2	19.00m to 20.00m - with rare pockets of shell fragments and organic matter

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report

DENSITY (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION (%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

Depth (m)	Sample	Legend	Strata Description
21	P24		
	P25		
22	P26		
23	P27		
24	P28		24.00m Very high strength greenish grey (GLEY 1 5GY 5/1) CLAY with occasional extremely closely spaced thin laminations of silt and rare shell fragments
25	P29		25.00m - without silt
26	P30	L2	
27	P31		
28	P32		28.00m Very high strength greenish grey (GLEY 1 5GY 5/1) CLAY with rare pockets of organic matter, rare extremely closely spaced thin laminations of silt
29	P33	L2	29.00m - without silt
30	P34	A	29.60m Interbedded very high to extremely high strength dark greenish grey (GLEY 1 10Y 4/1) sandy CLAY with occasional closely spaced thin to thick laminations of dark grey fine sand and dark greenish grey (GLEY 1 10Y 4/1) clayey SAND with frequent extremely closely to very closely spaced thin laminations of clay
31	P35		
32	P36	A	32.00m Extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with occasional closely spaced thin laminations and pockets of fine sand, and occasional pockets of organic matter
33	P37		33.00m Very high to extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shell fragments
34	P38		
35	P39	A	
36	P40		
37	P41		37.00m - with rare pockets of organic matter
38	P42		
	P42A		
	P43	A	38.20m Medium to high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with occasional subrounded fine gravel and rare pockets of shell fragments
39	P44		

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

39.70m Very high to extremely high strength CLAY

40.80m - dissipation test

41.70m - dissipation test

End of borehole at 42.38m

C01

A

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa) 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa) 0.375 0.750 1.125
Pore Pressure Ratio, Bq -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test
100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION (%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-1	17/12/2020	1494401mE	4915166mN	36.46m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION | FRACTURE STATE (RQD / SCR / TCR) | CONE PENETROMETER TEST (Net Cone Resistance q_{inet} (MPa); Sleeve Friction f_s (MPa)) | POINT LOAD STRENGTH INDEX[4] (MPa) | UNDRAINED SHEAR STRENGTH[4] (kPa) | DENSITY[4] (Mg/m^3) | CLASSIFICATION[4] (%)

00.00m Low strength sandy CLAY

01.10m Extremely low strength CLAY with occasional closely to medium spaced very thin to thin beds of clayey sand

03.95m to 05.75m - very low to low strength

05.50m - dissipation test

05.75m Interbedded very low to low strength CLAY and clayey SAND

08.70m - dissipation test

09.70m Very loose to loose silty SAND with very thin beds of clay

11.05m Loose SAND

17.20m Medium strong to strong black (5Y 2.5/1) and brown (7.5YR 4/6) weathered fine grained MARLSTONE with occasional thin laminations and pockets of calcite. RMR=12-13, GIS=20-35, FI=2-6

[1] : Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-1	17/12/2020	1494401mE	4915166mN	36.46m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION | FRACTURE STATE (RQD / SCR / TCR) | CONE PENETROMETER TEST (Net Cone Resistance q_{inet} (MPa); Sleeve Friction f_s (MPa)) | POINT LOAD STRENGTH INDEX[4] (MPa) | UNDRAINED SHEAR STRENGTH[4] (kPa) | DENSITY[4] (Mg/m^3) | CLASSIFICATION[4] (%)

21 — CR10
22 — CR11
23 — CR12
24 — CR13
25 — CR14
26
27
28
29
30
31
32
33
34
35
36
37
38
39

21.30m to 21.50m - medium bed of (10YR 5/3) thinly laminated clay

24.00m to 24.20m - medium bed of dark grey (2.5Y 4/1) clay with occasional gravel of marlstone. Gravel is angular fine to coarse

End of borehole at 25.00m

[1] : Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

00.00m Extremely low strength CLAY with rare medium spaced thin beds of silty sand — C01 — L1A

03.20m Extremely low to very low strength CLAY — C02 — L1A

07.15m Medium dense SAND — C03

C04

10.50m - dissipation test — S1A

C05

C06

15.75m to 15.95m - thin bed of clay

15.90m Very dense SAND

C07 — S1B

C08

19.20m - becoming silty

19.60m High to very high strength CLAY

CONE PENETROMETER TEST

Net Cone Resistance q_{net} (MPa): 10 20 30 40 50 60 70

Sleeve Friction f_s (MPa): 0.375 0.750 1.125

Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)

Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test

50.0 100.0 150.0 200.0 250.0

DENSITY (Mg/m^3)

Bulk Density; Dry Density

1.4 1.8 2.2 2.6

CLASSIFICATION (%)

Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]

20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa)
Sleeve Friction f_s (MPa)
10 20 30 40 50 60 70
0.375 0.750 1.125
Pore Pressure Ratio, Bq
-0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)
Torvane
Pocket Penetrometer
CIU Triaxial Test
CAU Triaxial Test
UU Triaxial Test
Laboratory Vane
DSS
S_u from q_{net}, For N_k values please see the report
50.0 100.0 150.0 200.0 250.0

DENSITY (Mg/m^3)
Bulk Density
Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION (%)
Water Content
Carbonate Content
Fines Content
Relative Density[3]
Plastic Limit
Liquid Limit
Plasticity Index
20 40 60 80

Depth (m)	*IN SITU* TEST	LEGEND	STRATA DESCRIPTION
21	C09	L2	
22			
23	C10		
24			
25			
26	C11		
27			
28			
29	C12		28.90m to 29.00m - thin bed of sand
30			
31			
32	C13		31.80m to 31.95m - thin bed of sand
33			
34			
35	C14		
36			
37			
38	C15		
39			

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project No.: GMOP20-G-013
Location: Genoa Port

Borehole No.: PCPT-2
Date Commenced: 12/12/2020
Coordinates[1]: 1493464mE 4914953mN
Water Depth[2]: 52.66m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST
Net Cone Resistance q_{inet} (MPa)
Sleeve Friction f_s (MPa)
10 20 30 40 50 60 70
0.375 0.750 1.125
Pore Pressure Ratio, Bq
-0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)
Torvane
Pocket Penetrometer
CIU Triaxial Test
CAU Triaxial Test
UU Triaxial Test
Laboratory Vane
DSS
S_u from q_{net}, For N_k values please see the report
50.0 100.0 150.0 200.0 250.0

DENSITY (Mg/m^3)
Bulk Density
Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION (%)
Water Content
Carbonate Content
Fines Content
Relative Density[3]
Plastic Limit
Liquid Limit
Plasticity Index
20 40 60 80

41 C16

End of borehole at 41.86m

42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

[1] Local Geodetic Datum: Gauss-Boaga Fuso W
[2] Water Depth: LAT
[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0
[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-3	13/12/2020	1493382mE	4915273mN	42.01m

GEOQUIPMARINE

DEPTH (m)	SAMPLE	*IN SITU* TEST	LEGEND	STRATA DESCRIPTION
0			L1A	00.00m Extremely low strength CLAY
			S1A	00.50m Loose gravelly SAND
1		C01		01.15m to 01.30m - thin bed of clay
				01.60m Extremely low to very low strength CLAY with rare medium spaced thin beds of clayey sand
2				
3				
4		C02		04.00m - dissipation test
5				
6				
7		C03	L1A	07.00m - becoming low strength
8				
9				
10		C04		
11				
12				
13		C05		
			S1A	13.30m Medium dense SAND
14				
15				
16		C06		
17				
18				
19		C07		

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa) 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa) 0.375 0.750 1.125
Pore Pressure Ratio, Bq -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test
20.0 40.0 60.0 80.0 100.0

DENSITY (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION (%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-3	13/12/2020	1493382mE	4915273mN	42.01m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report

DENSITY (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION (%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

Depth (m)	SAMPLE	*IN SITU* TEST	LEGEND	STRATA DESCRIPTION
21		C08		20.00m - becoming dense 20.20m to 20.50m - gravelly
22				22.05m Very dense SAND
23		C09		
24		C10		
25		C11		
26				
27		C12		
28			S1B	
29		C13		
30		C14		
31		C15		
32		C16		
33		C17		
34		C18		
35				End of borehole at 34.30m
36				
37				
38				
39				

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{inet} (MPa) 10 20 30 40 50 60 70; Sleeve Friction f_s (MPa) 0.375 0.750 1.125; Pore Pressure Ratio, Bq -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test — 100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3): Bulk Density; Dry Density — 1.4 1.8 2.2 2.6

CLASSIFICATION (%): Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3] — 20 40 60 80

Depth (m)	Sample	In Situ Test	Legend	Strata Description
0			S1A	00.00m Medium dense SAND 00.40m to 00.65m - medium bed of clay
1		C01	L1A	01.00m Very low to low strength CLAY with rare closely to medium spaced very thin to thin beds of sandy clay
4		C02		04.00m Low to medium strength CLAY with occasional medium spaced thin to medium beds of sandy clay
10		C04	L1B	10.00m - dissipation test
15		C06		15.00m Low to medium strength CLAY
18.5		C07		18.50m - becoming sandy
19			S1A	19.00m Loose to medium dense SAND

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

21 C08
22
23
24 S1A
25 C09
26
27
28 C10
29
30
31 C11
32
33
34 C12
35
36 C13
37 H01
38
39 C15

L2
L2

21.90m to 22.05m - thin bed of clay

28.50m Very high strength CLAY

29.00m to 29.30m - medium bed of sand

33.00m Very high to extremely high strength greenish grey (GLEY1 10Y 5/1) silty CLAY with rare pockets of dark grey staining

34.70m to 34.80m - thin bed of sand

35.80m to 36.00m - medium bed of sand

CONE PENETROMETER TEST

Net Cone Resistance q_{inet} (MPa)
Sleeve Friction f_s (MPa)
10 20 30 40 50 60 70
0.375 0.750 1.125

Pore Pressure Ratio, Bq
-0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)

- Torvane
- Pocket Penetrometer
- CIU Triaxial Test
- CAU Triaxial Test
- UU Triaxial Test
- Laboratory Vane
- DSS
- S_u from q_{net}, For N_k values please see the report

100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3)

- Bulk Density
- Dry Density

1.4 1.8 2.2 2.6

CLASSIFICATION (%)

- Water Content
- Carbonate Content
- Fines Content
- Relative Density[3]
- Plastic Limit
- Liquid Limit
- Plasticity Index

20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); 10 20 30 40 50 60 70; 0.375 0.750 1.125; Pore Pressure Ratio, Bq; -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test; 100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3): Bulk Density; Dry Density; 1.4 1.8 2.2 2.6

CLASSIFICATION (%): Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]; 20 40 60 80

DEPTH (m)	SAMPLE	*IN SITU* TEST	LEGEND	STRATA DESCRIPTION
41		C16	L2	40.30m Extremely high strength CLAY
42				
43				End of borehole at 42.32m
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH[4] (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS

DENSITY[4] (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION[4] (%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

00.00m Extremely low to very low strength CLAY with rare closely to medium spaced thin to medium beds of sandy clay

05.05m - becoming sandy

05.25m Loose to medium dense SAND

08.38m - dissipation test

08.35m Very low to low strength CLAY

09.15m Medium dense SAND

09.95m to 10.20m - with gravel

10.40m High to very high strength CLAY

12.00m Very high strength CLAY

17.30m - dissipation test

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

21.00m Very high strength CLAY with rare medium spaced thin beds of sandy clay

23.05m Very high strength CLAY

27.15m Very high to extremely high strength CLAY

30.00m Extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY

39.50m to 40.50m - with rare subrounded coarse gravel

C08 C09 C10 C11 C12 C13 C14

PU01 PU01A PU01B PU02

L2 A

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa)
Sleeve Friction f_s (MPa)
10 20 30 40 50 60 70
0.375 0.750 1.125
Pore Pressure Ratio, Bq
-0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane
Laboratory Vane
Pocket Penetrometer
DSS
CIU Triaxial Test
CAU Triaxial Test
UU Triaxial Test
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density
Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4] (%)
Water Content
Plastic Limit
Carbonate Content
Liquid Limit
Fines Content
Plasticity Index
Relative Density[3]
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH[4] (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS

DENSITY[4] (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION[4] (%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

40.50m Very high strength to extremely high strength CLAY

43.50m Extremely high strength dark greenish grey (GLEY 1 10Y 4/1) CLAY with rare shell fragments and rare pockets of black silt

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); 10 20 30 40 50 60 70; 0.375 0.750 1.125; Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa): Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; 100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3): Bulk Density; Dry Density; 1.4 1.8 2.2 2.6

CLASSIFICATION[4] (%): Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]; 20 40 60 80

61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79

C06 C07 C08 C09 C10 C11

P03 P04

A

63.00m Extremely high strength dark greenish grey (GLEY 1 10Y4/1) CLAY with rare shell fragments and rare pockets of black silt

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

81 m: 80.10m to 80.40m - medium bed of sand

End of borehole at 81.28m

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa) 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa) 0.375 0.750 1.125
Pore Pressure Ratio, Bq -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH[4] (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test
100.0 200.0 300.0 400.0 500.0

DENSITY[4] (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION[4] (%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-7	19/12/2020	1491770mE	4915317mN	52.56m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

00.00m Very low strength CLAY with occasional closely to medium spaced thin beds of sandy clay

02.60m - becoming sandy

02.70m Medium dense SAND

03.80m - becoming very dense and gravelly

04.40m Medium dense GRAVEL

05.40m Very dense light grey (GLEY1 N 7/) to dark grey (GLEY1 N 3/) clayey angular fine to coarse GRAVEL with subangular cobbles

09.30m Weak to medium strong grey (GLEY1 N 6/) to greenish grey (GLEY1 5GY 5/1) fine grained MARLSTONE. Discontinuities 50 to 80 deg, very closely to medium spaced, planar to stepped, infilled with clay, rarely stained dark greenish grey. RMR=51, GSI=60, FI=3

10.40m Extremely weak thinly laminated weathered fine grained grey (GLEY1 N 5/) to dark grey (GLEY 1 N4/) MUDSTONE. RMR=N/A, GSI=10, FI=N/A

End of borehole at 10.85m

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH[4] (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report"

DENSITY[4] (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION[4](%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8	23/12/2020	1493948mE	4914839mN	54.26m

GEOQUIPMARINE

DEPTH (m)	SAMPLE	*IN SITU* TEST	LEGEND	STRATA DESCRIPTION
0				
1	P01		L1A	00.00m Extremely low strength very dark greenish grey (GLEY 1 10Y 3/1) CLAY with occasional angular fine to coarse gravel and rare pockets of fibrous organic matter
	P02			01.00m Extremely to very low strength greenish grey (GLEY 1 10GY 6/1) CLAY with occasional pockets of fibrous organic matter and rare shell fragments
2				
3		C01	L1A	03.50m - becoming low to medium strength and sandy
4				End of borehole at 04.30m
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				

CONE PENETROMETER TEST
Net Cone Resistance q_{net} (MPa): 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa): 0.375 0.750 1.125
Pore Pressure Ratio, Bq: -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test
20.0 40.0 60.0 80.0 100.0

DENSITY (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION (%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

00.00m Extremely low to very low strength very dark greenish grey (GLEY 1 10Y 3/1) CLAY with occasional angular fine to medium gravel and rare pockets of fibrous organic matter and wood fragments

01.00m to 02.00m - with rare fine sand

02.00m - becoming greenish grey (GLEY 1 10GY 4/1)

05.50m - becoming low to medium strength and sandy

06.20m Loose dark grey (GLEY 1 N 4/) silty fine SAND with rare shell fragments and rare mica

09.50m Loose to medium dense SAND with rare medium spaced thin to medium beds of sandy clay

14.00m High to very high strength dark grey (GLEY 1 N 4/) CLAY with occasional pockets of fine to coarse sand and rare shell fragments

16.50m High strength dark grey (GLEY 1 N 4/) CLAY with rare shell fragments

19.50m Very high strength gravelly CLAY

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa) 10 20 30 40 50 60 70; Sleeve Friction f_s (MPa) 0.375 0.750 1.125; Pore Pressure Ratio, Bq -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test. 100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3): Bulk Density; Dry Density. 1.4 1.8 2.2 2.6

CLASSIFICATION (%): Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]. 20 40 60 80

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); 10 20 30 40 50 60 70; 0.375 0.750 1.125; Pore Pressure Ratio, Bq; -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test; 100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3): Bulk Density; Dry Density; 1.4 1.8 2.2 2.6

CLASSIFICATION (%): Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]; 20 40 60 80

Depth (m)	Sample	In Situ Test	Legend	Strata Description
21			L2	
				20.95m High to very high strength dark grey (GLEY 1 N 4/) CLAY with rare shell fragments, rare rounded fine gravel and rare pockets and widely spaced thin laminations and beds of silty sand
22		C07		
23				
24	P08			
25	P09		L2	
26				
27		C08		26.90m - dissipation test
28				27.70m - with occasional closely spaced thin beds of sand
29				
30		C09		29.10m Dense dark greyish brown (2.5Y 4/2) to light olive brown (2.5Y 5/3) clayey gravelly fine to coarse SAND. Gravel is grey to black subangular to rounded fine to coarse
31			S1B	
32	P10 PU10A H11A PU11 PU12 H12A			
33	PU12B PU13 PU14			
34		C10 C11		33.00m Very dense black (GLEY 1 N 2.5/) to greyish brown (2.5Y 4/2) angular to subrounded fine to coarse GRAVEL of marlstone with rare thin laminations of calcite and rare light brown clay
35		C12 C13	FG	
36		C14 C15		
37				37.00m Dense to very dense very dark greyish brown (2.5Y 3/2) fine to coarse SAND with rare pockets of light brown clay and rare subrounded fine to medium gravel
38		C16		37.20m to 37.30m - thin bed of clay
39		C17	S1B	

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST: Net Cone Resistance q_{net} (MPa); Sleeve Friction f_s (MPa); Pore Pressure Ratio, Bq

UNDRAINED SHEAR STRENGTH (kPa): Torvane; Pocket Penetrometer; CIU Triaxial Test; CAU Triaxial Test; UU Triaxial Test; Laboratory Vane; DSS; S_u from q_{net}, For N_k values please see the report

DENSITY (Mg/m^3): Bulk Density; Dry Density

CLASSIFICATION (%): Water Content; Carbonate Content; Fines Content; Relative Density[3]; Plastic Limit; Liquid Limit; Plasticity Index

PU15
PU16
PU16A
PU16B
PU17
C18
C19
C20
C21
C22
PU18
FG
PU19
C23
C24

42.00m Dense to very dense black (2.5Y 2.5/1) subrounded coarse GRAVEL of marlstone with occasional cobbles and occasional pockets of calcite

55.00m to 57.50m - with occasional widely spaced medium beds of dark grey to light olive grey clay

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

[4] Hollow symbols represent offshore results

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE

DEPTH (m) | SAMPLE | *IN SITU* TEST | LEGEND | STRATA DESCRIPTION

CONE PENETROMETER TEST
Net Cone Resistance q_{inet} (MPa) 10 20 30 40 50 60 70
Sleeve Friction f_s (MPa) 0.375 0.750 1.125
Pore Pressure Ratio, Bq -0.4 0.4 1.2

UNDRAINED SHEAR STRENGTH (kPa)
Torvane; Laboratory Vane; Pocket Penetrometer; DSS; CIU Triaxial Test; S_u from q_{net}, For N_k values please see the report; CAU Triaxial Test; UU Triaxial Test
100.0 200.0 300.0 400.0 500.0

DENSITY (Mg/m^3)
Bulk Density; Dry Density
1.4 1.8 2.2 2.6

CLASSIFICATION (%)
Water Content; Plastic Limit; Carbonate Content; Liquid Limit; Fines Content; Plasticity Index; Relative Density[3]
20 40 60 80

DEPTH (m)	SAMPLE	STRATA DESCRIPTION
61		
62	H20	
63		
64		
65	H21	
66		End of borehole at 65.05m
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

[3] Relative densities derived from Jamiolkowski et al. (2003), K_0=1.0

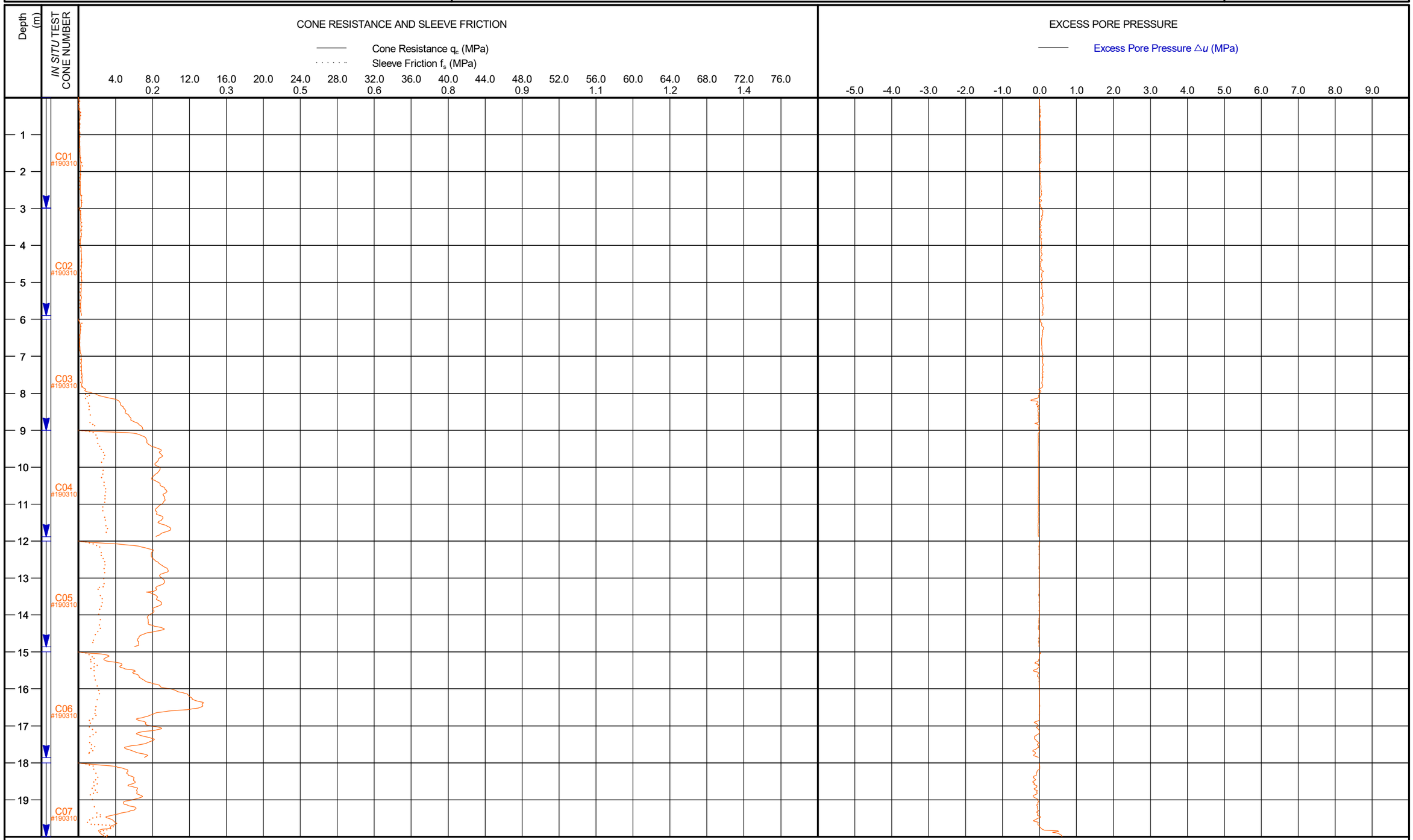
[4] Hollow symbols represent offshore results

Appendix A.3 Raw In Situ Test Results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

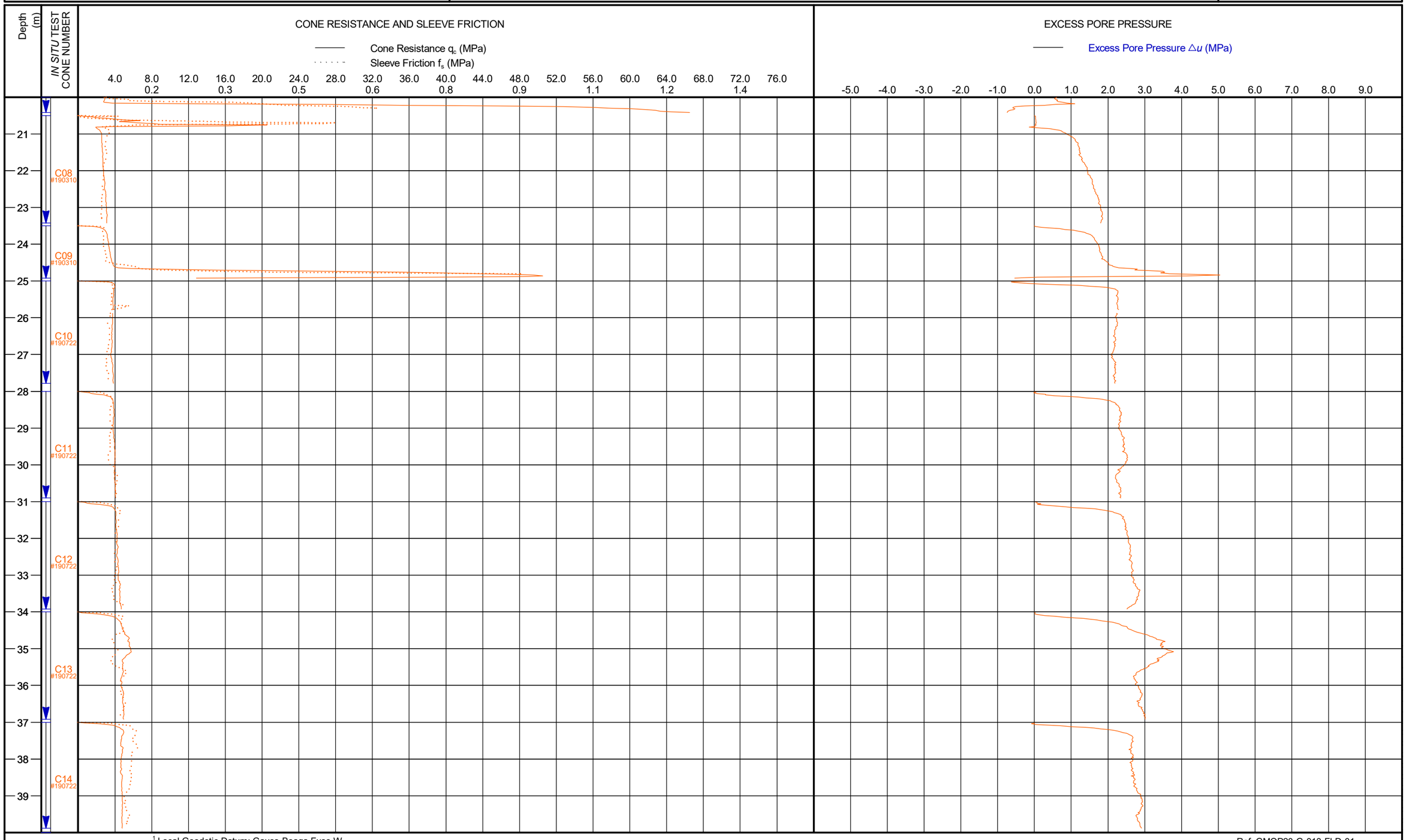
RAW PCPT RESULTS

Ref: GMOP20-G-013-FLD-01

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

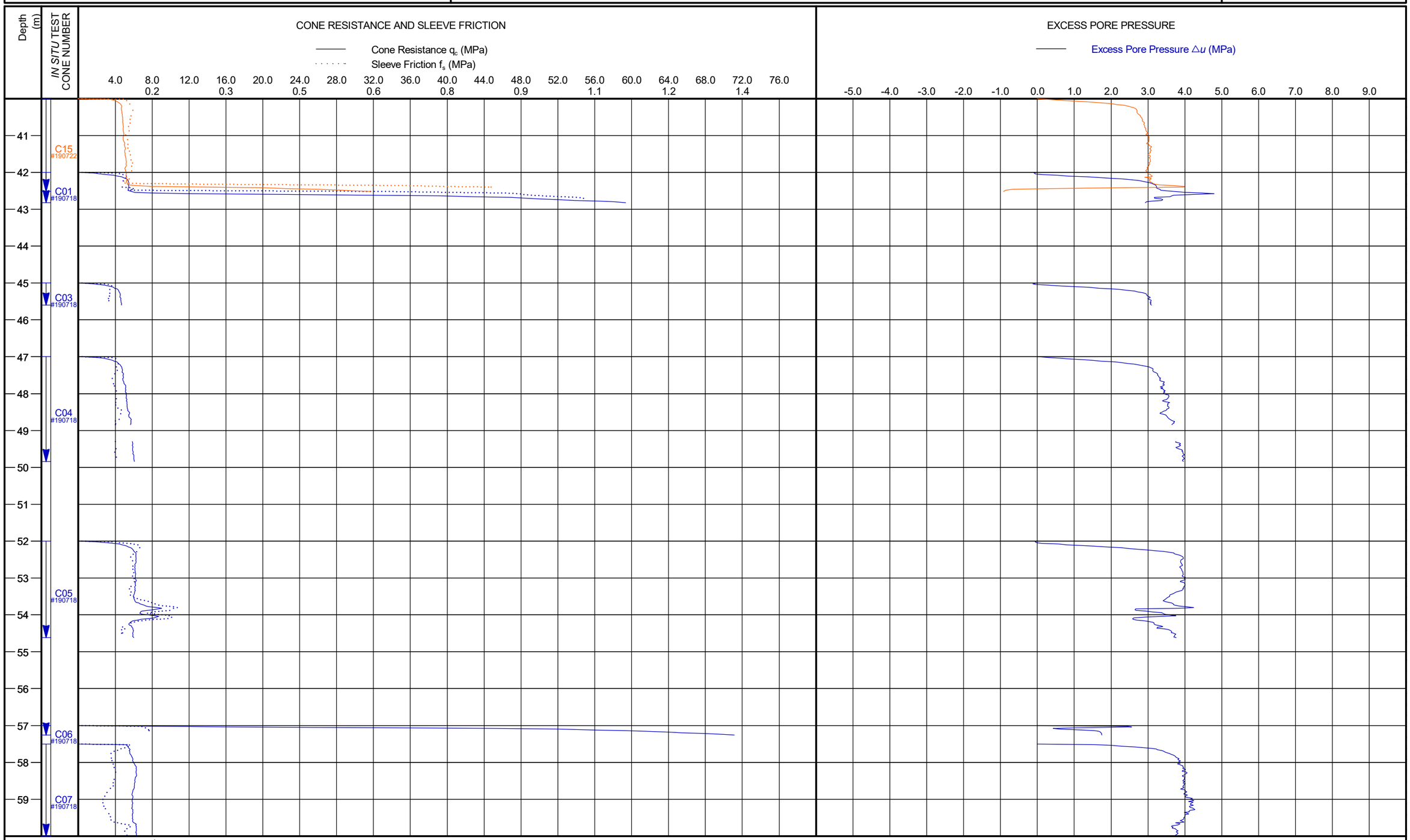
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

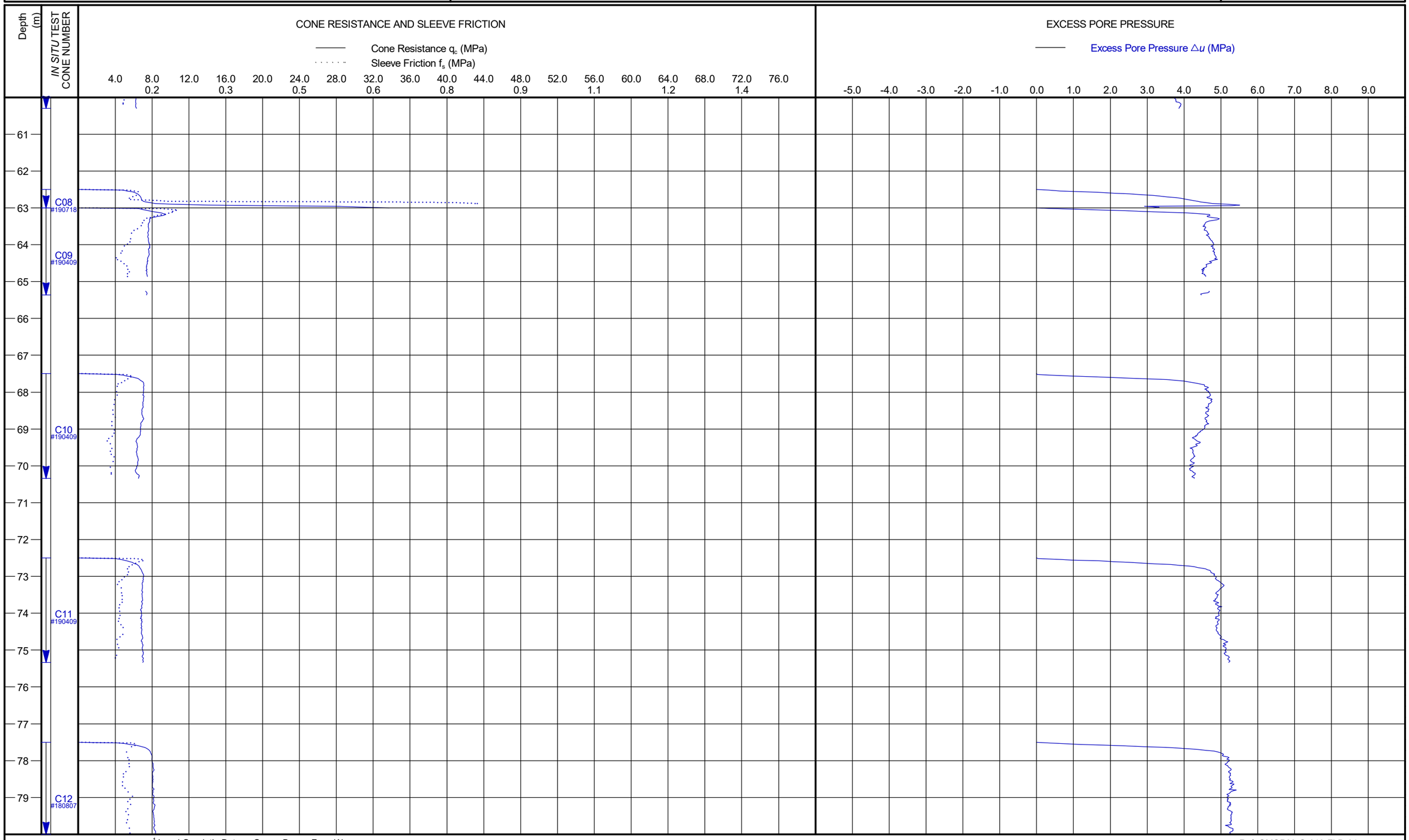
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m

GEOQUIPMARINE

Depth (m)

IN SITU TEST CONE NUMBER

CONE RESISTANCE AND SLEEVE FRICTION

Cone Resistance q_c (MPa)

Sleeve Friction f_s (MPa)

4.0 8.0 12.0 16.0 20.0 24.0 28.0 32.0 36.0 40.0 44.0 48.0 52.0 56.0 60.0 64.0 68.0 72.0 76.0

0.2 0.3 0.5 0.6 0.8 0.9 1.1 1.2 1.4

EXCESS PORE PRESSURE

Excess Pore Pressure $\triangle u$ (MPa)

-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0

81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

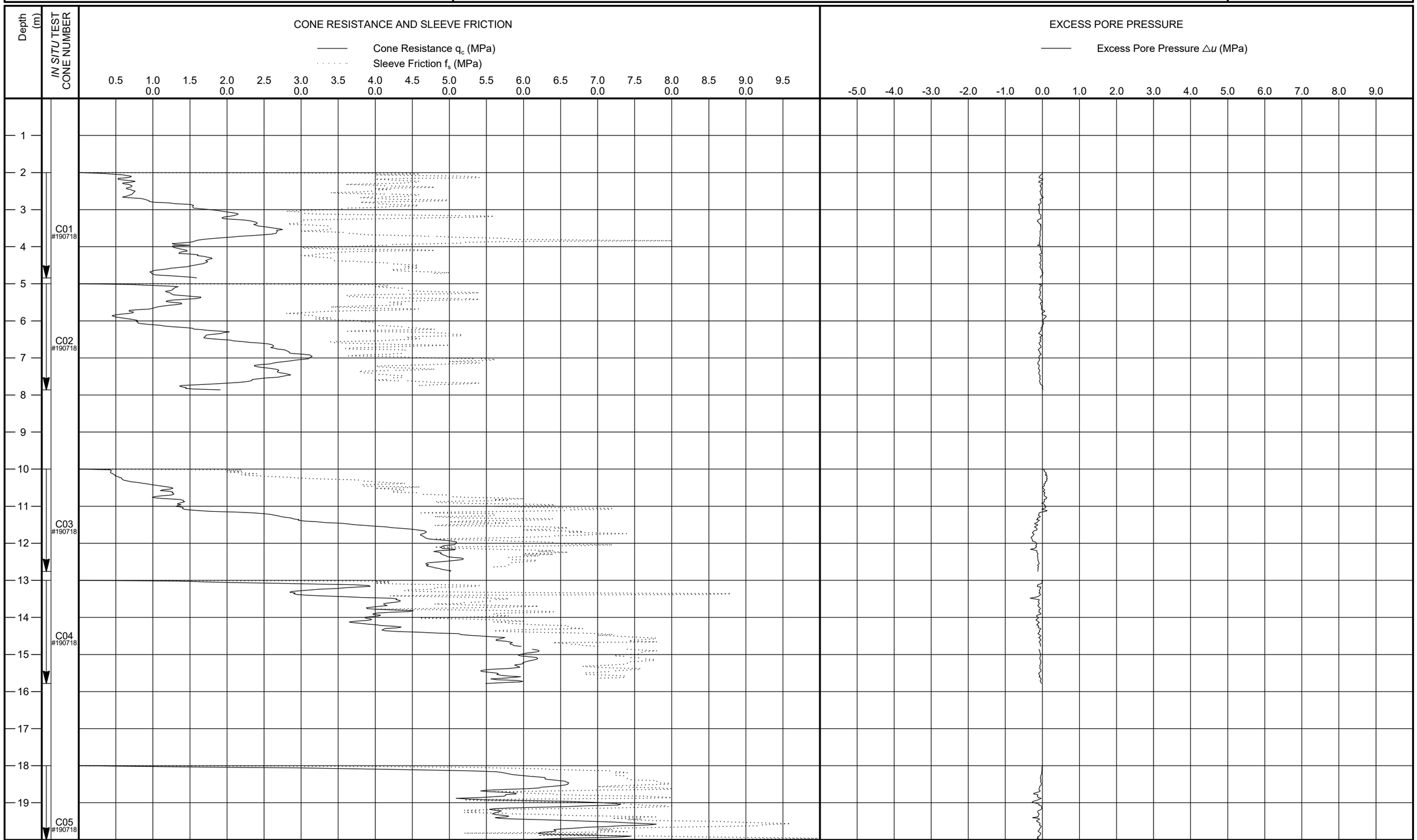
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

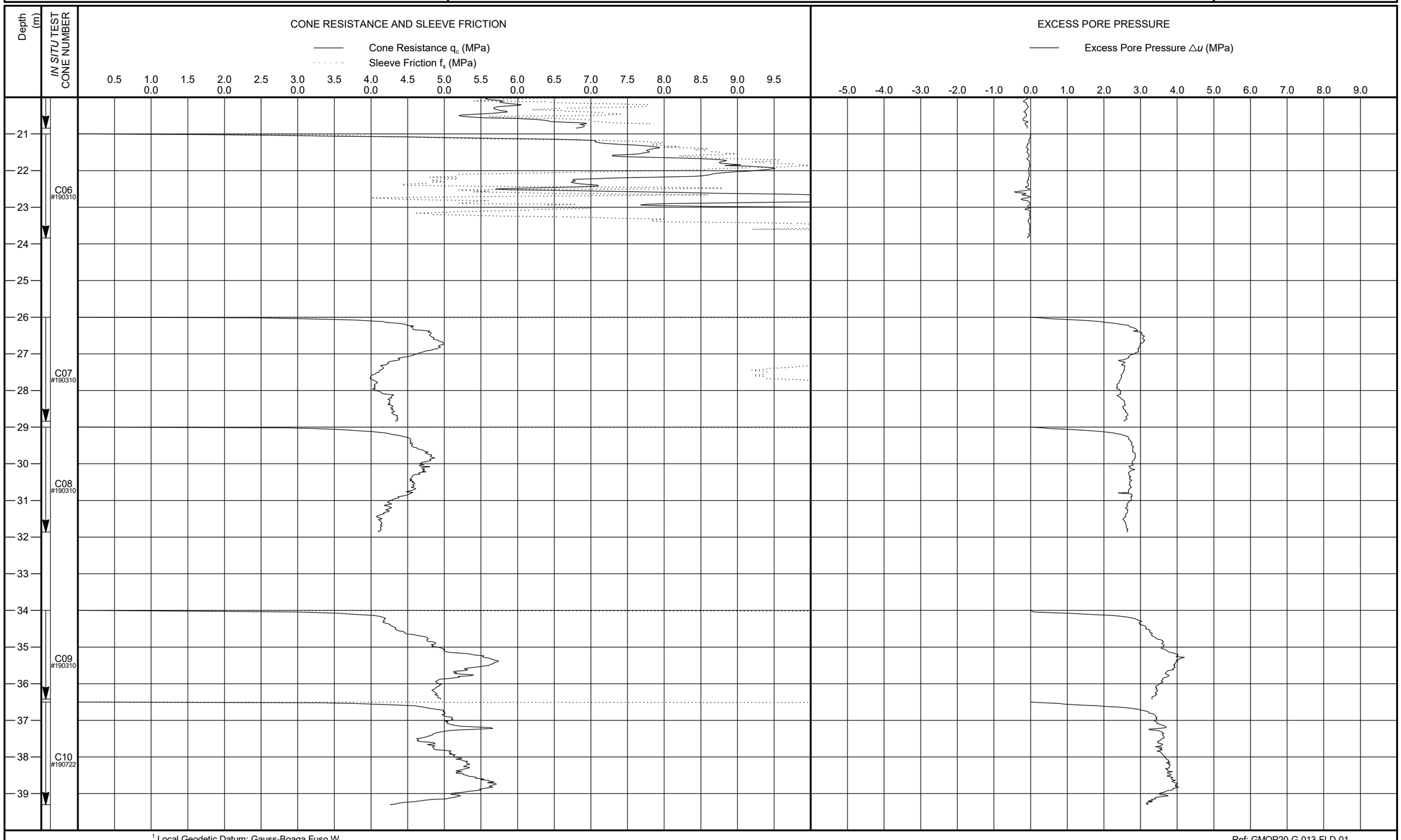
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

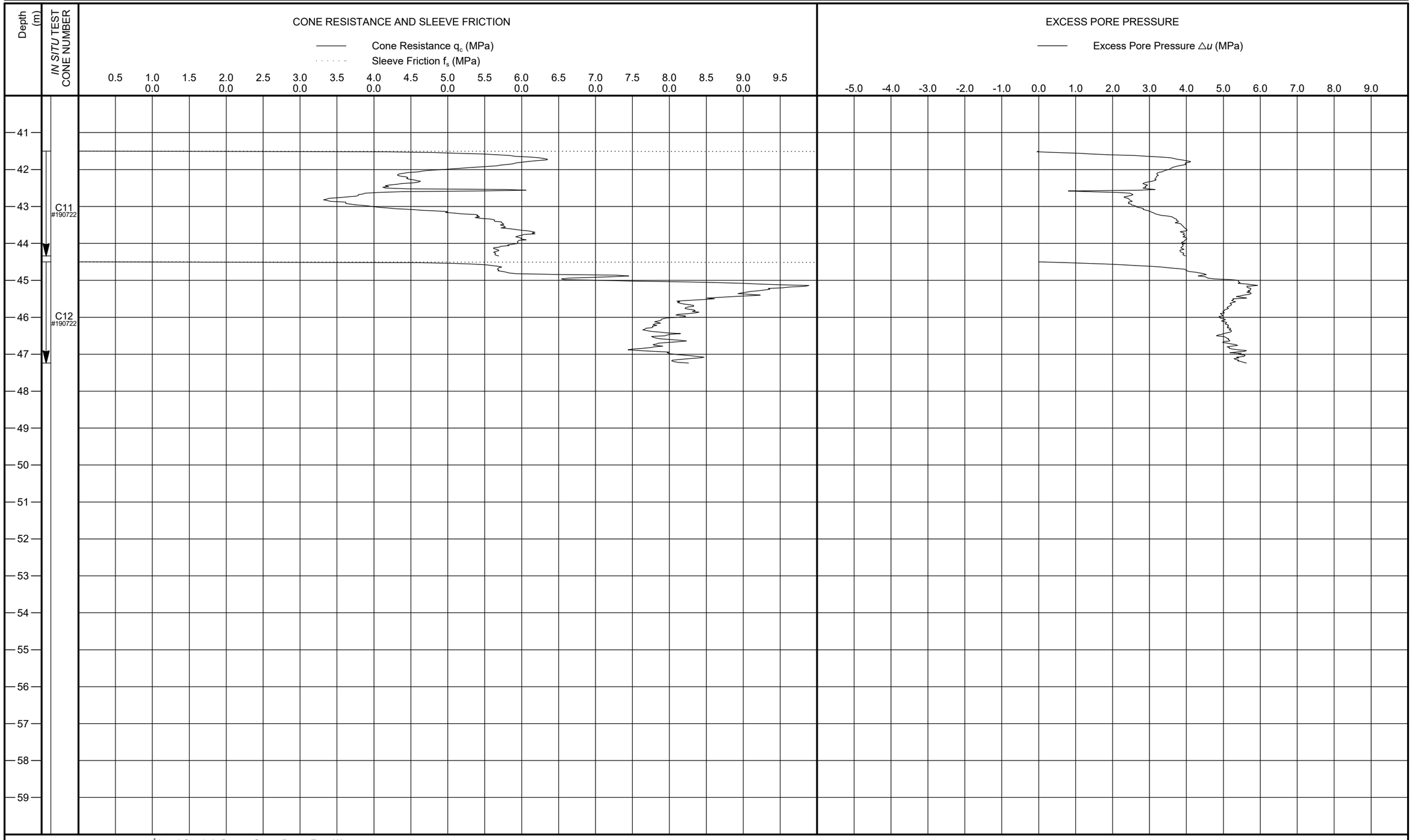
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE

Depth (m)

IN SITU TEST CONE NUMBER

CONE RESISTANCE AND SLEEVE FRICTION

Cone Resistance q_c (MPa)

Sleeve Friction f_s (MPa)

4.0 8.0 12.0 16.0 20.0 24.0 28.0 32.0 36.0 40.0 44.0 48.0 52.0 56.0 60.0 64.0 68.0 72.0 76.0

0.2 0.3 0.5 0.6 0.8 0.9 1.1 1.2 1.4

EXCESS PORE PRESSURE

Excess Pore Pressure $\triangle u$ (MPa)

-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE

Depth (m)

IN SITU TEST CONE NUMBER

CONE RESISTANCE AND SLEEVE FRICTION

Cone Resistance q_c (MPa)

Sleeve Friction f_s (MPa)

4.0 8.0 12.0 16.0 20.0 24.0 28.0 32.0 36.0 40.0 44.0 48.0 52.0 56.0 60.0 64.0 68.0 72.0 76.0

0.2 0.3 0.5 0.6 0.8 0.9 1.1 1.2 1.4

EXCESS PORE PRESSURE

Excess Pore Pressure $\triangle u$ (MPa)

-5.0 -4.0 -3.0 -2.0 -1.0 0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

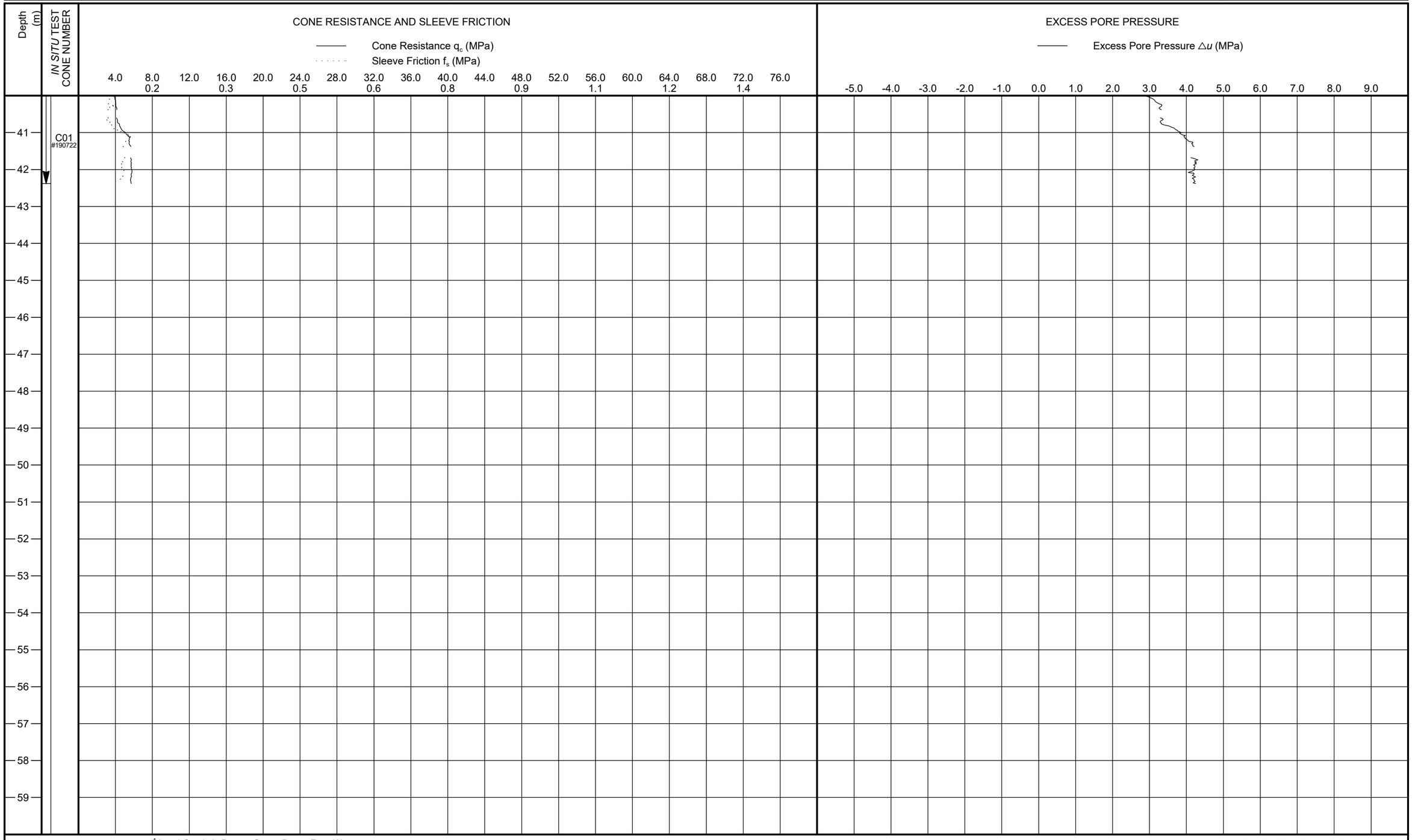
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

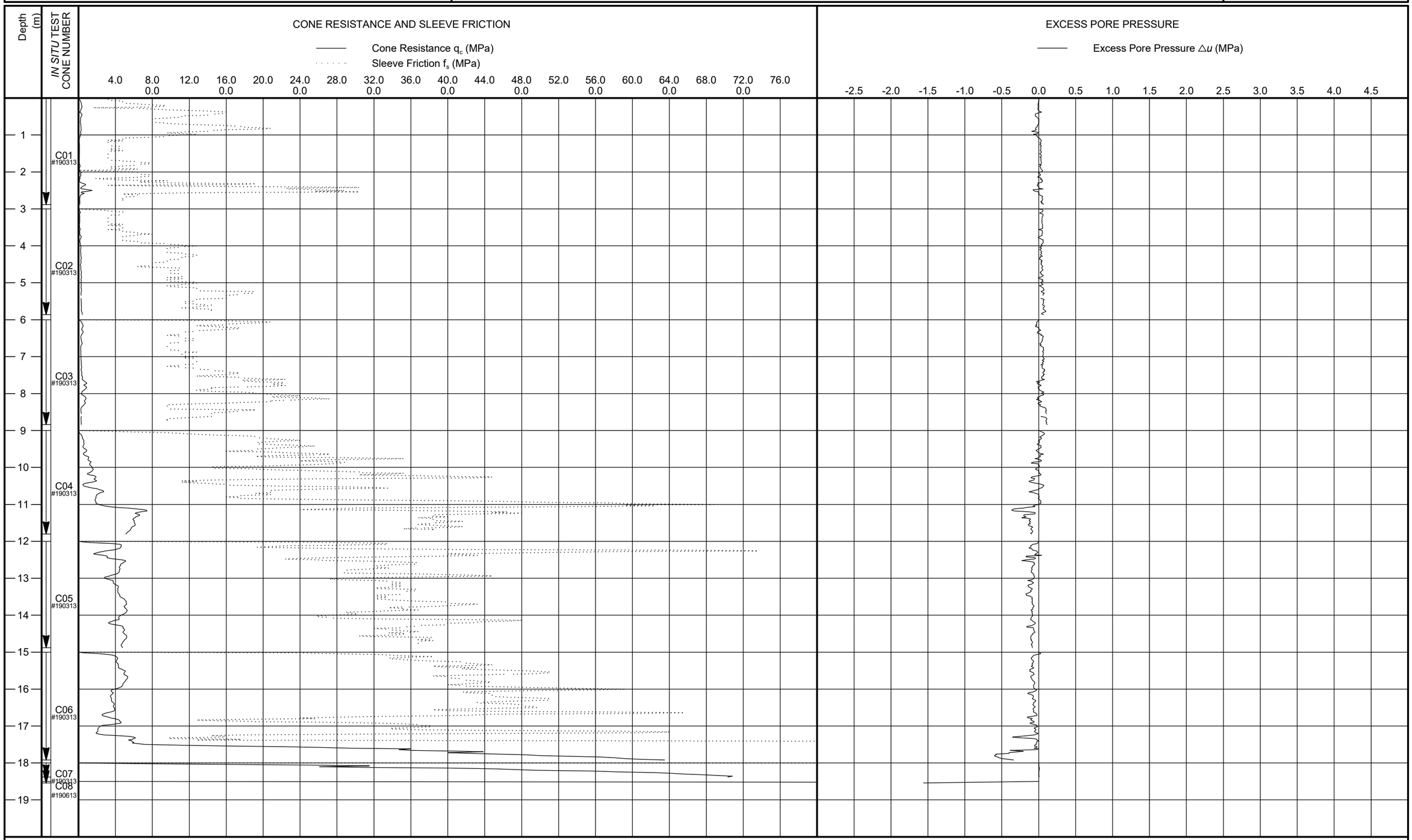
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-1	17/12/2020	1494401mE	4915166mN	36.46m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

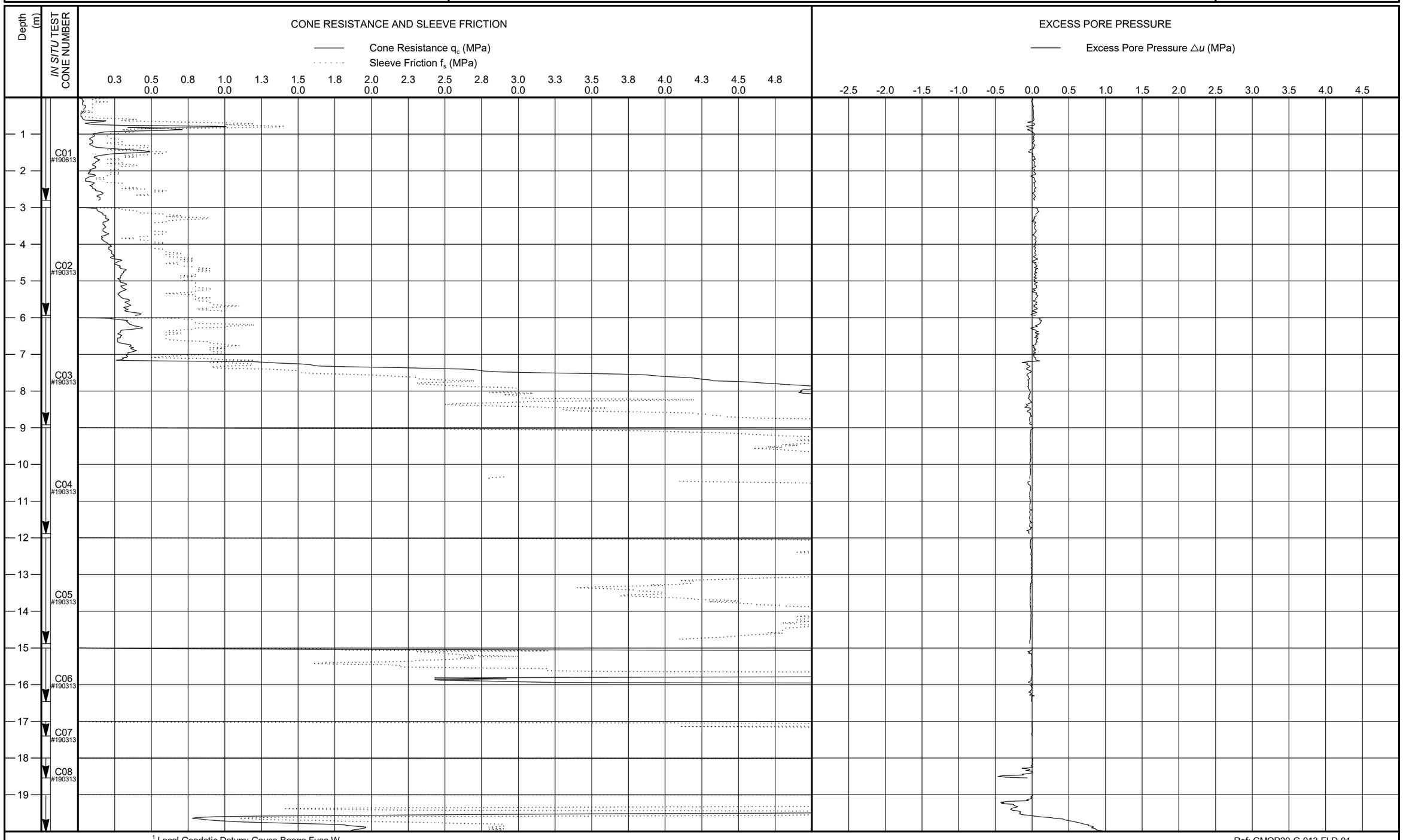
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

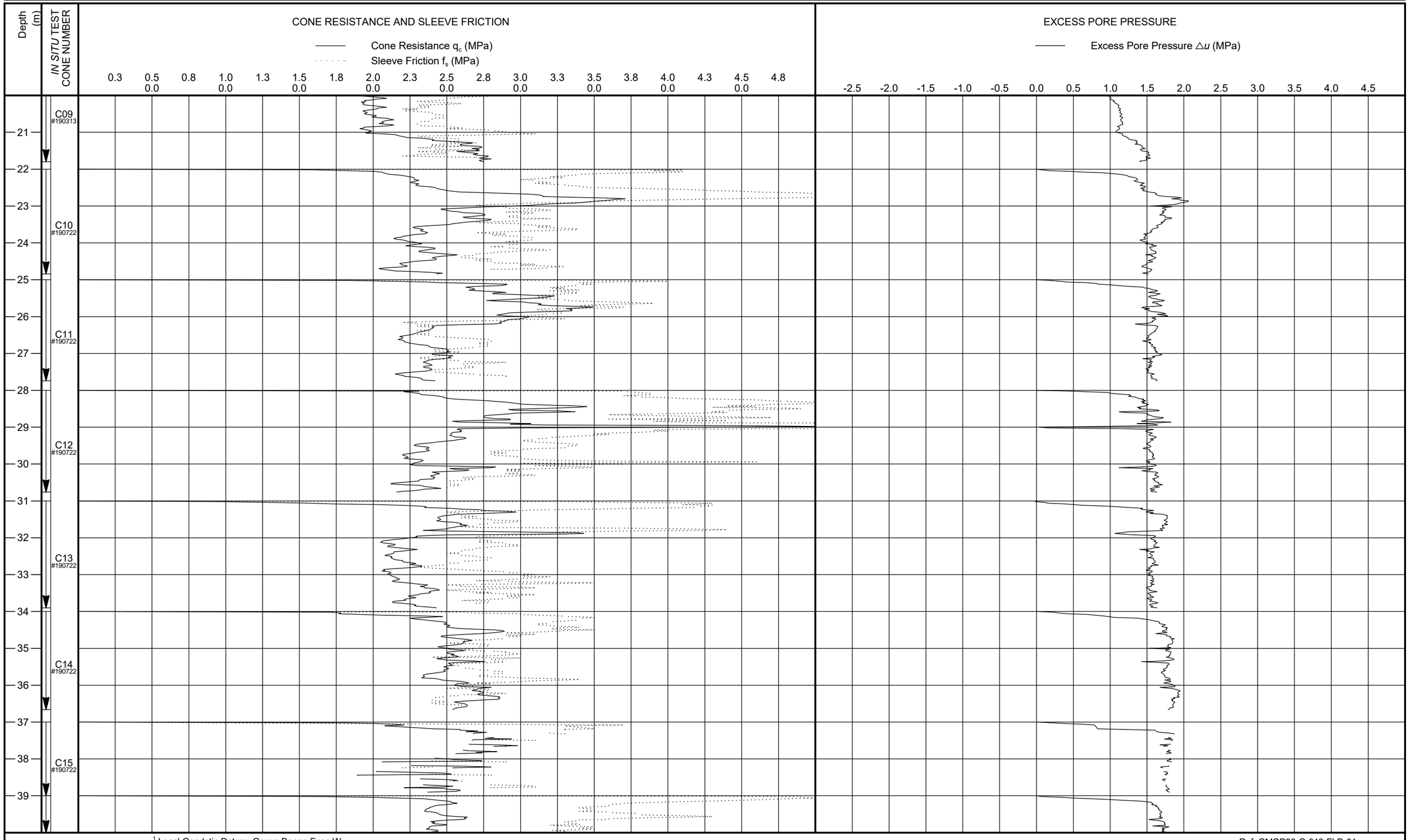
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

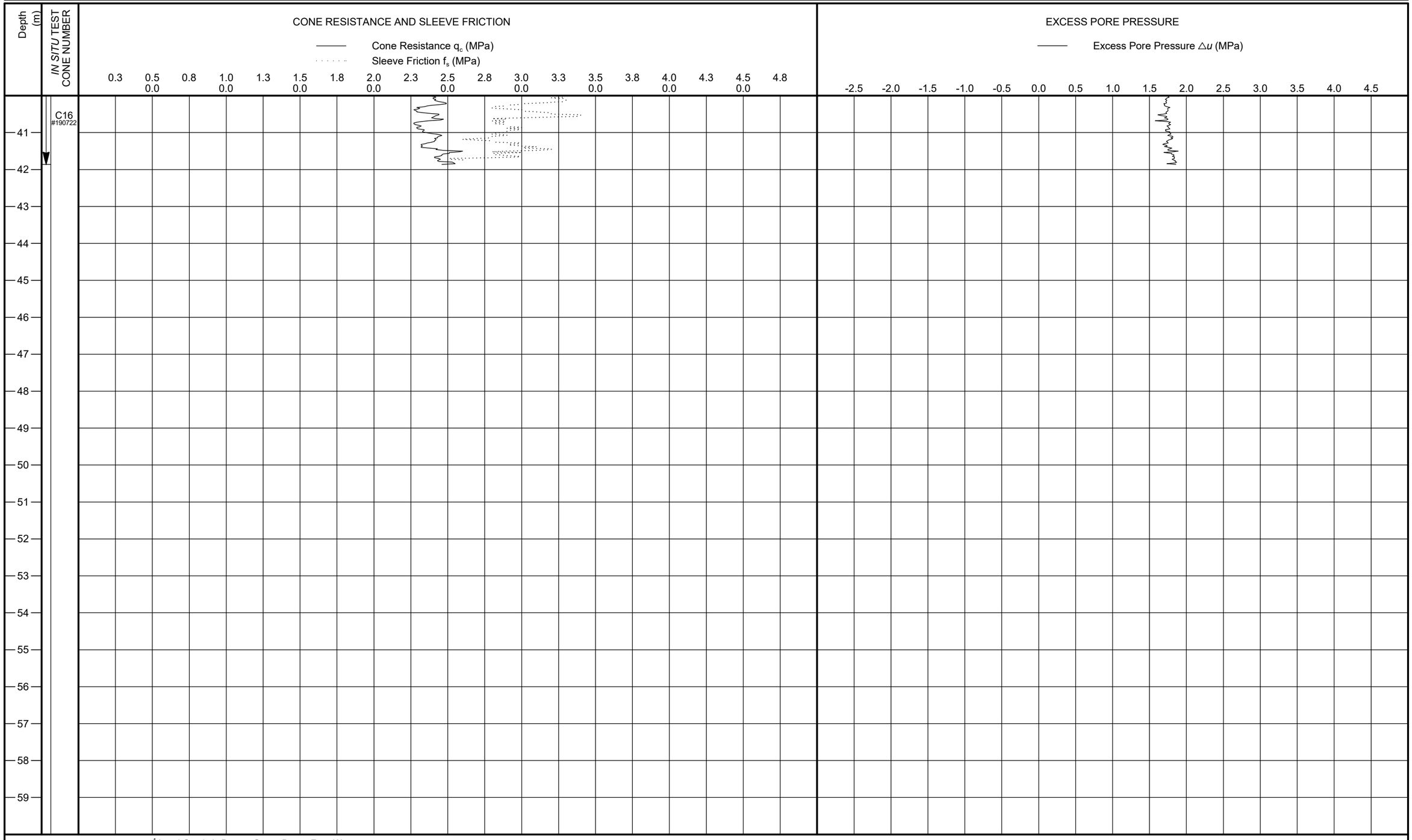
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

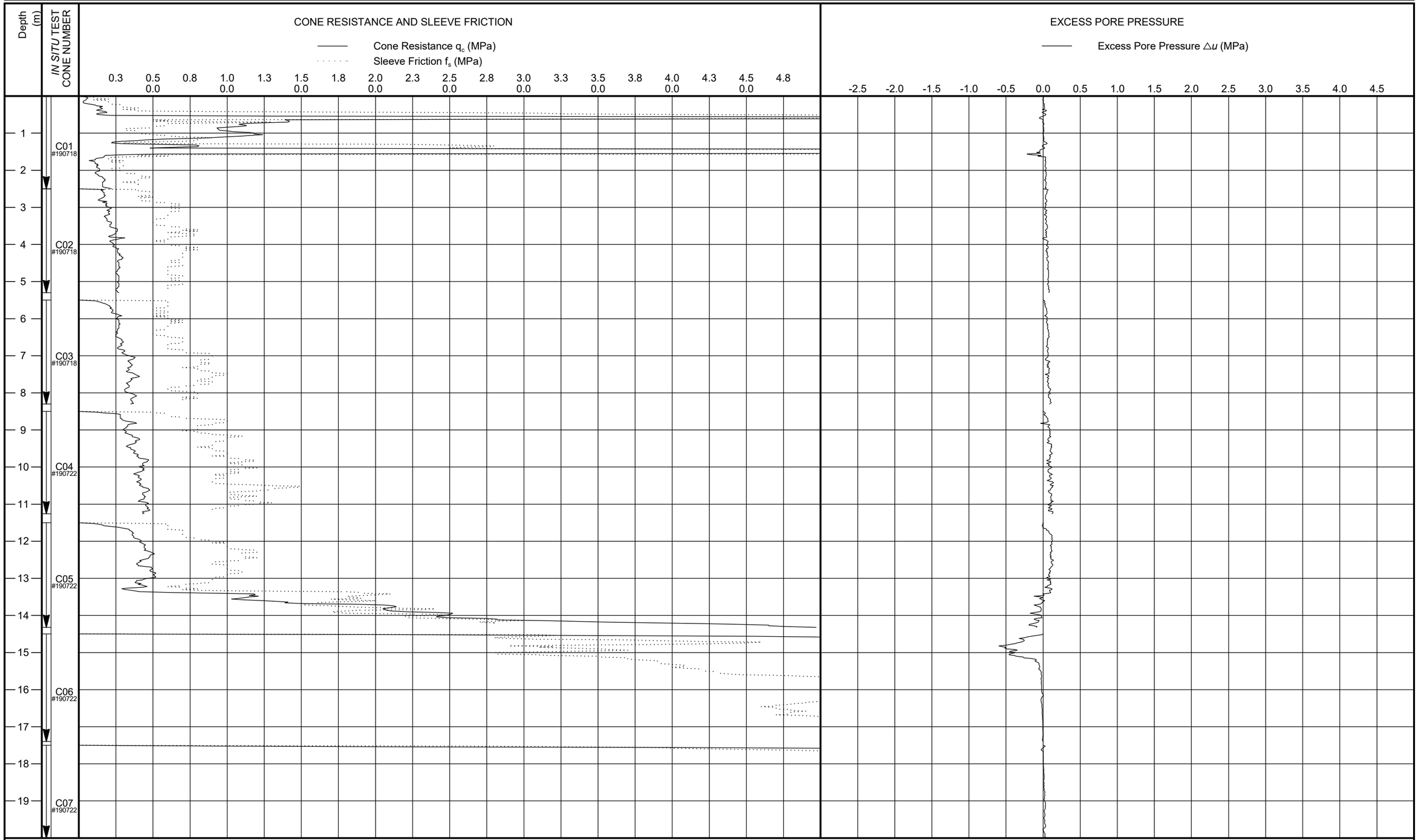
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-3	13/12/2020	1493382mE	4915273mN	42.01m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

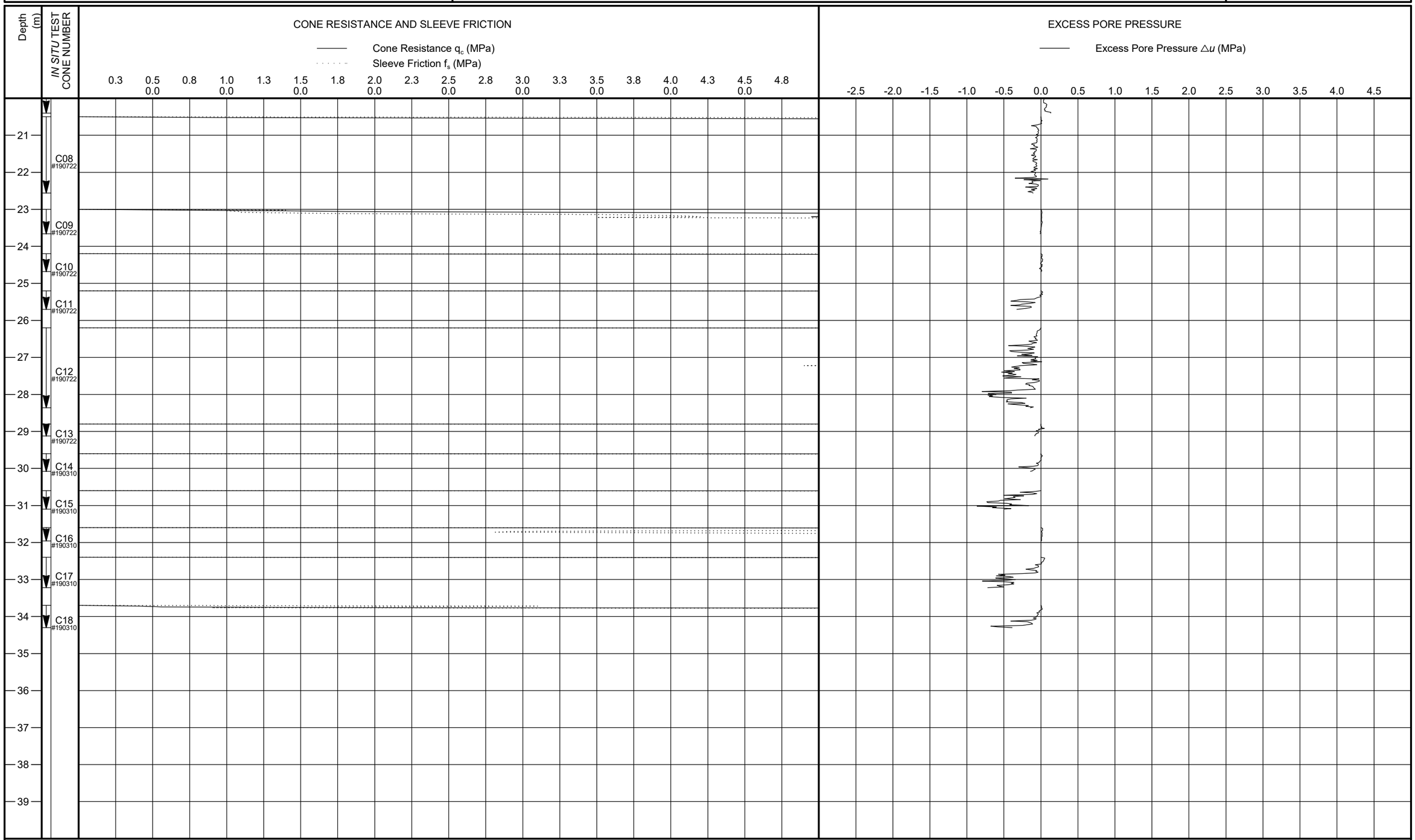
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-3	13/12/2020	1493382mE	4915273mN	42.01m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

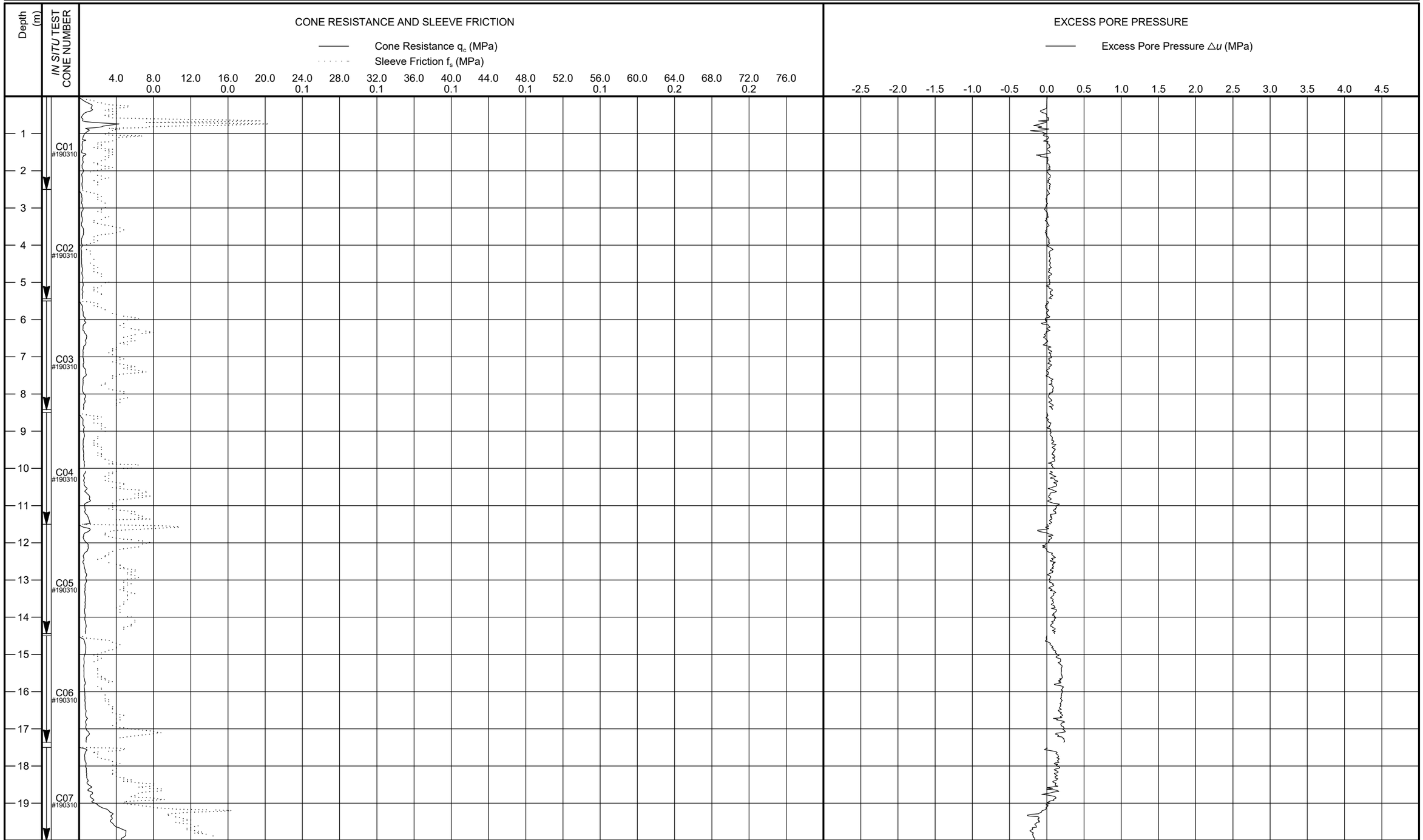
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

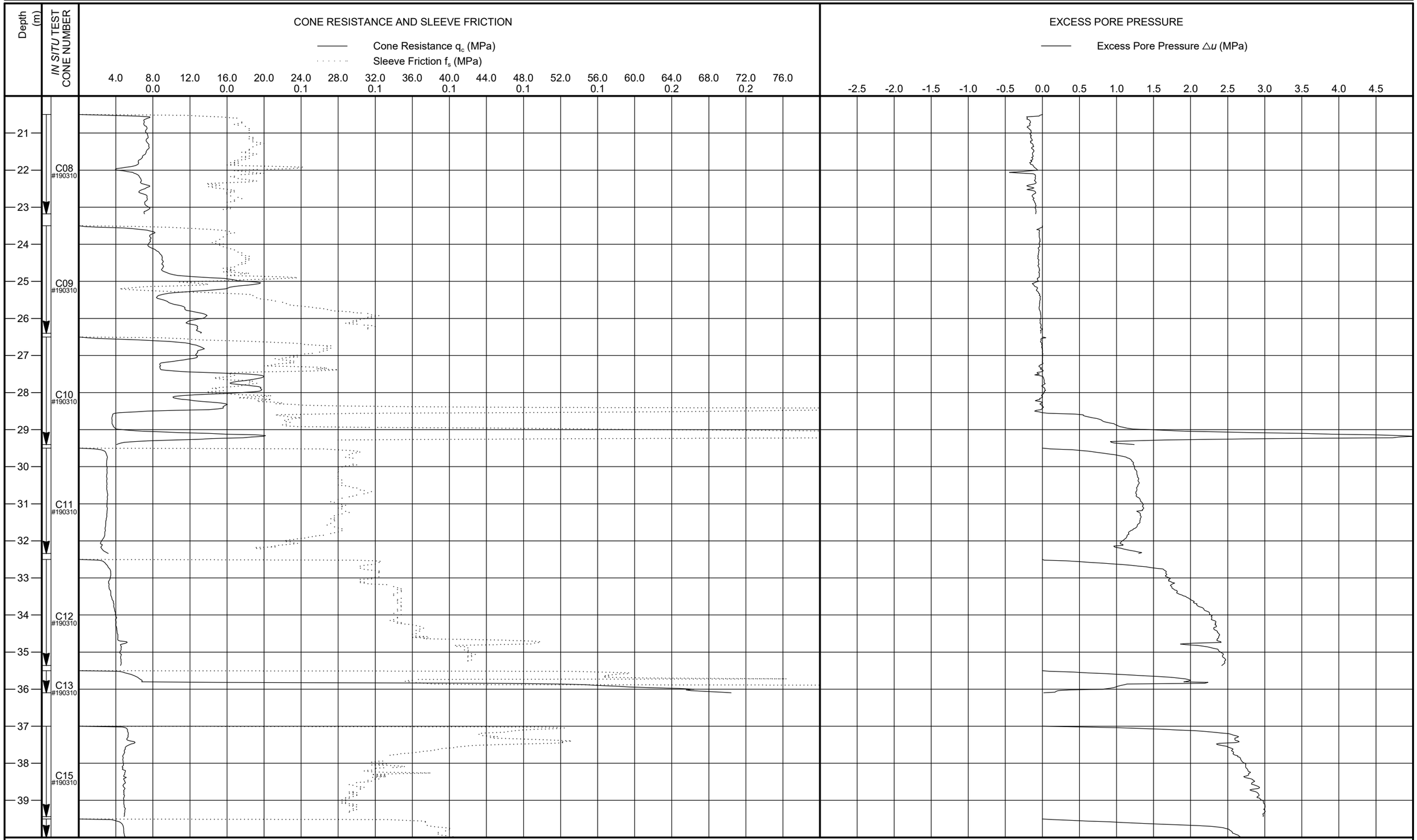
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

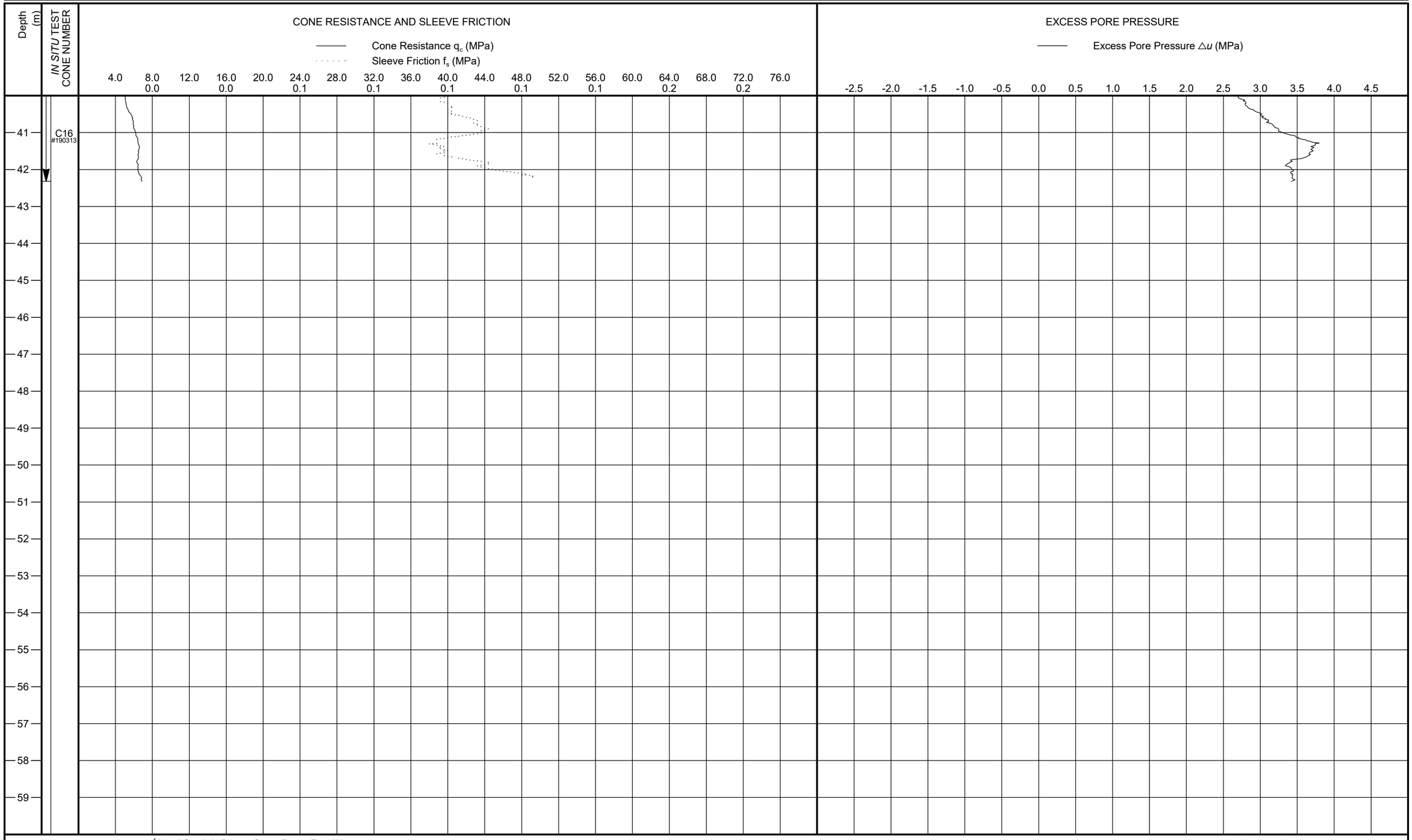
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

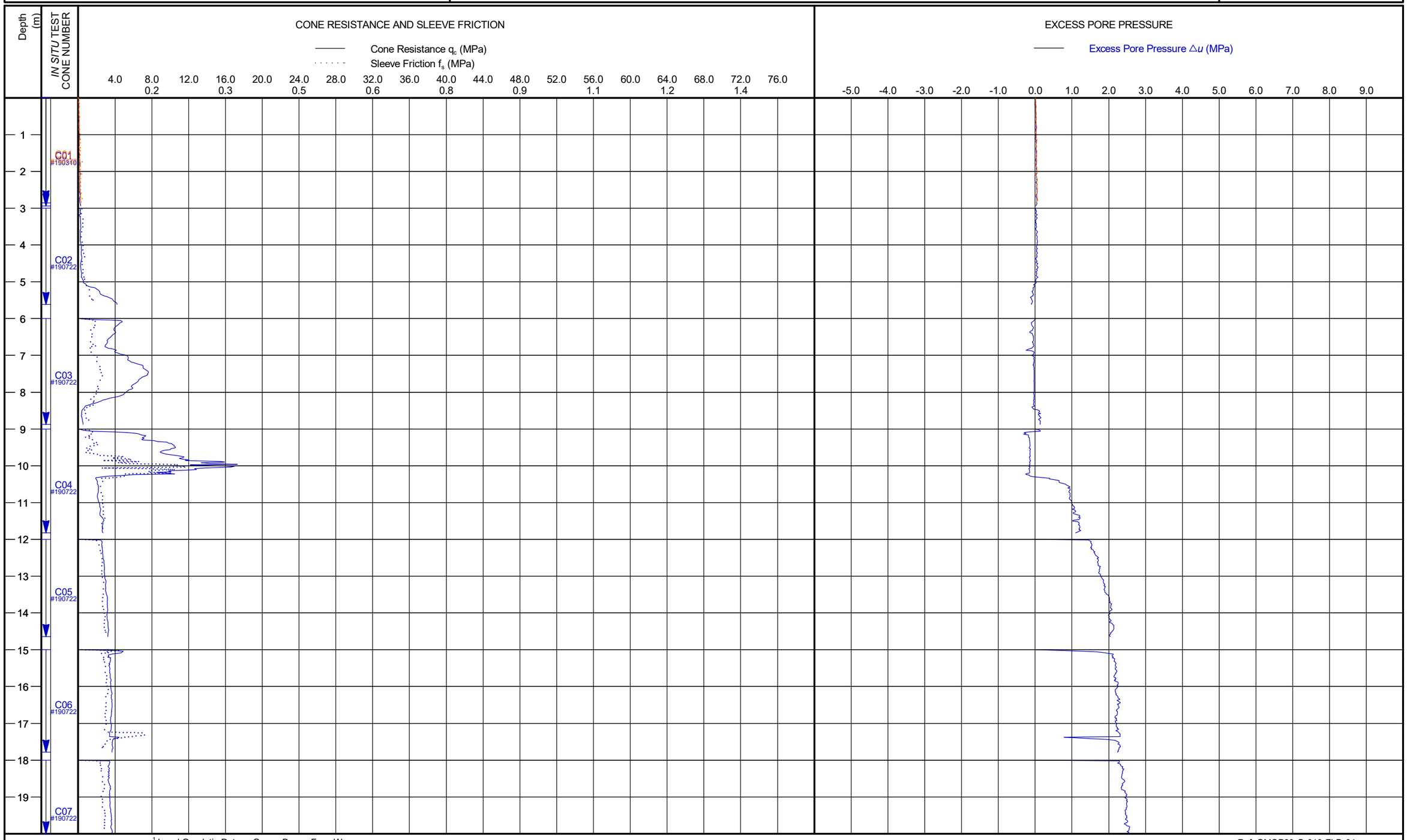
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

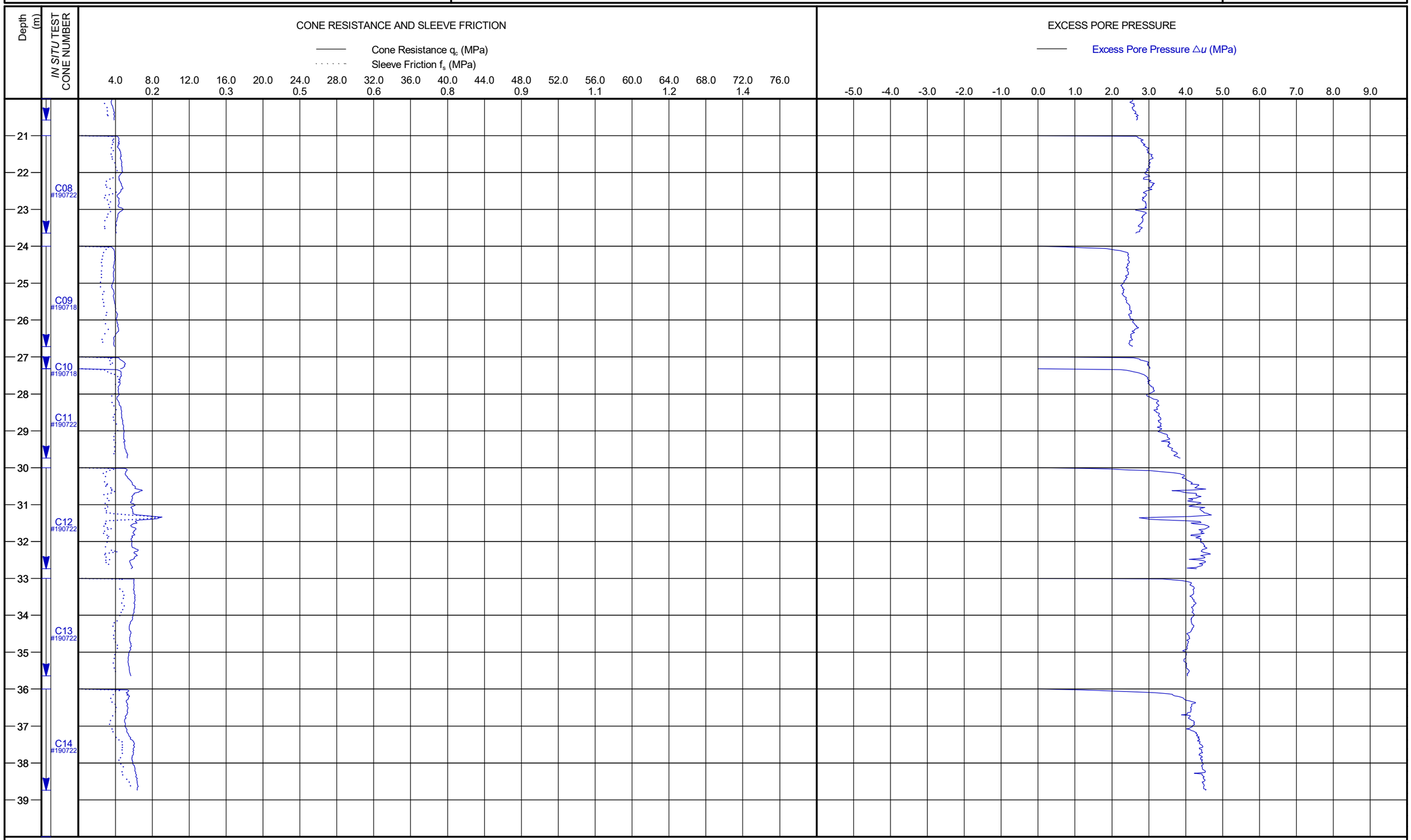
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

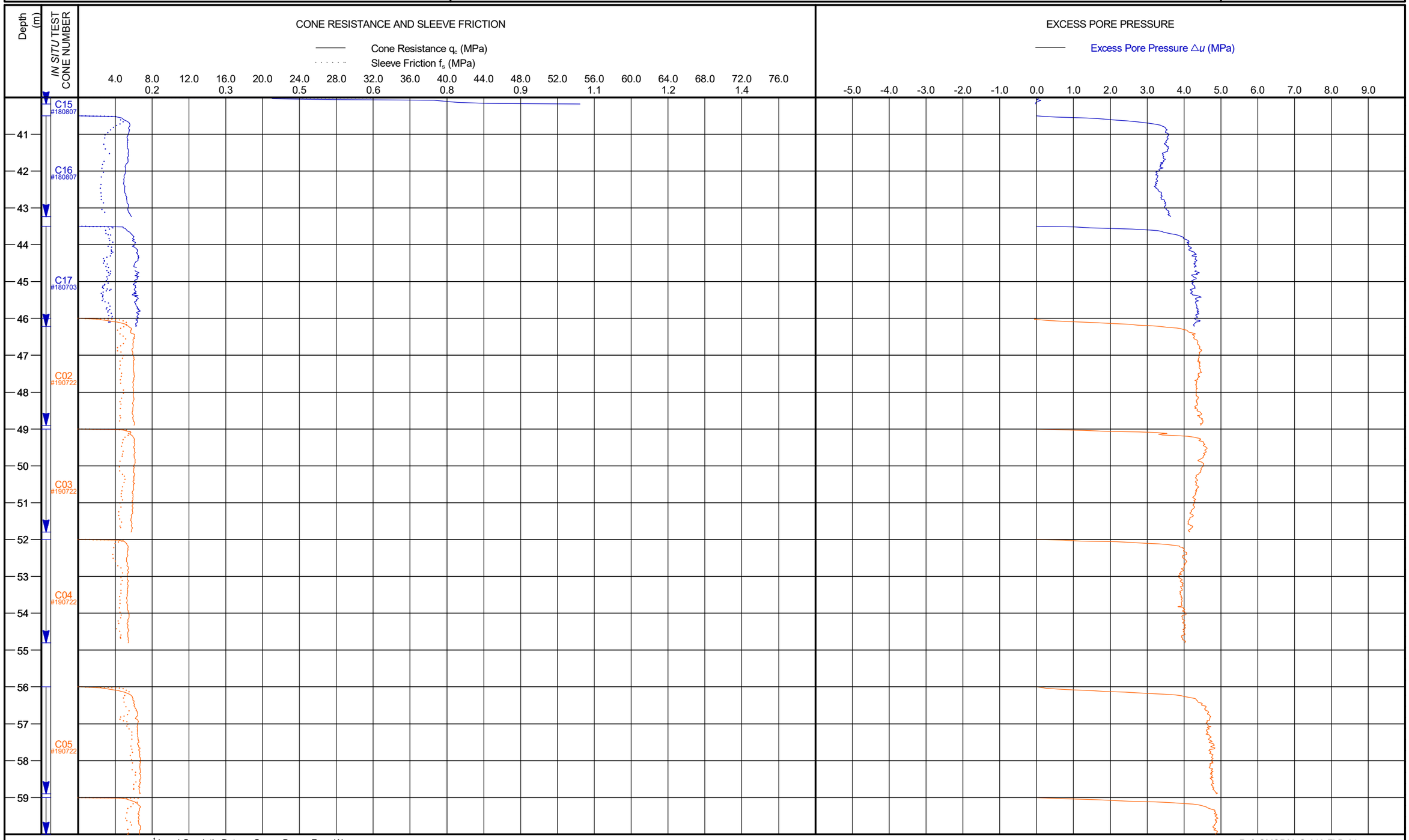
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

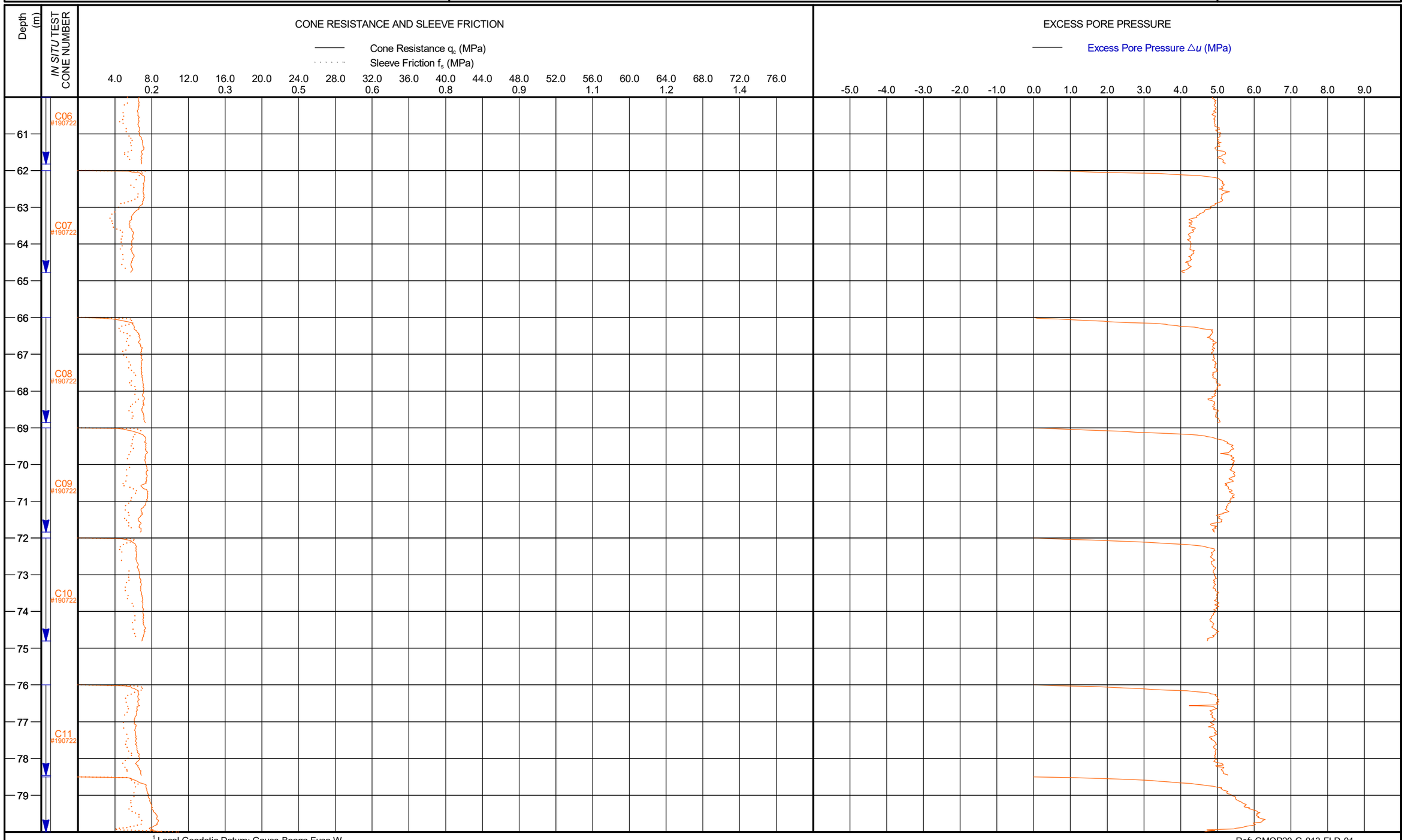
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

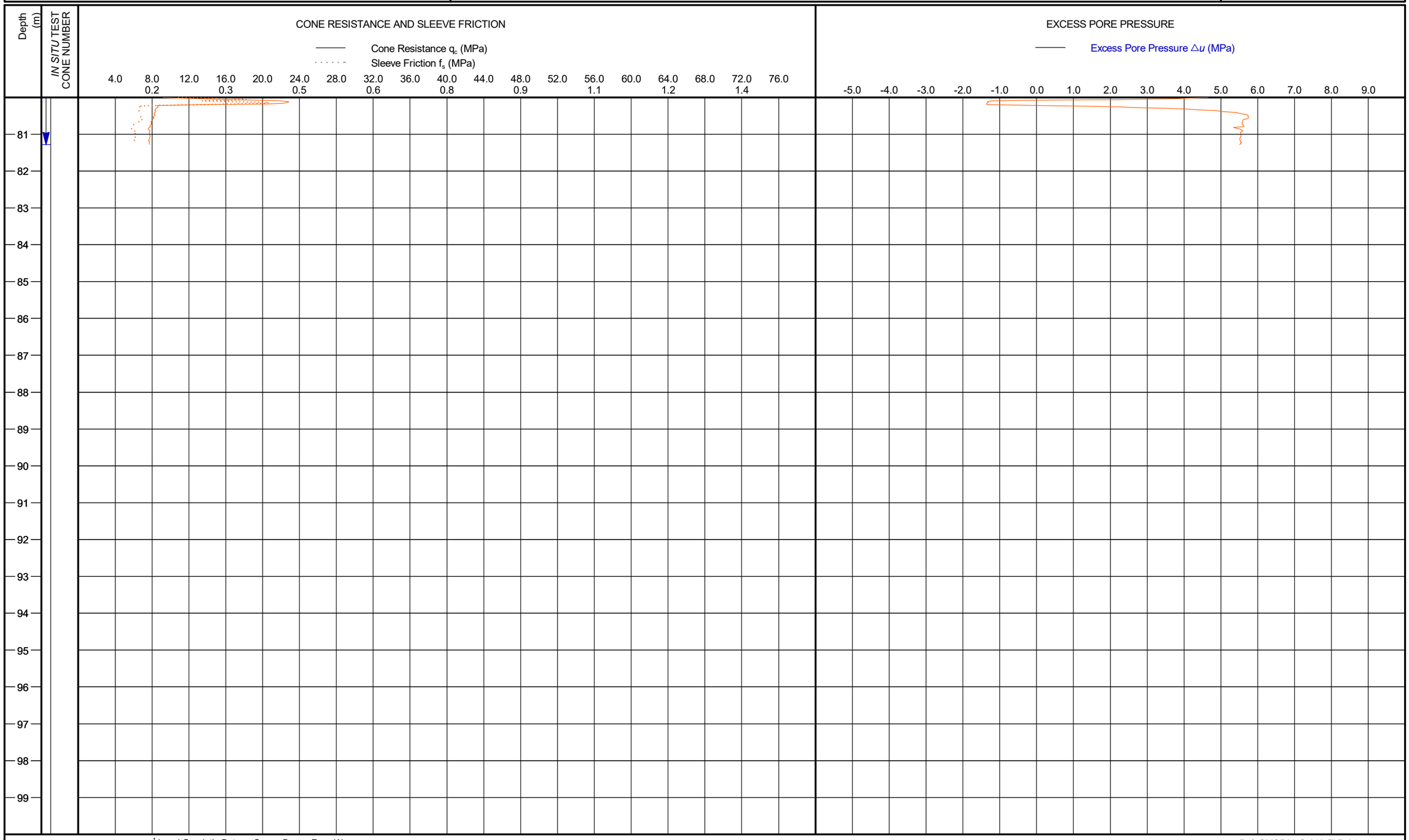
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

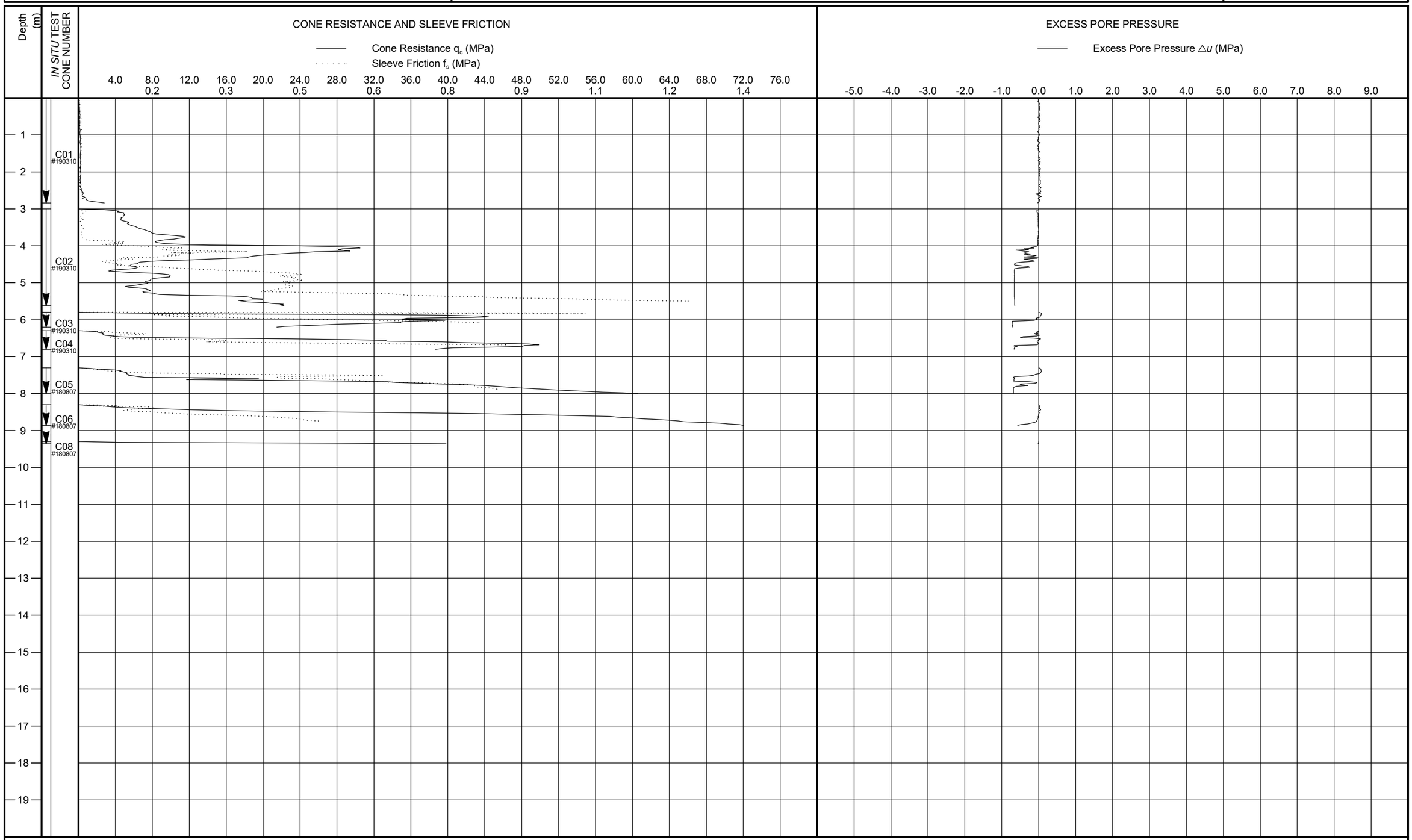
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-7	19/12/2020	1491770mE	4915317mN	52.56m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

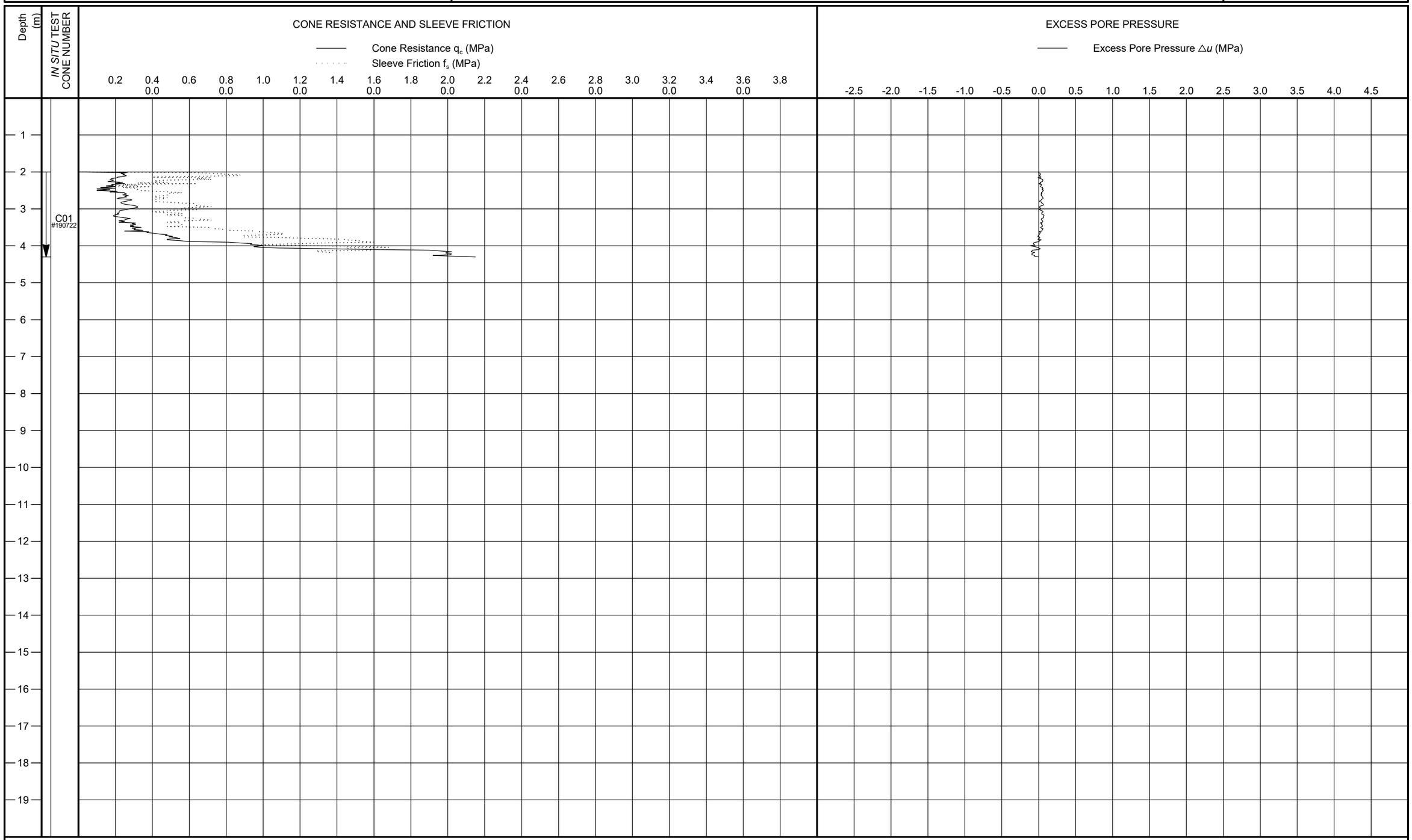
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8	23/12/2020	1493948mE	4914839mN	54.26m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

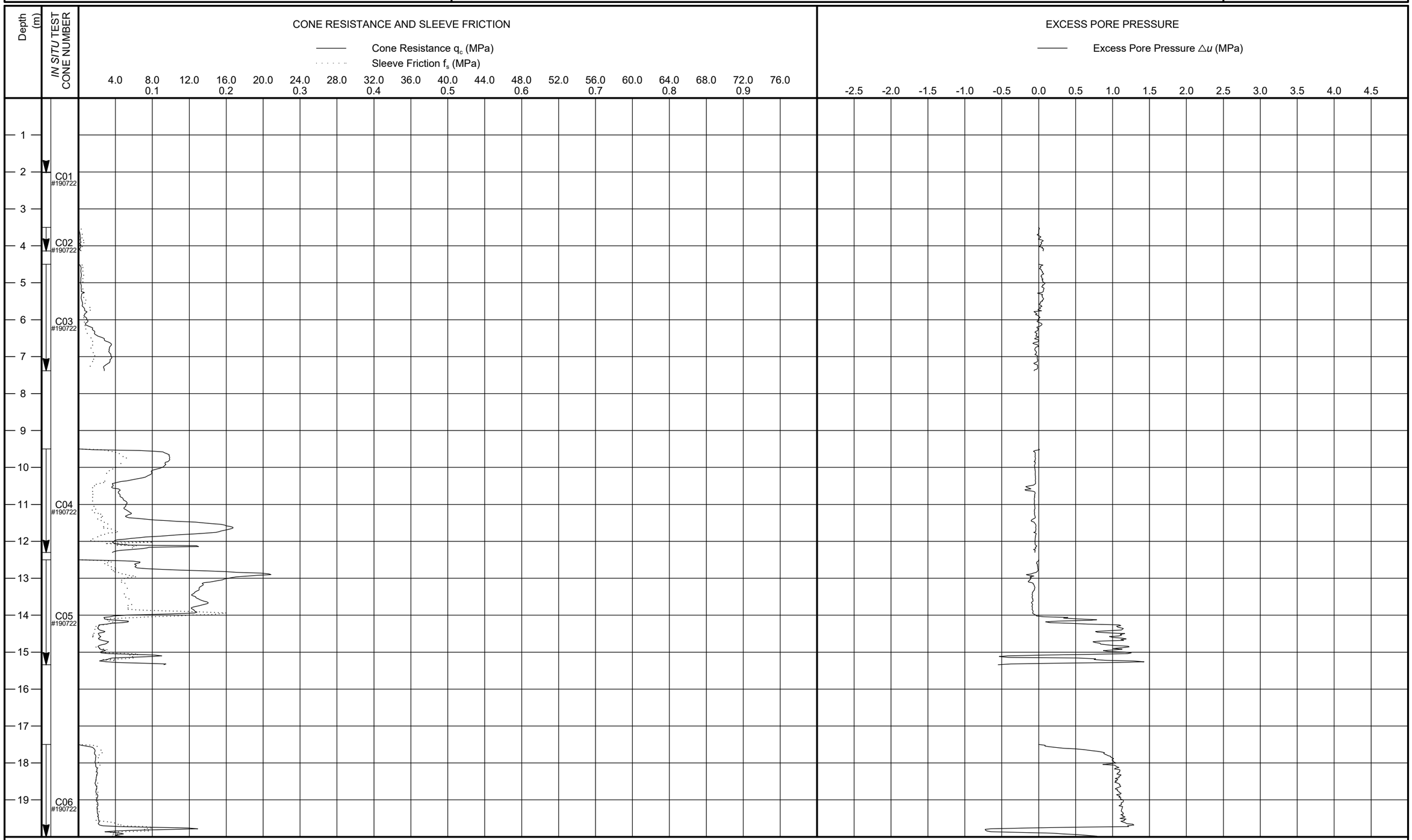
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

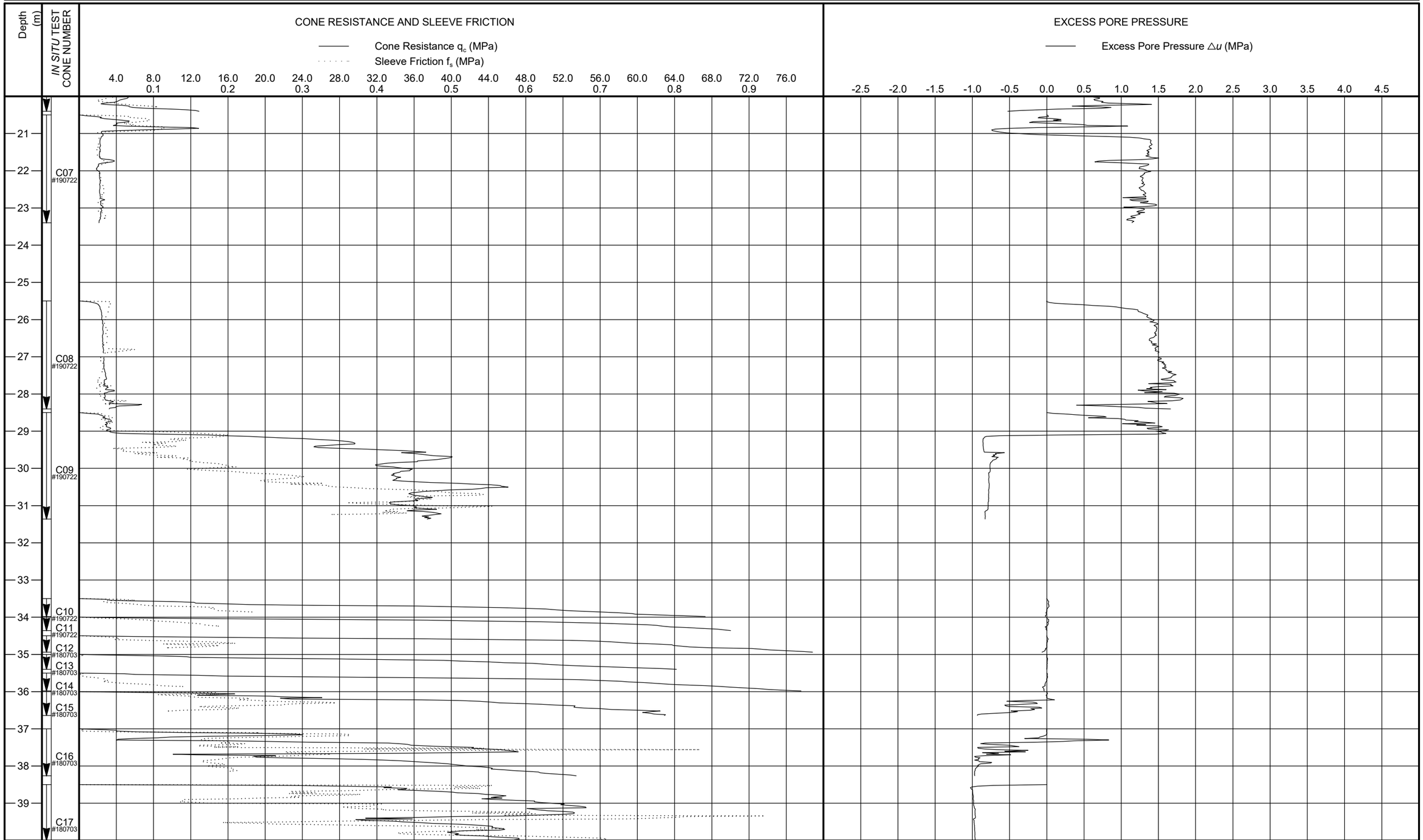
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

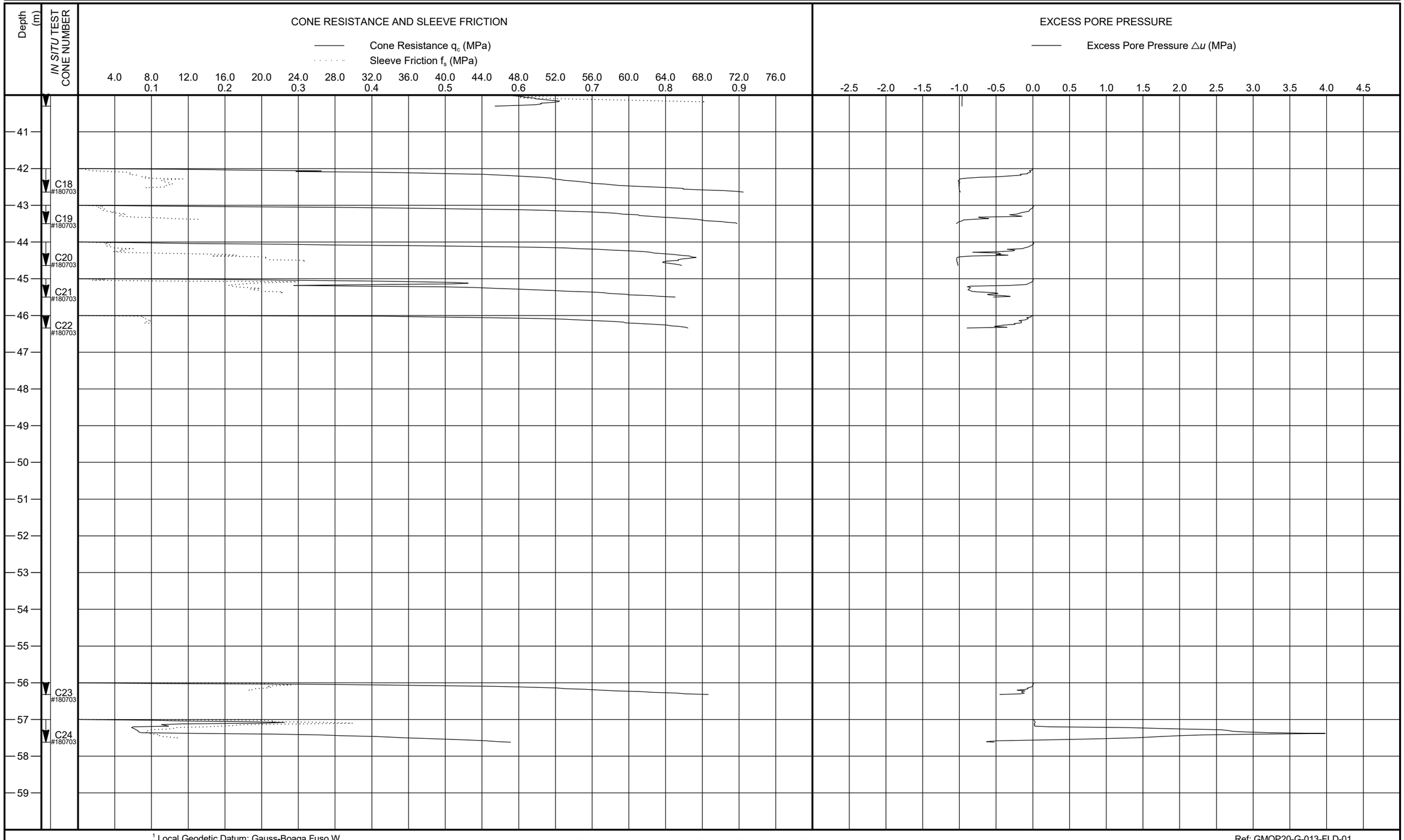
[2] Water Depth: LAT

RAW PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

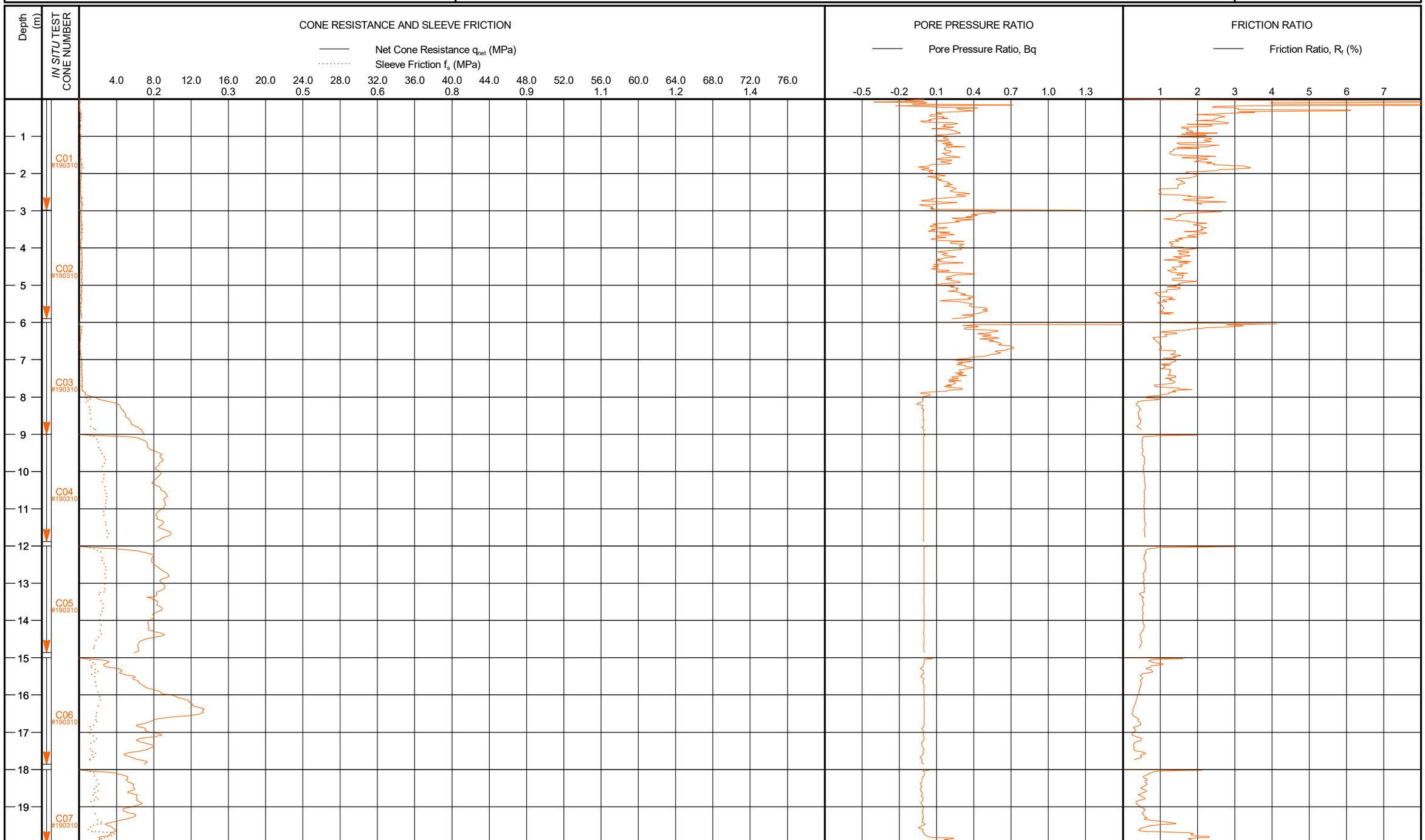
RAW PCPT RESULTS

Appendix A.4 Derived In Situ Test Results

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

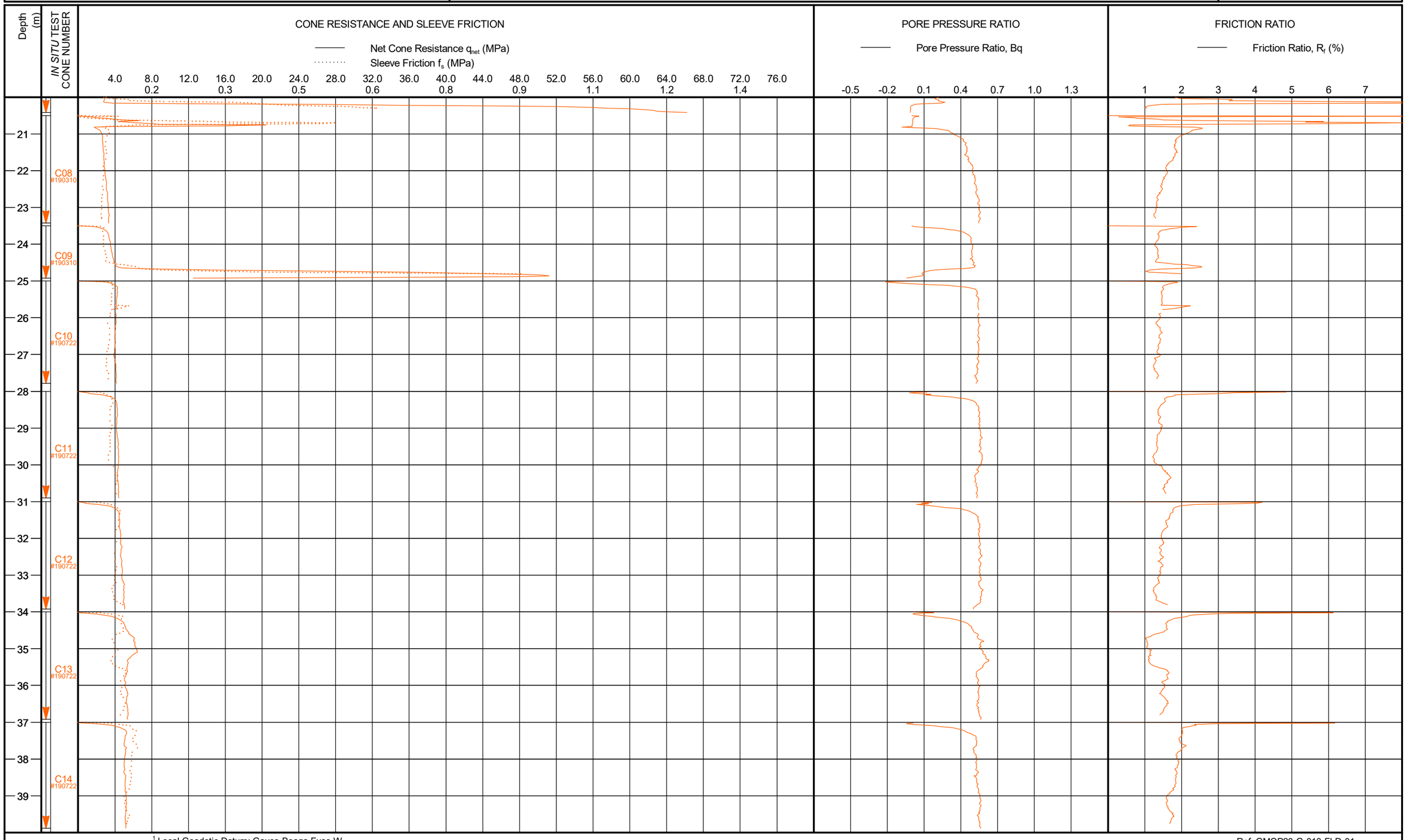
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

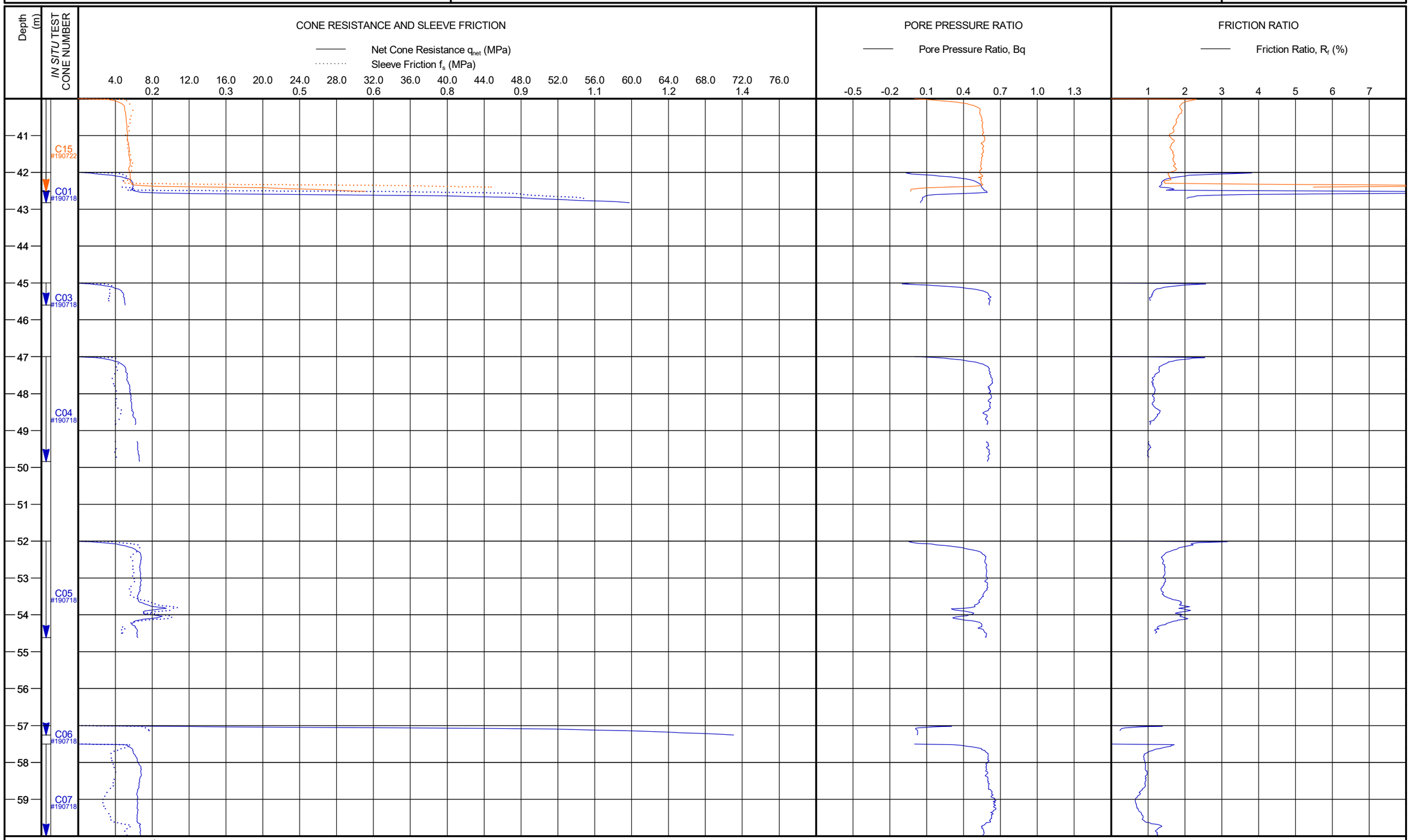
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m
PCPT-4	17/12/2020	1492628mE	4915144mN	52.48m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

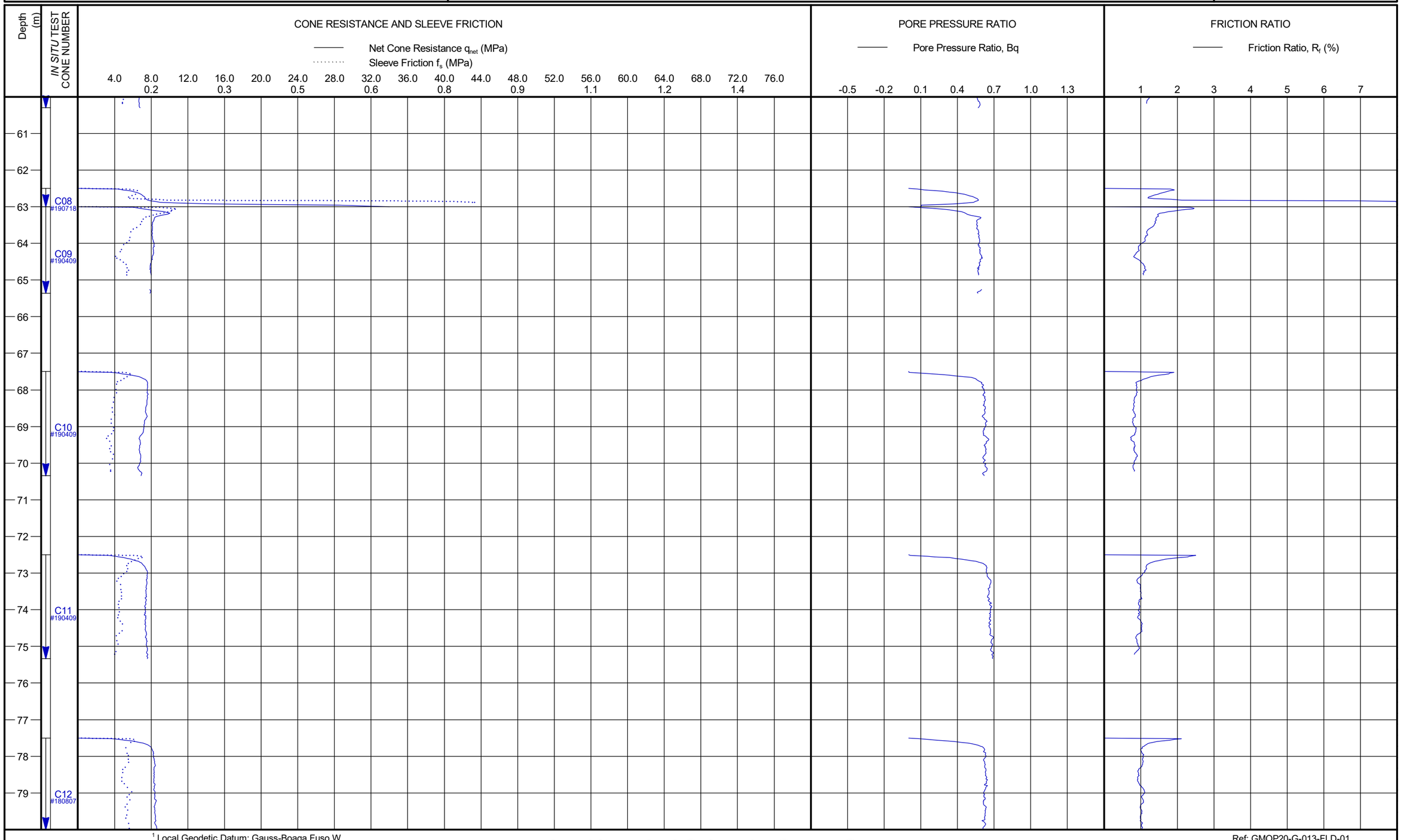
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-4	22/12/2020	1492615mE	4915142mN	52.46m

GEOQUIPMARINE

Depth (m)

IN SITU TEST CONE NUMBER

CONE RESISTANCE AND SLEEVE FRICTION

Net Cone Resistance q_{net} (MPa)

Sleeve Friction f_s (MPa)

4.0 8.0 12.0 16.0 20.0 24.0 28.0 32.0 36.0 40.0 44.0 48.0 52.0 56.0 60.0 64.0 68.0 72.0 76.0

0.2 0.3 0.5 0.6 0.8 0.9 1.1 1.2 1.4

PORE PRESSURE RATIO

Pore Pressure Ratio, Bq

-0.5 -0.2 0.1 0.4 0.7 1.0 1.3

FRICTION RATIO

Friction Ratio, R_f (%)

1 2 3 4 5 6 7

81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

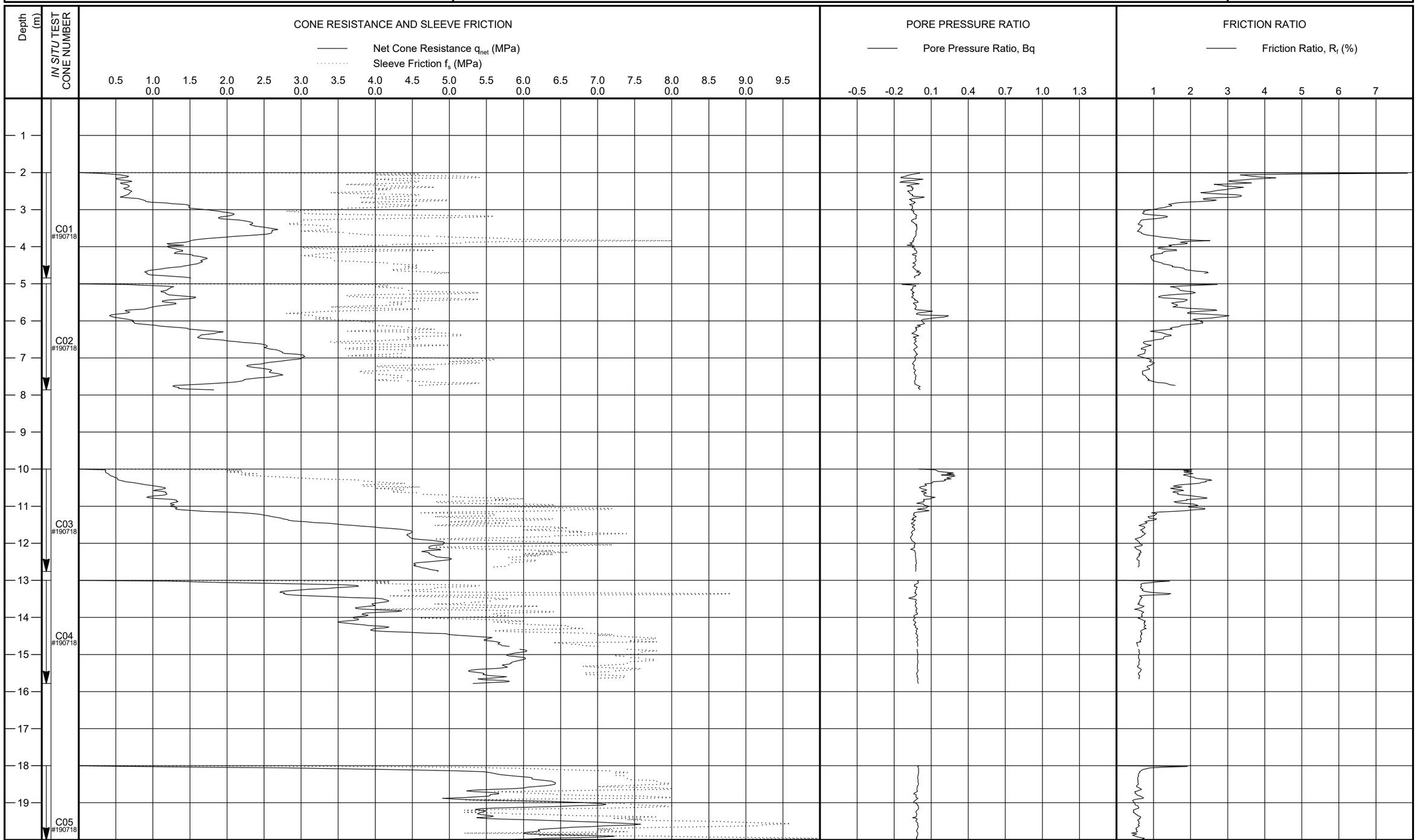
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

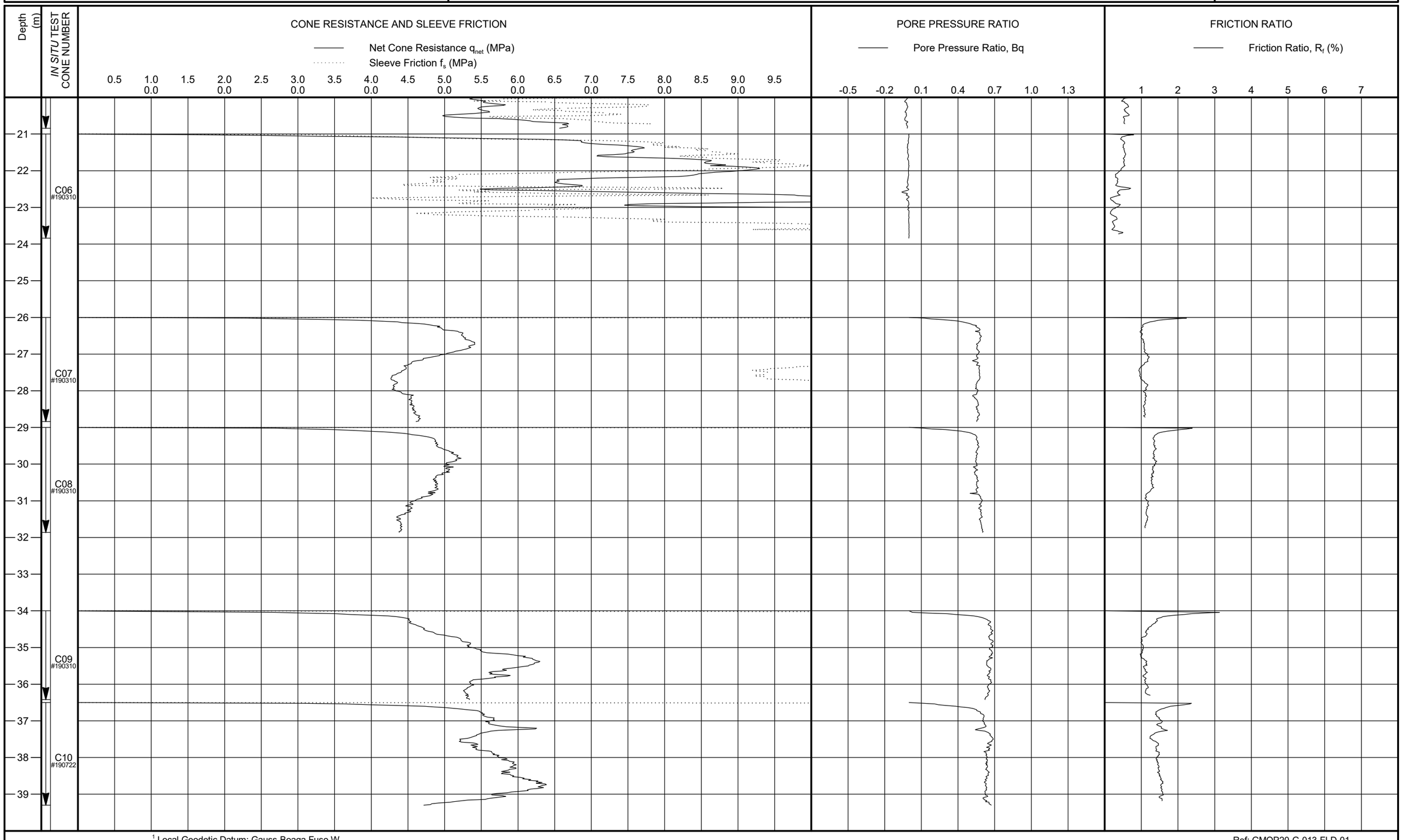
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

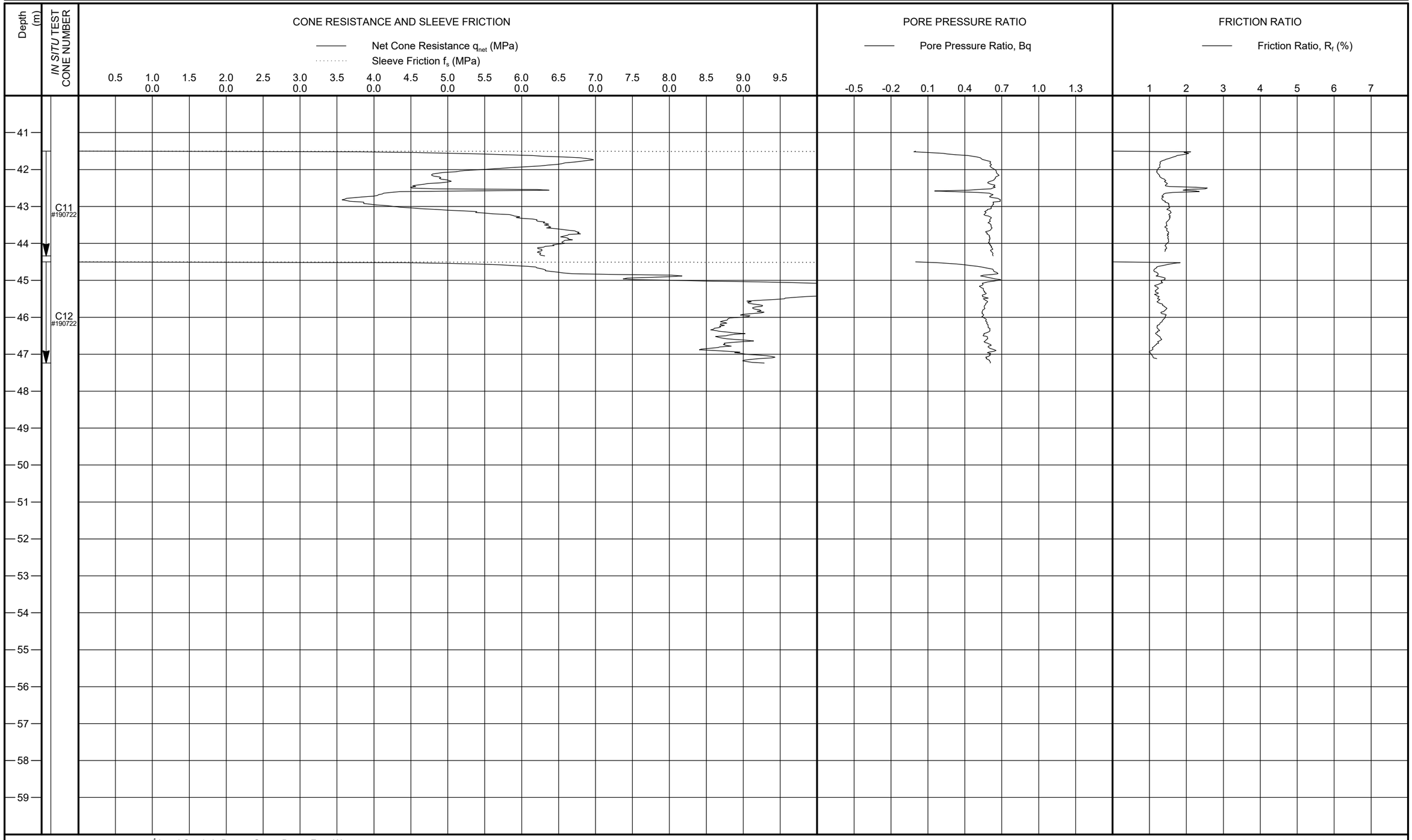
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-6	25/12/2020	1491090mE	4916168mN	28.86m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE

Depth (m)

IN SITU TEST CONE NUMBER

CONE RESISTANCE AND SLEEVE FRICTION

Net Cone Resistance q_{net} (MPa)

Sleeve Friction f_s (MPa)

4.0 8.0 12.0 16.0 20.0 24.0 28.0 32.0 36.0 40.0 44.0 48.0 52.0 56.0 60.0 64.0 68.0 72.0 76.0

0.2 0.3 0.5 0.6 0.8 0.9 1.1 1.2 1.4

PORE PRESSURE RATIO

Pore Pressure Ratio, Bq

-0.5 -0.2 0.1 0.4 0.7 1.0 1.3

FRICTION RATIO

Friction Ratio, R_f (%)

1 2 3 4 5 6 7

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE

Depth (m)

IN SITU TEST CONE NUMBER

CONE RESISTANCE AND SLEEVE FRICTION

Net Cone Resistance q_{net} (MPa)

Sleeve Friction f_s (MPa)

4.0 8.0 12.0 16.0 20.0 24.0 28.0 32.0 36.0 40.0 44.0 48.0 52.0 56.0 60.0 64.0 68.0 72.0 76.0

0.2 0.3 0.5 0.6 0.8 0.9 1.1 1.2 1.4

PORE PRESSURE RATIO

Pore Pressure Ratio, Bq

-0.5 -0.2 0.1 0.4 0.7 1.0 1.3

FRICTION RATIO

Friction Ratio, R_f (%)

1 2 3 4 5 6 7

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

[1] Local Geodetic Datum: Gauss-Boaga Fuso W

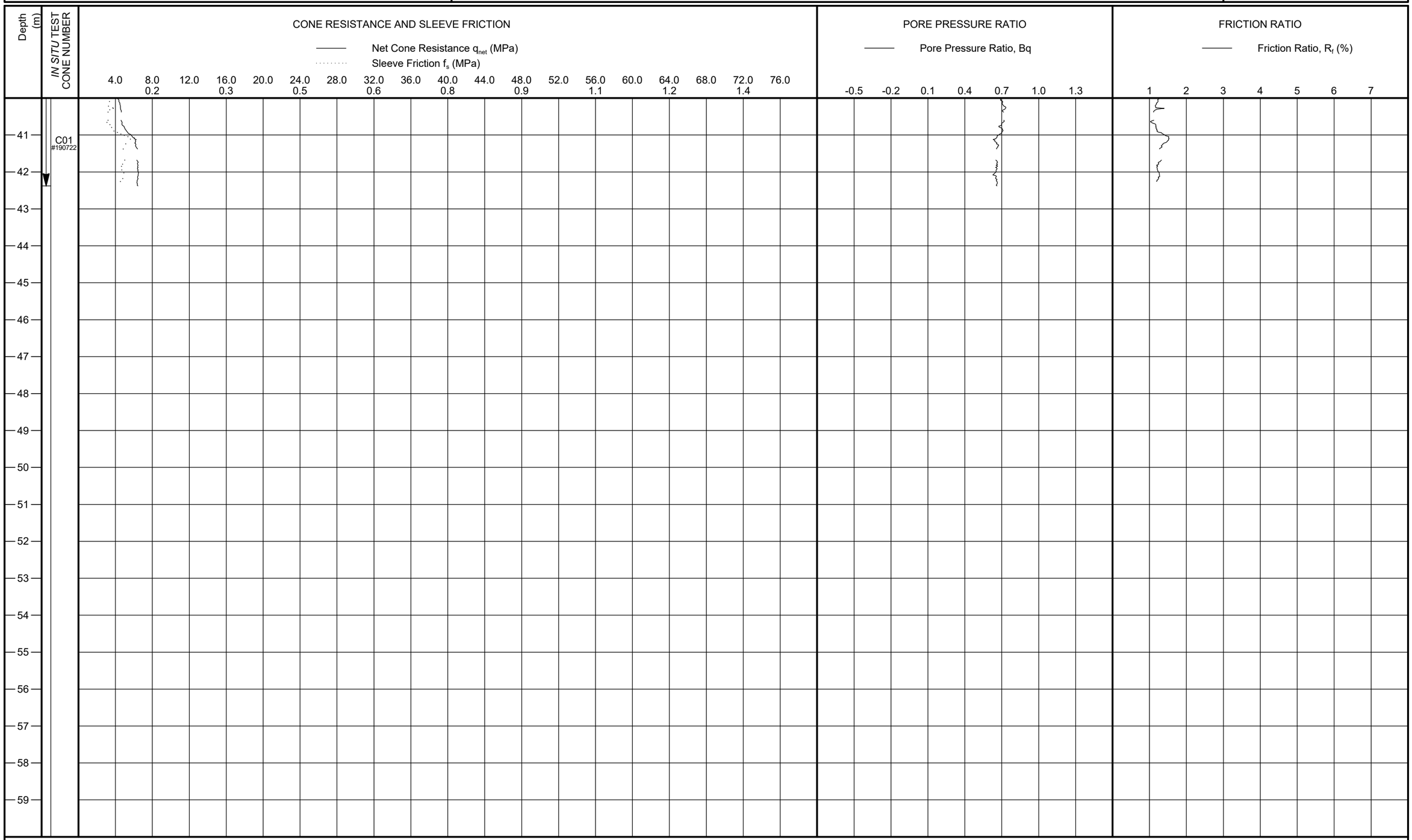
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
CC-7	20/12/2020	1490921mE	4915540mN	52.36m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

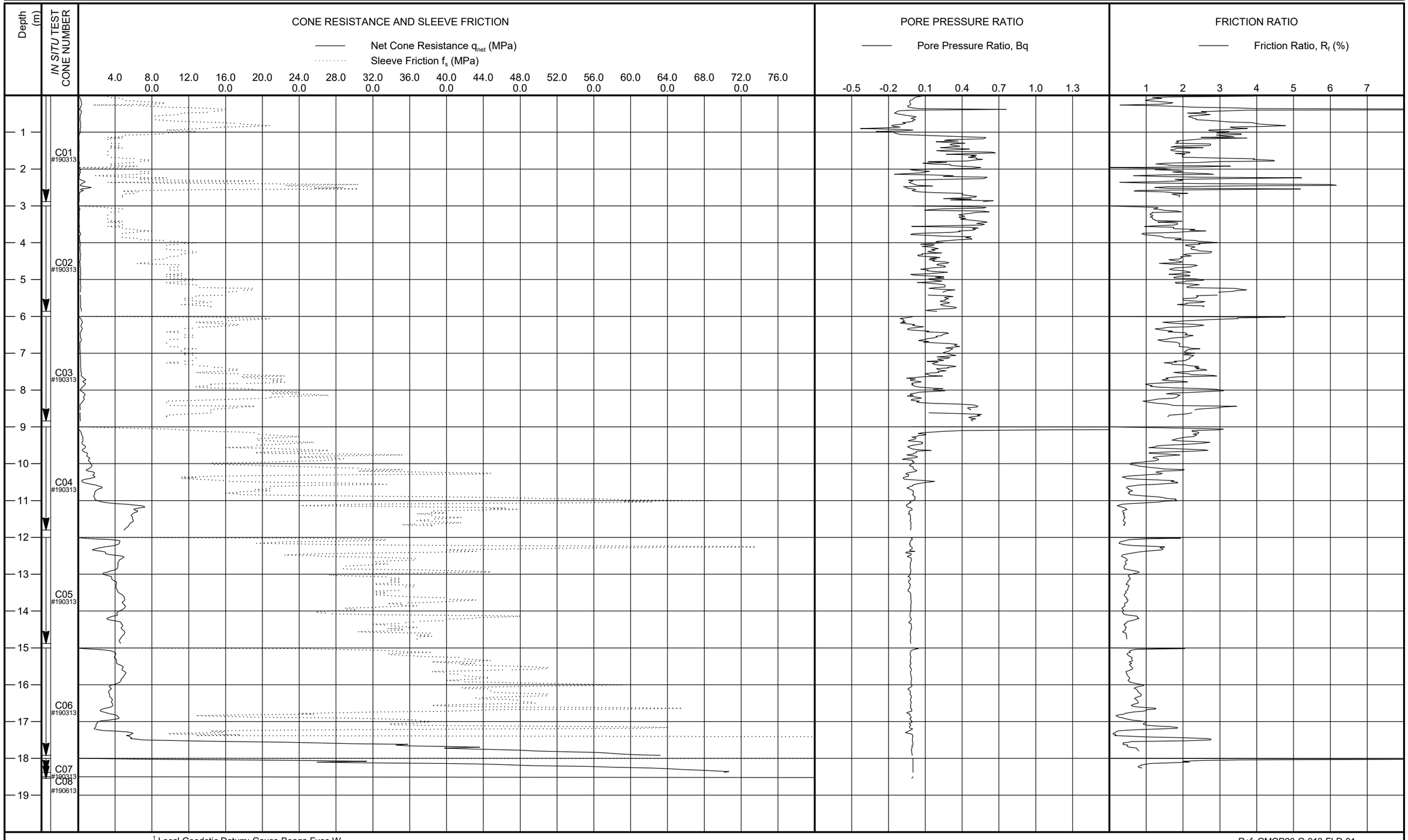
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-1	17/12/2020	1494401mE	4915166mN	36.46m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

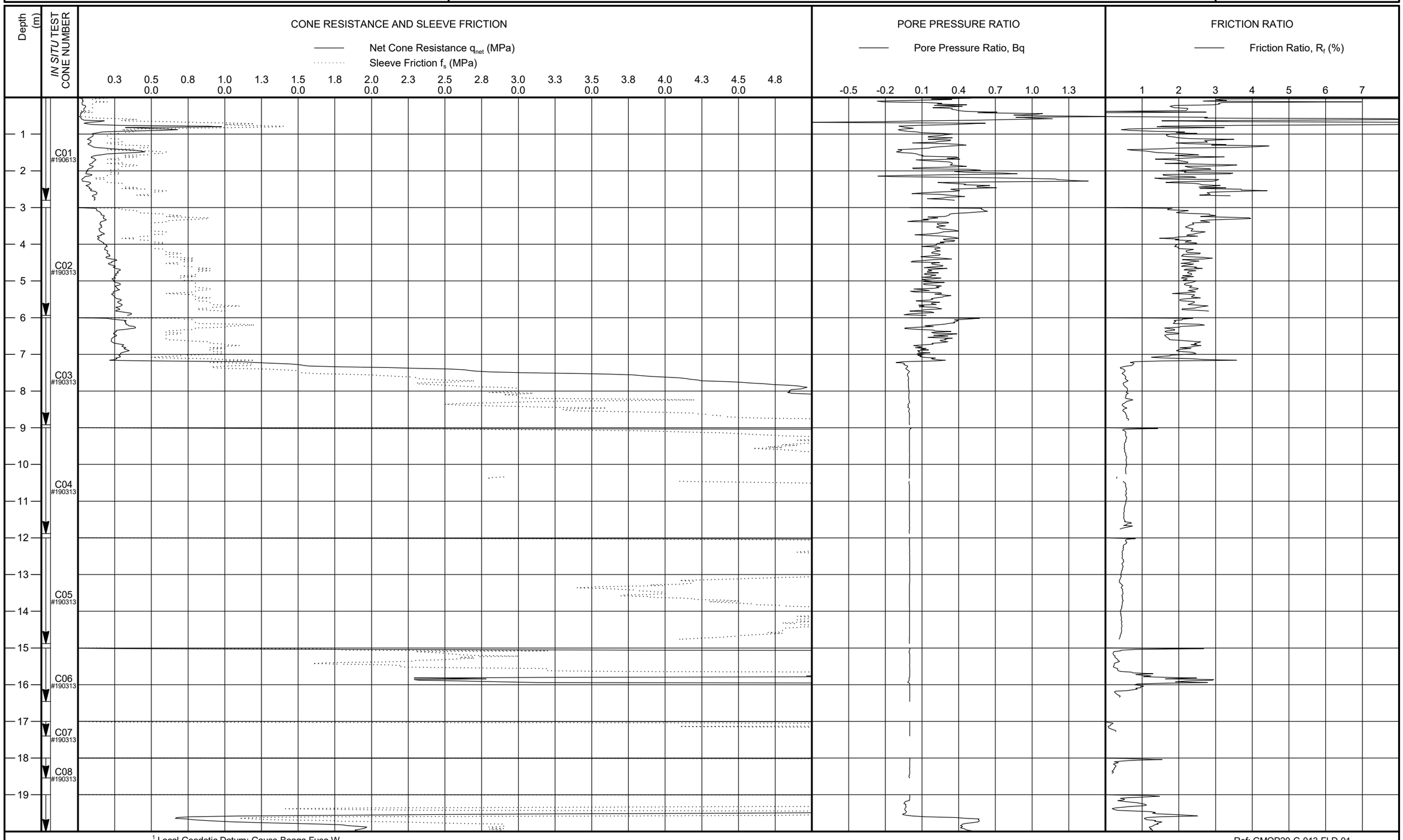
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

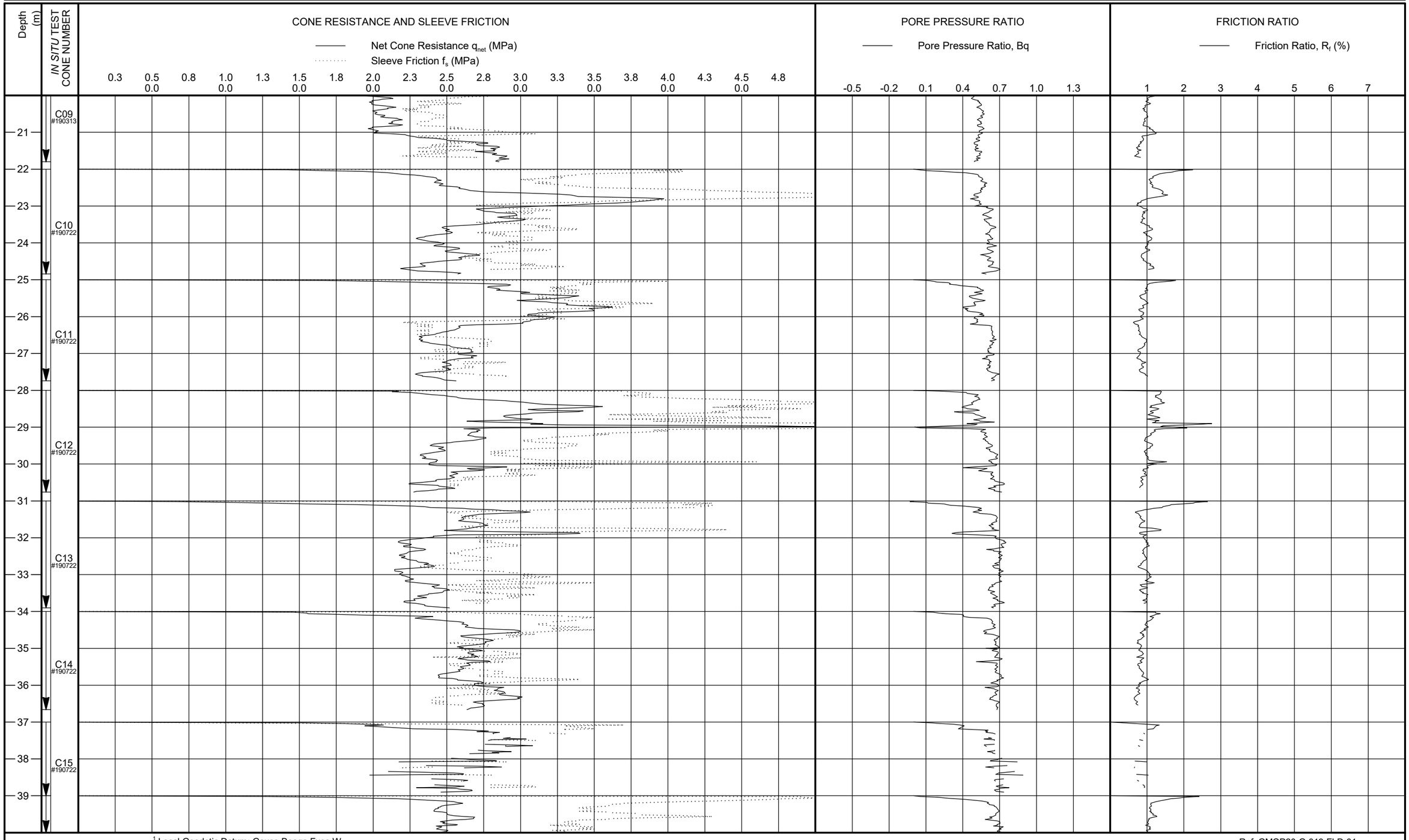
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

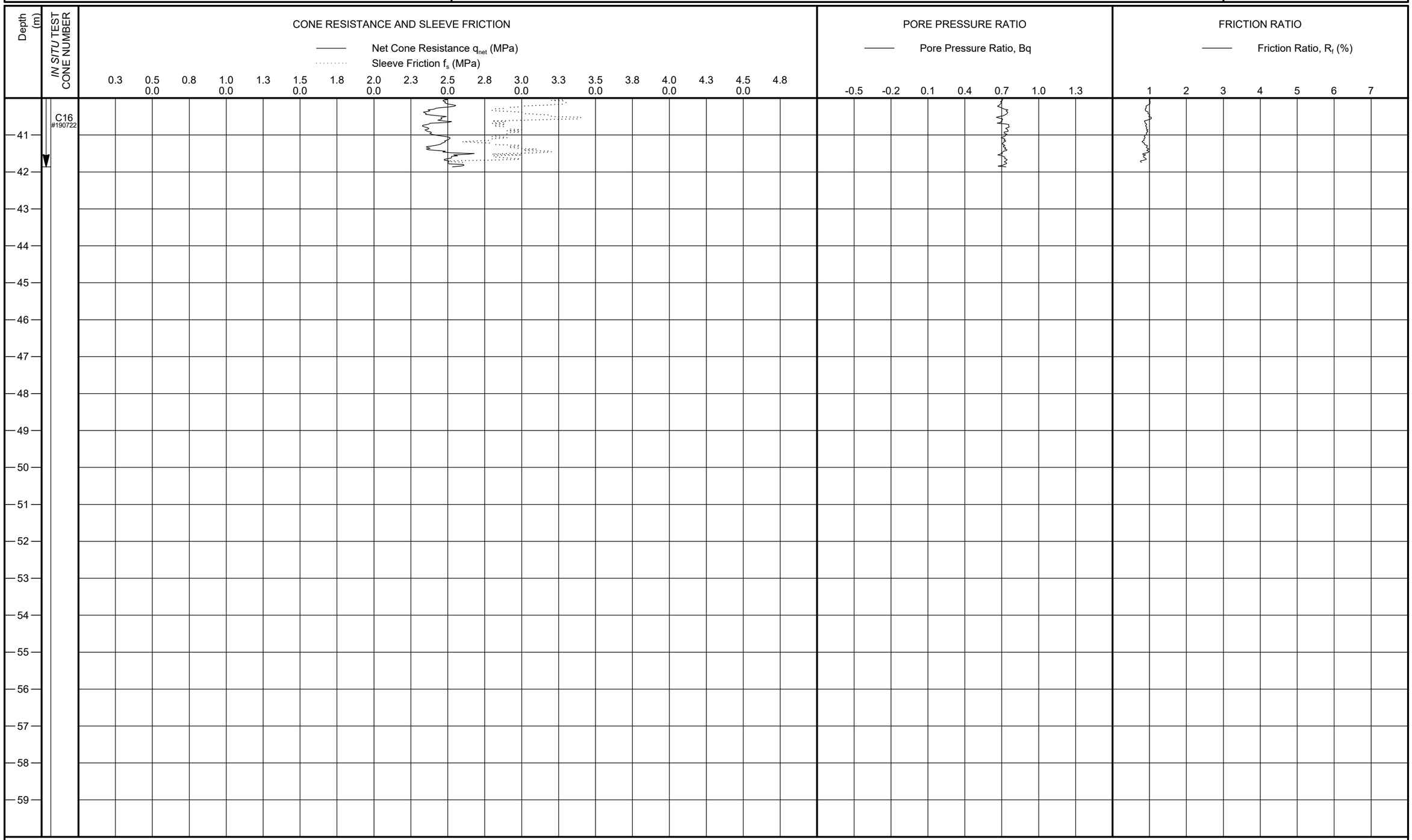
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-2	12/12/2020	1493464mE	4914953mN	52.66m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

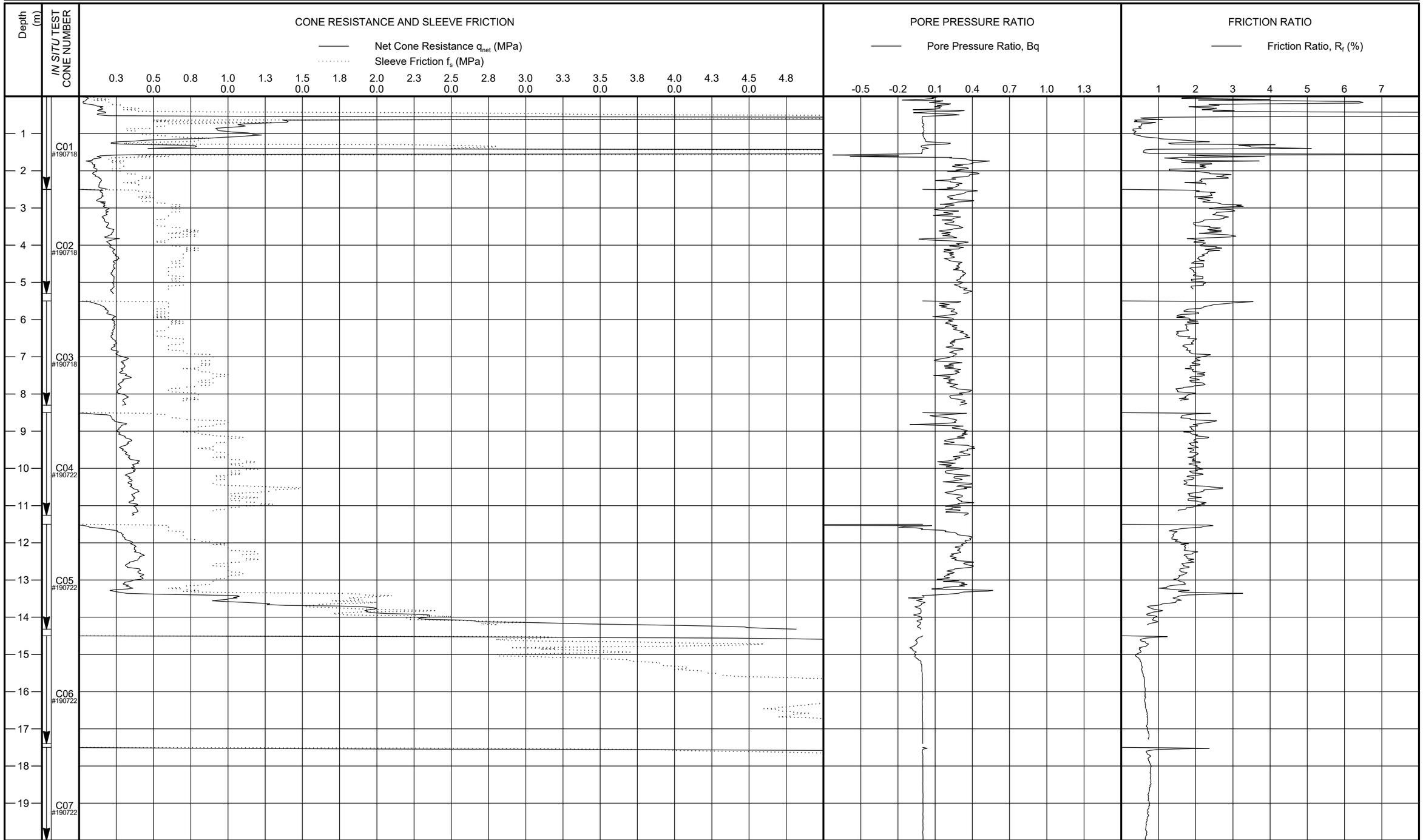
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-3	13/12/2020	1493382mE	4915273mN	42.01m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

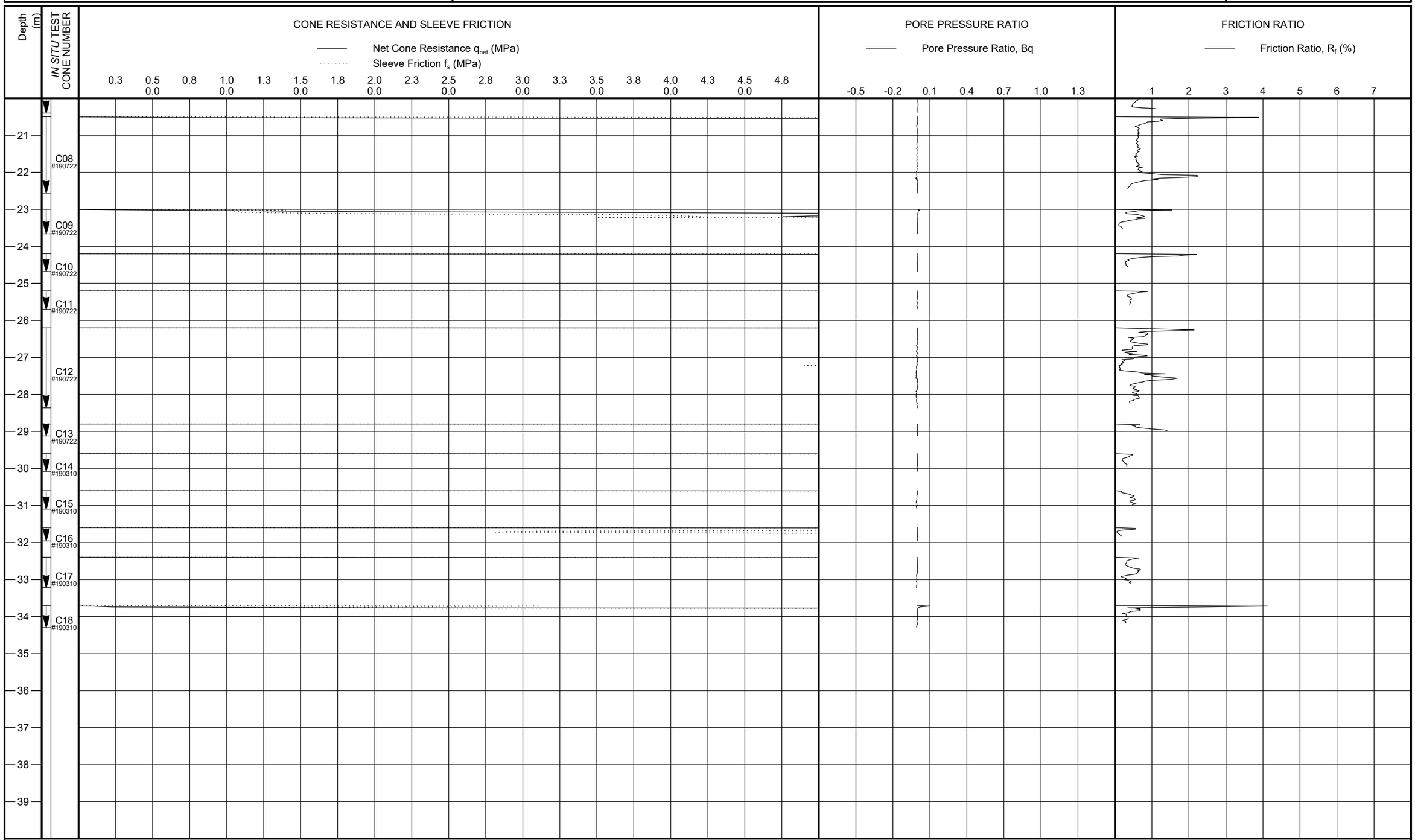
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-3	13/12/2020	1493382mE	4915273mN	42.01m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

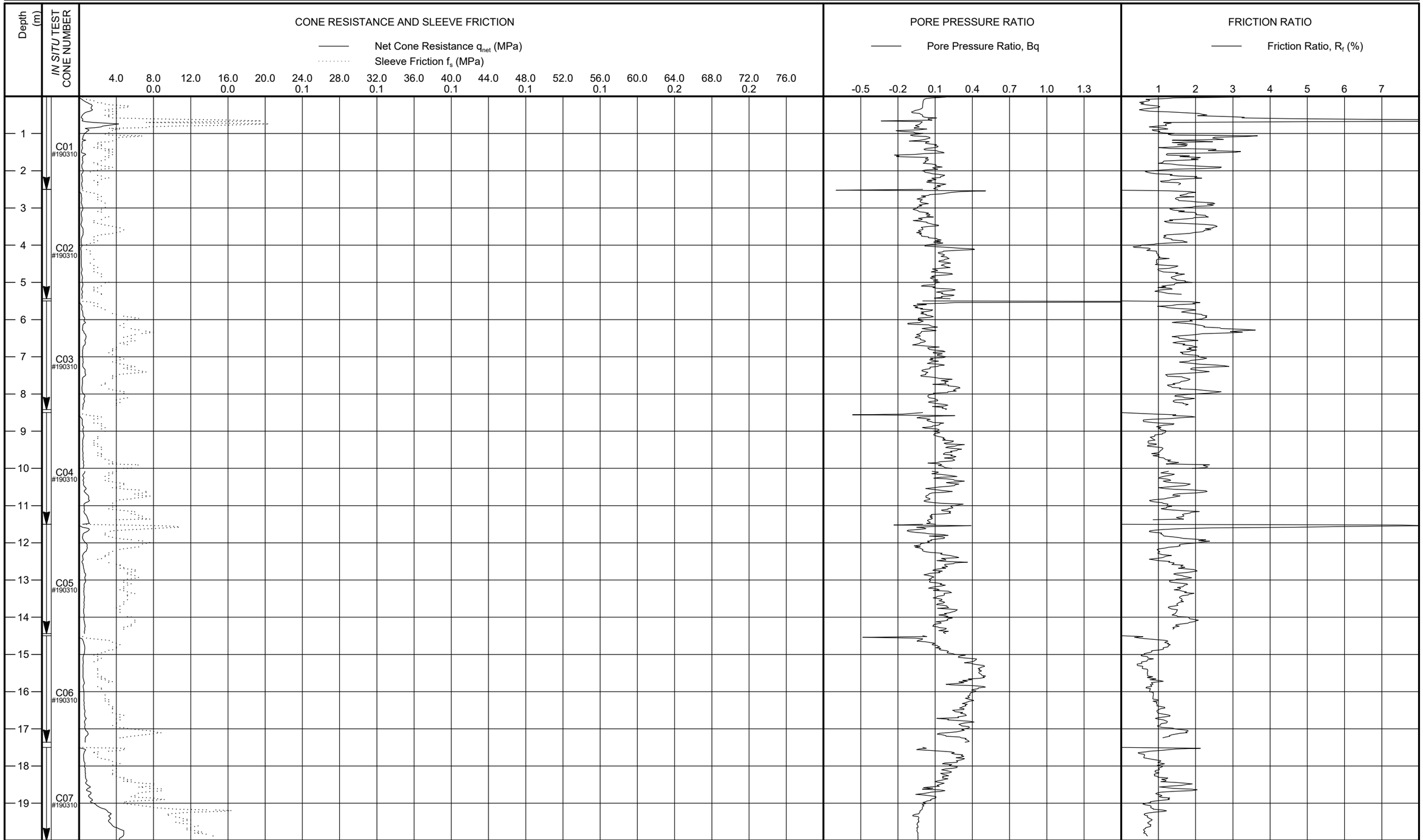
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

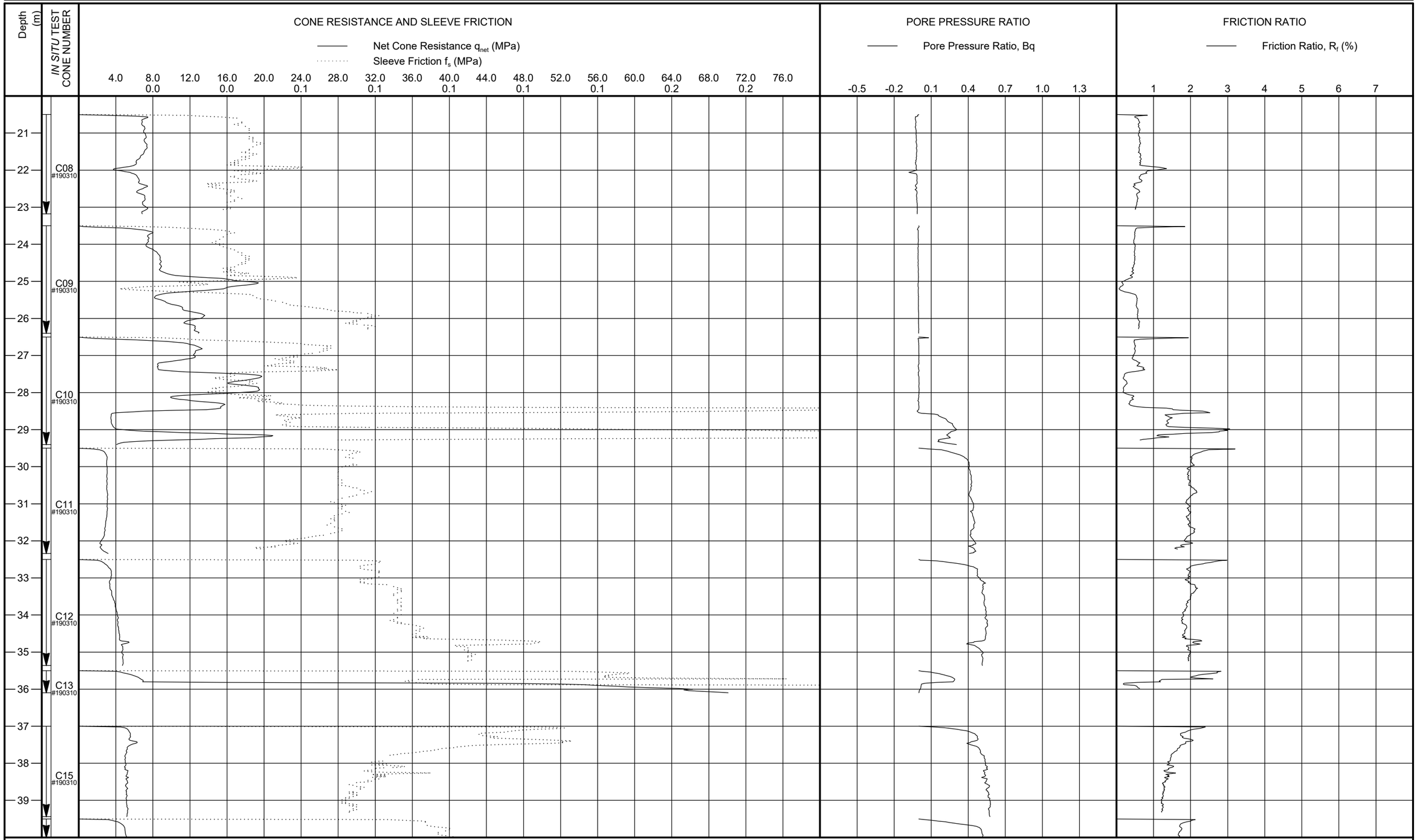
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

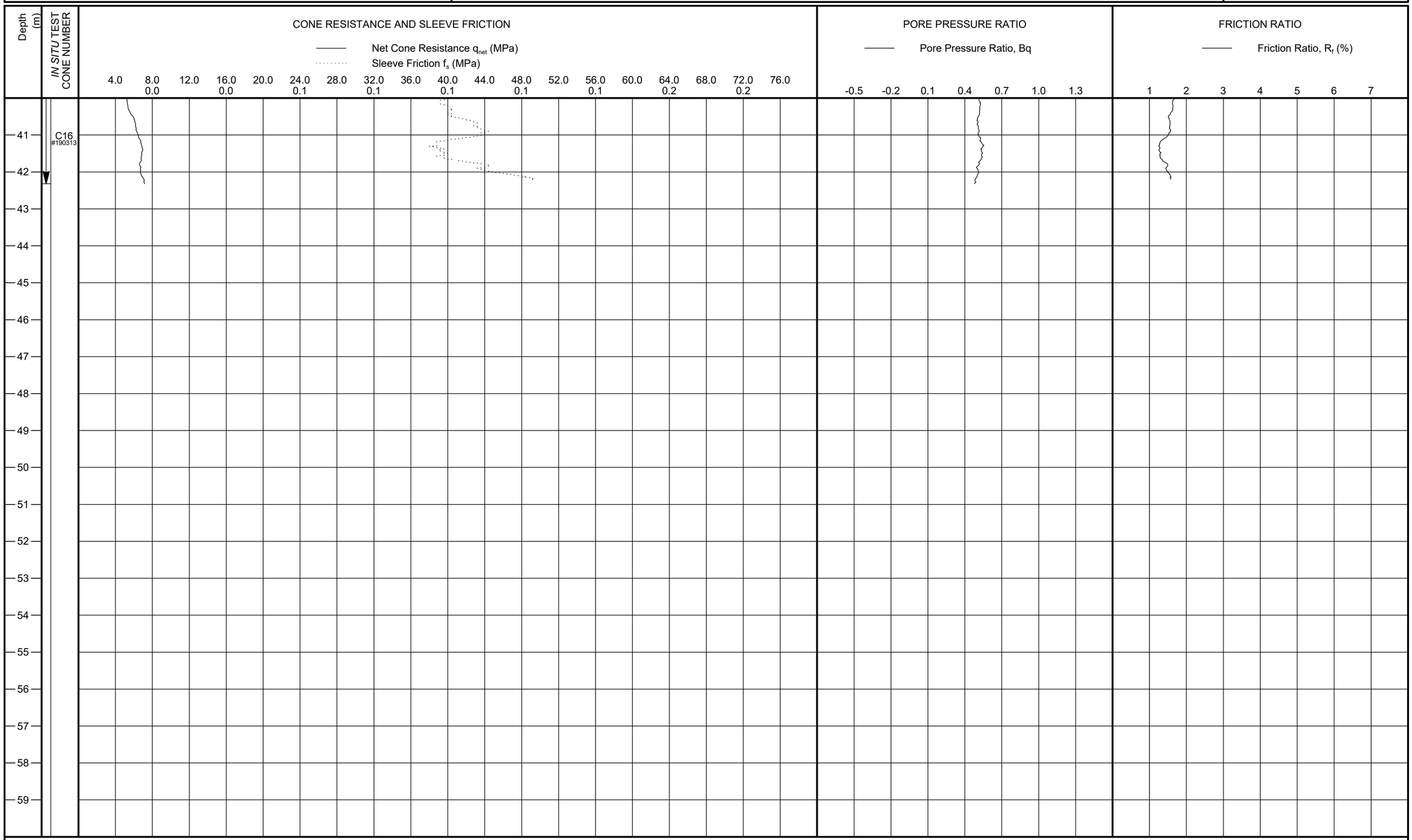
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-5	15/12/2020	1492799mE	4915775mN	30.96m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

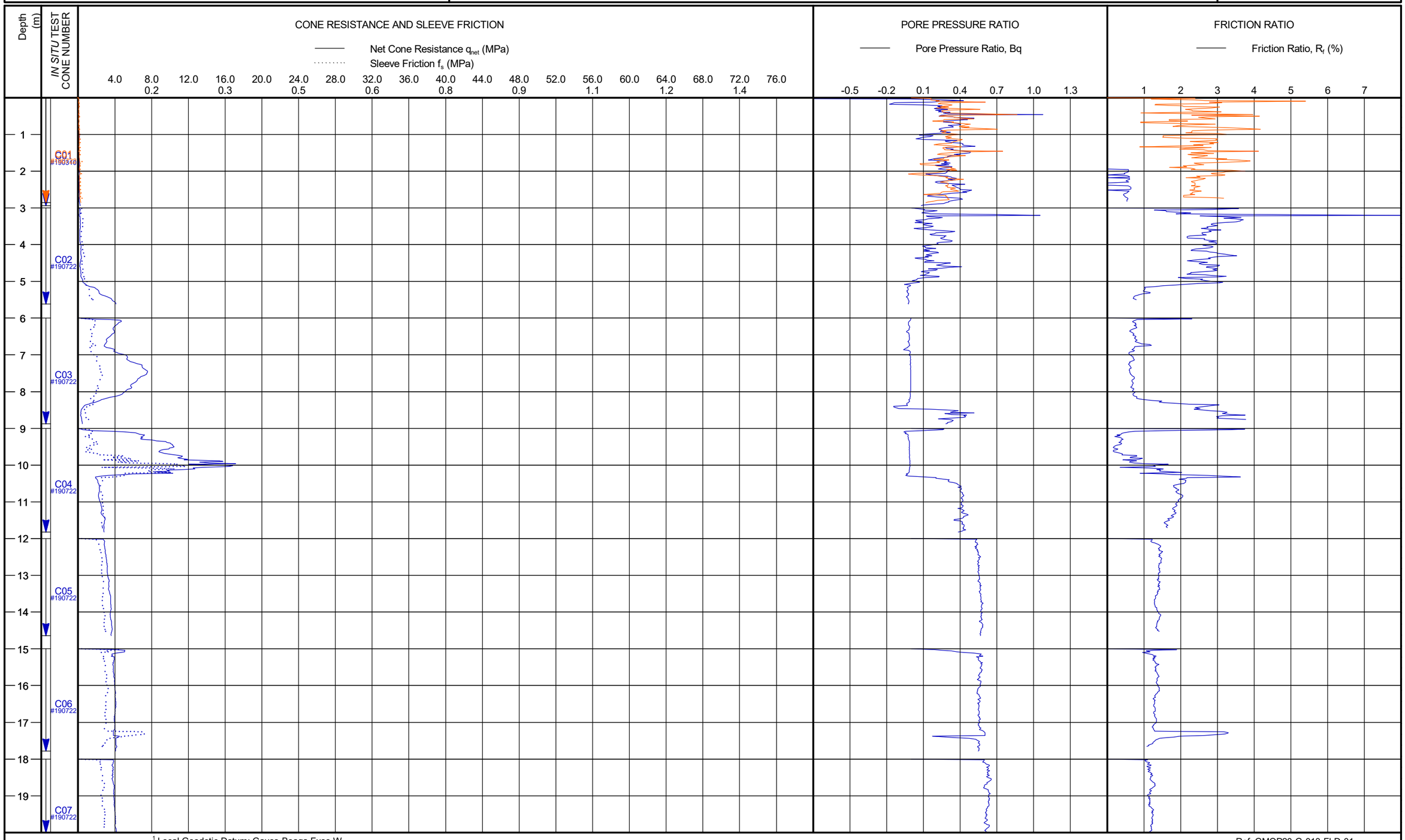
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

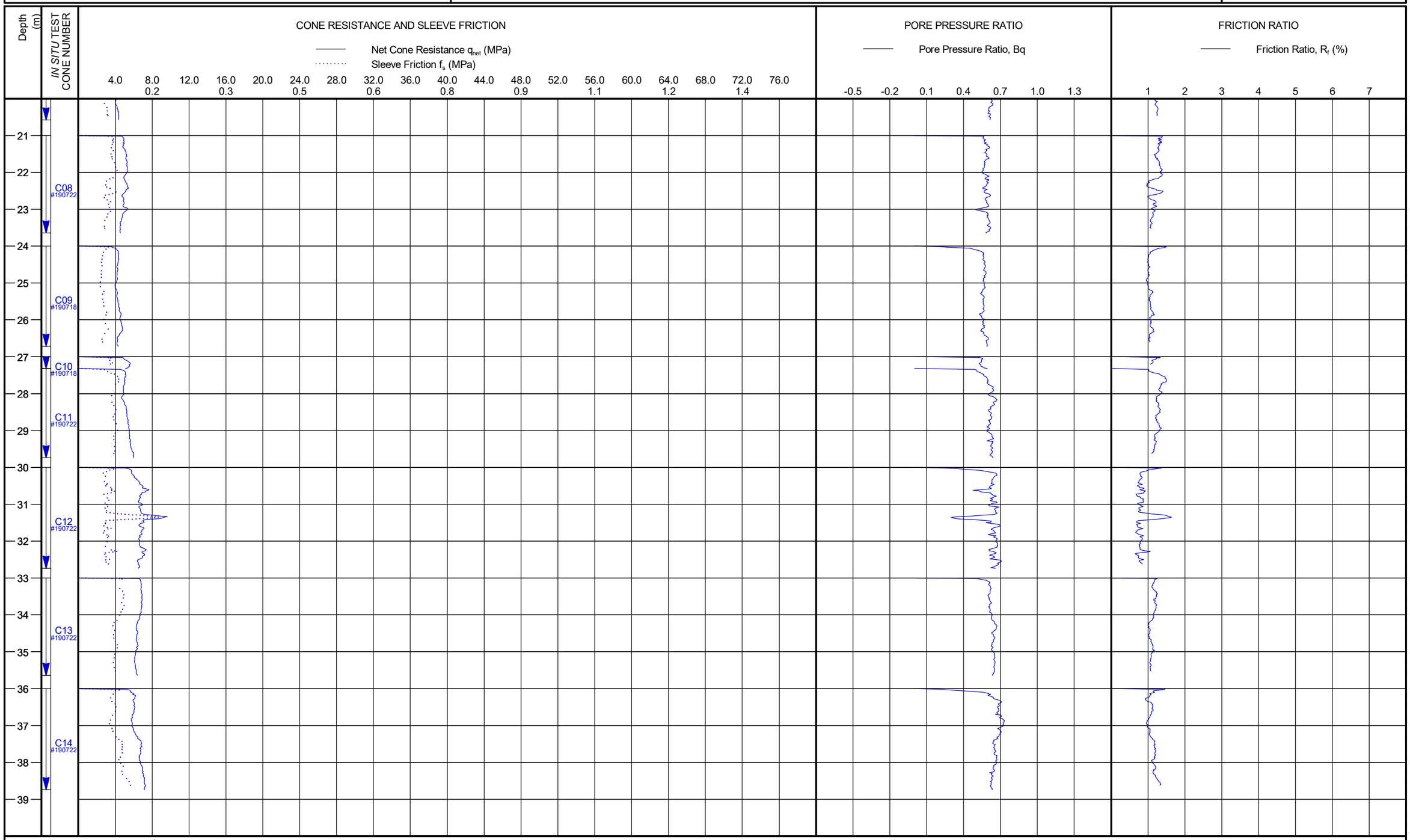
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

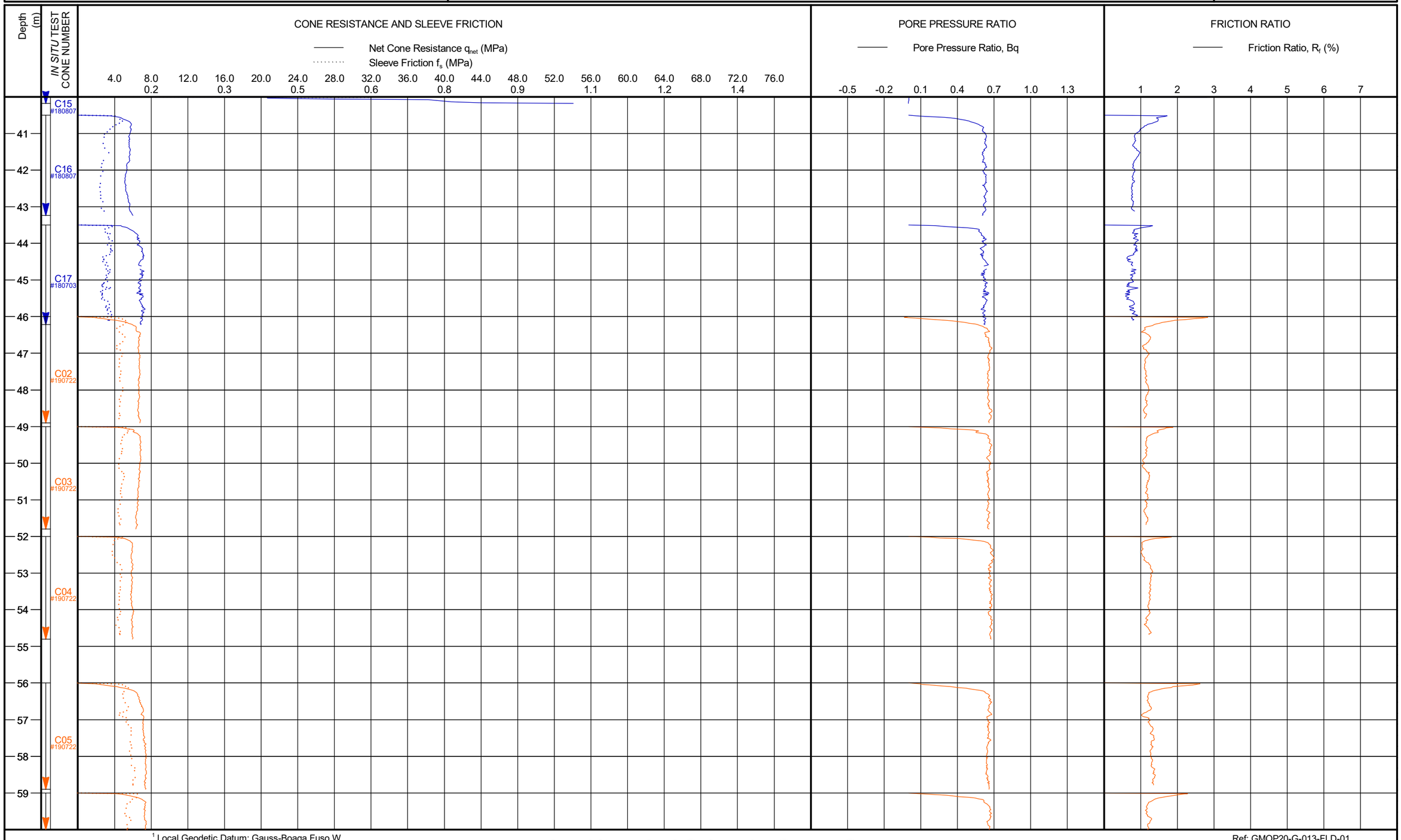
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

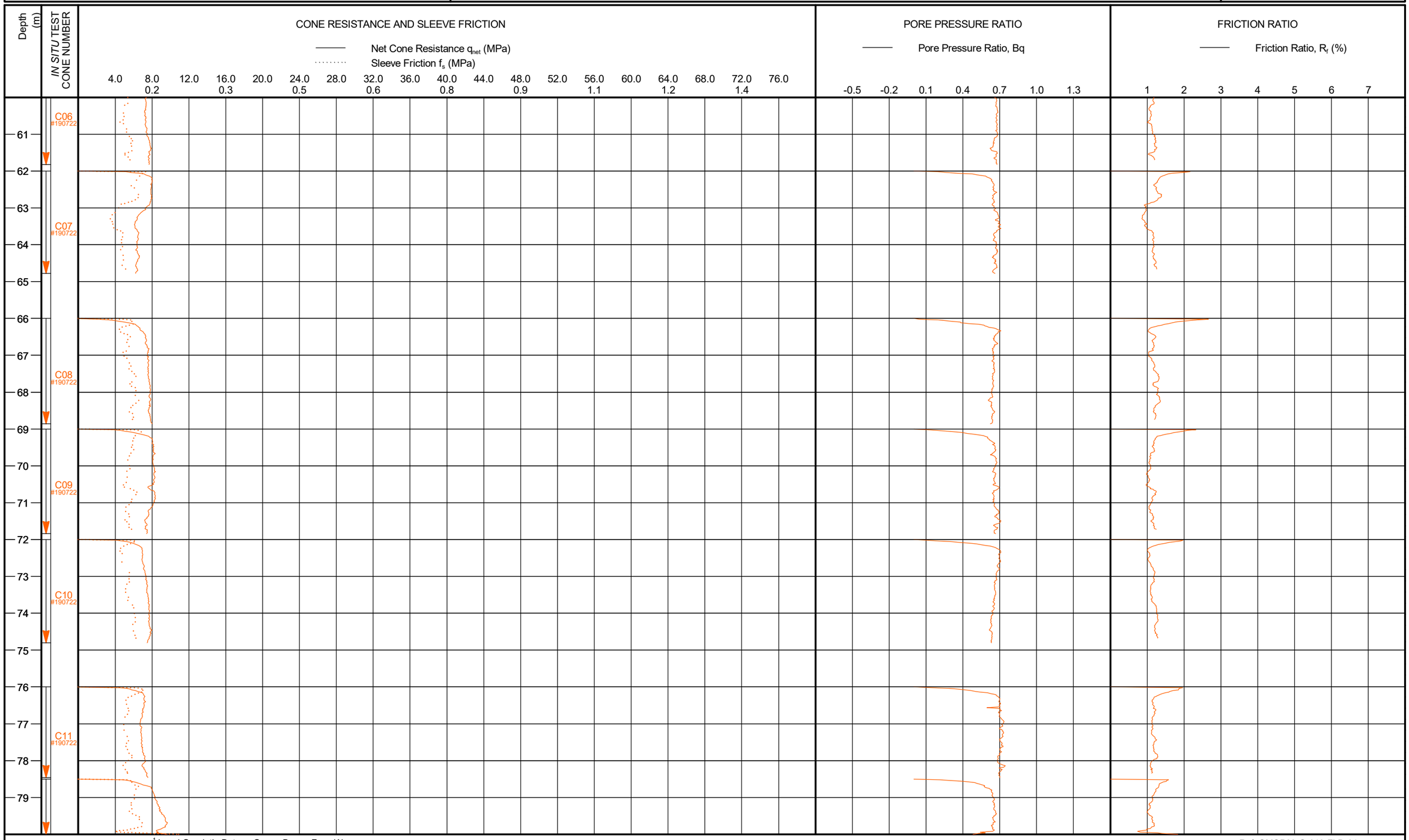
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

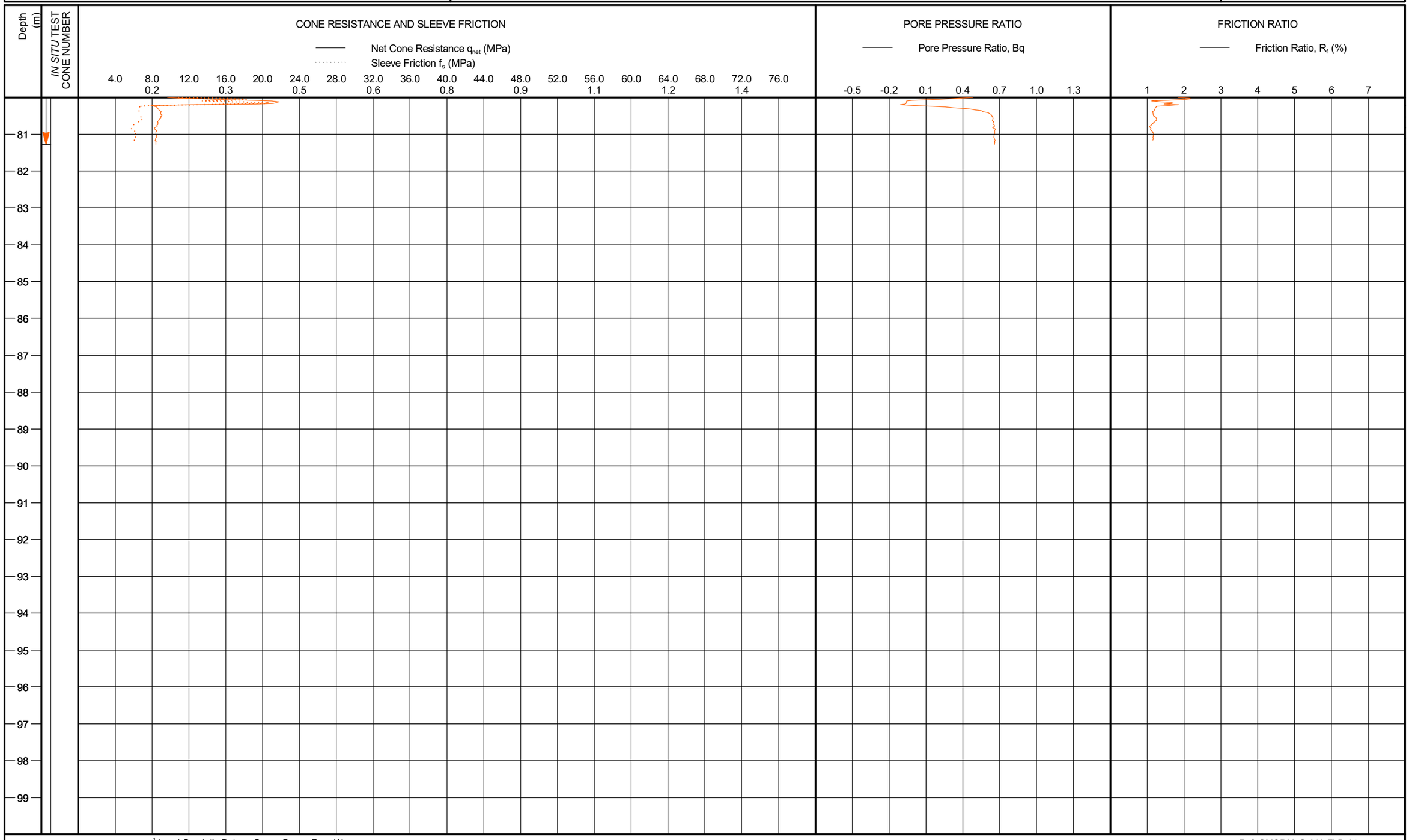
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-6	31/12/2020	1490971mE	4915538mN	50.31m
PCPT-6A	03/01/2020	1490973mE	4915540mN	50.43m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

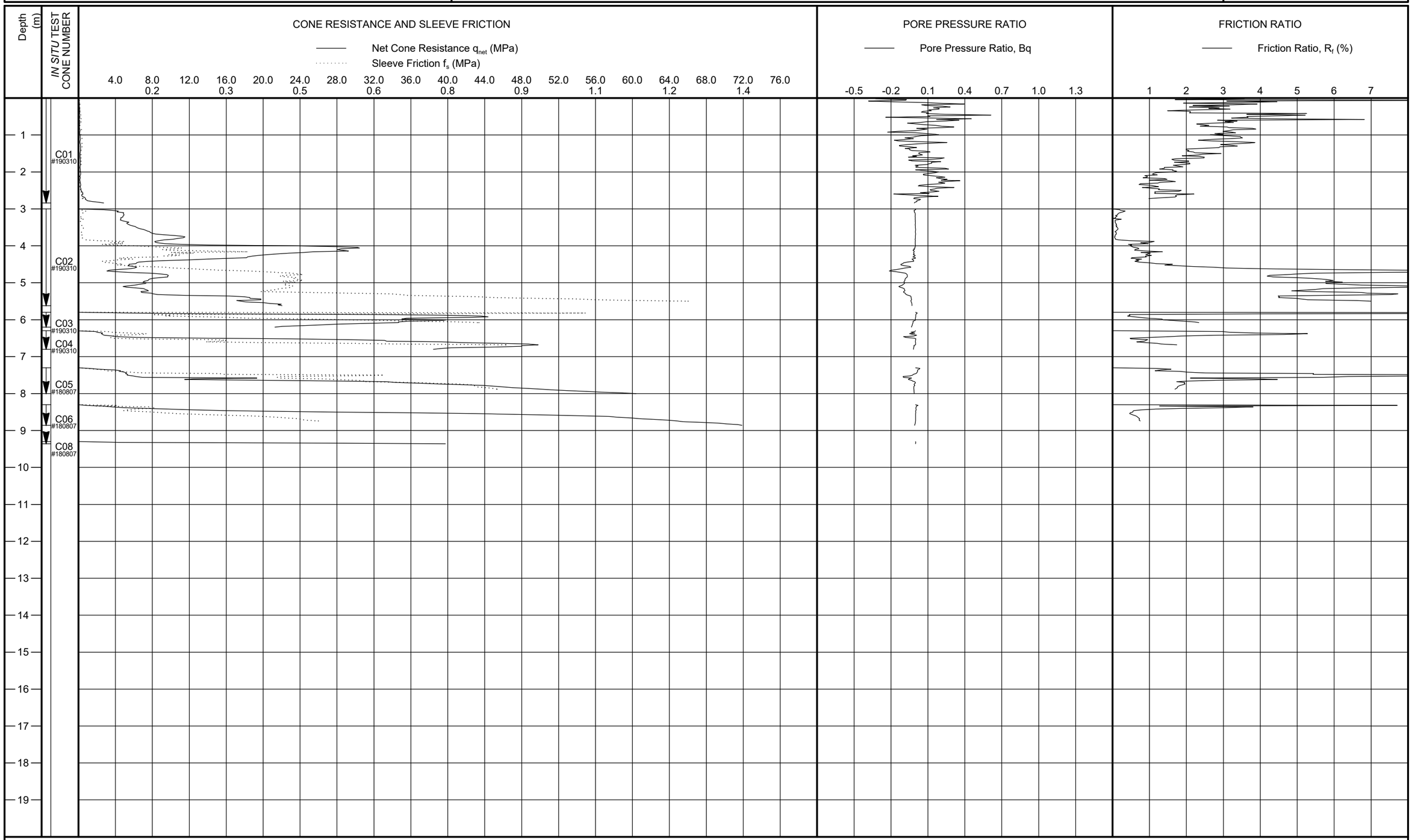
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-7	19/12/2020	1491770mE	4915317mN	52.56m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

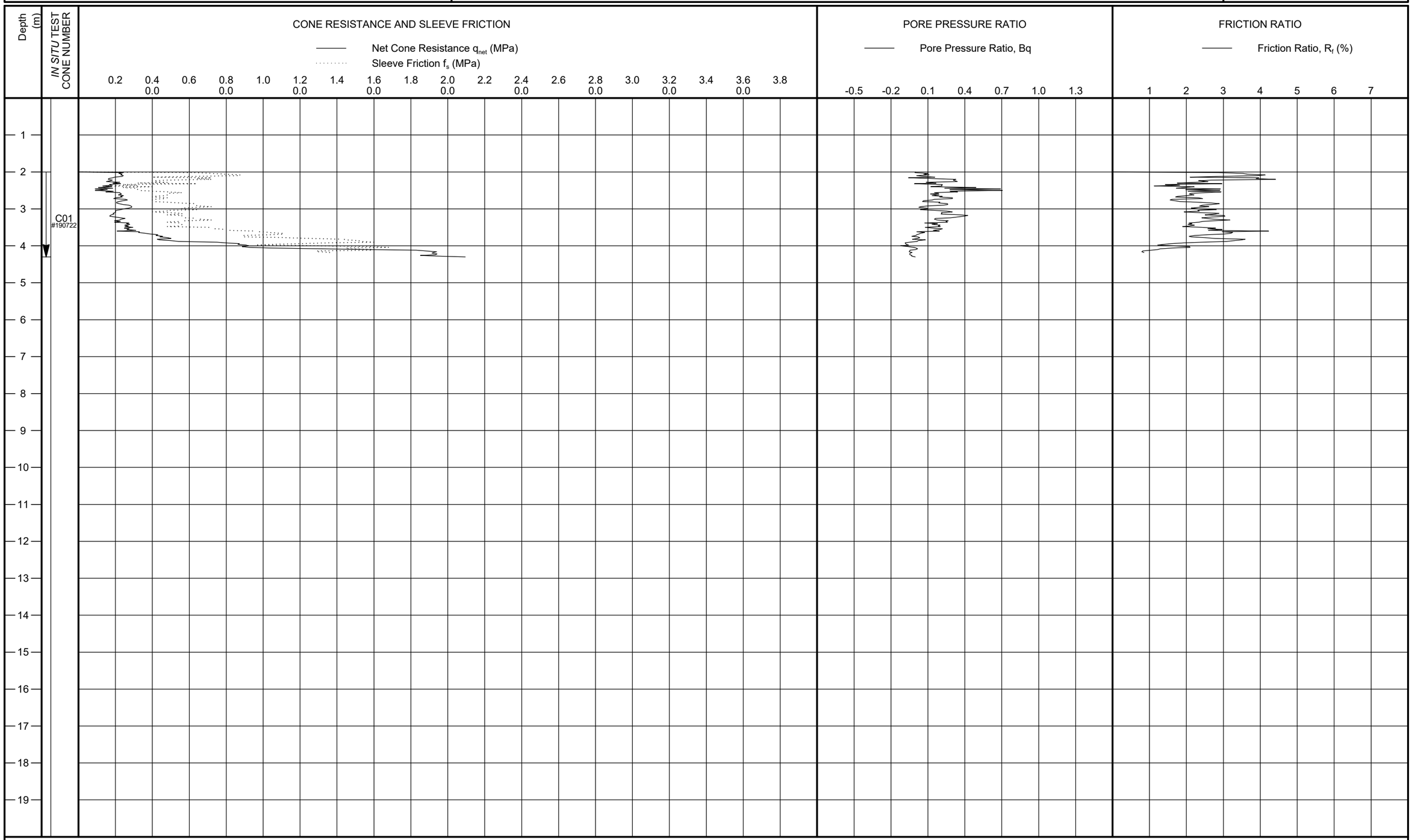
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8	23/12/2020	1493948mE	4914839mN	54.26m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

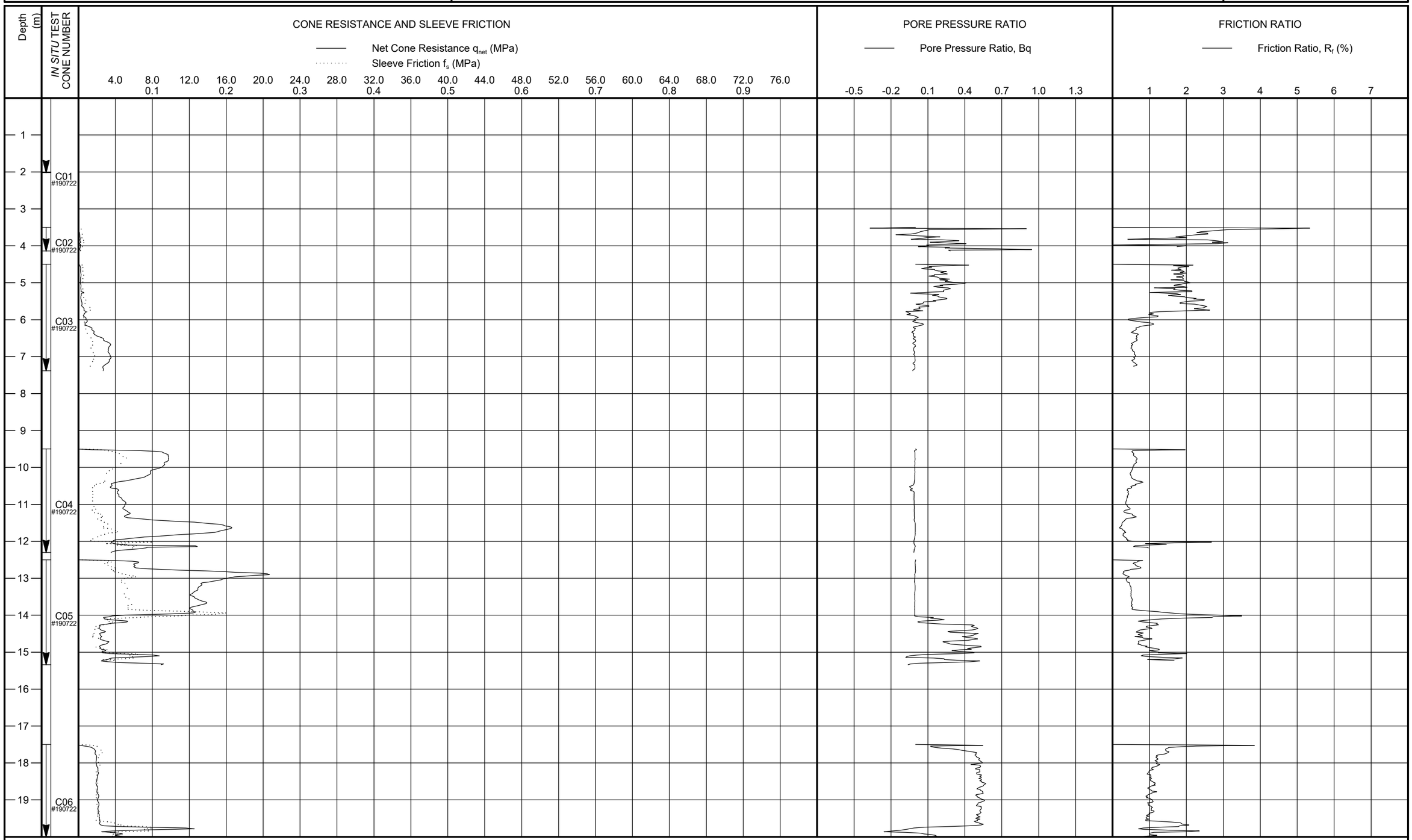
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

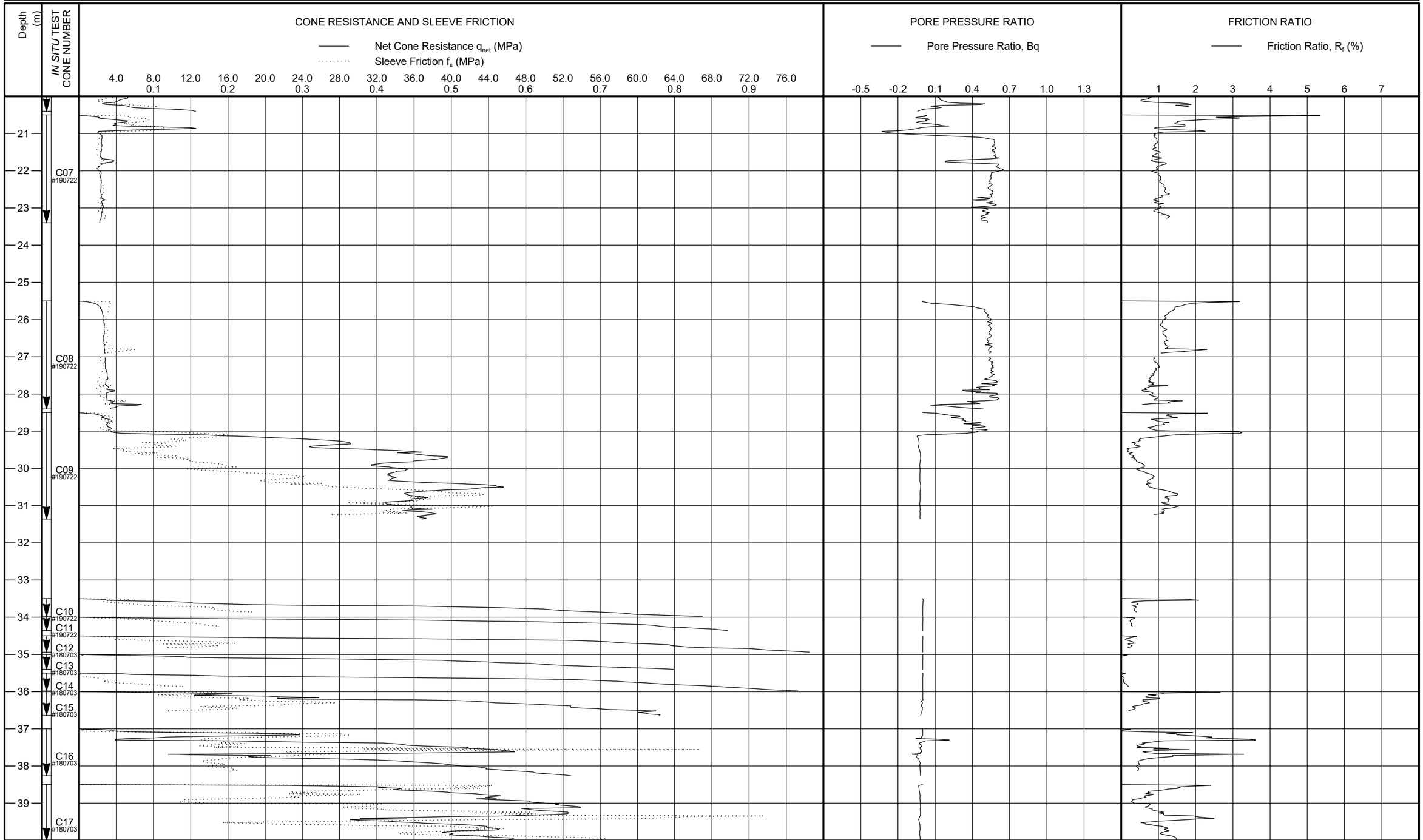
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE



[1] Local Geodetic Datum: Gauss-Boaga Fuso W

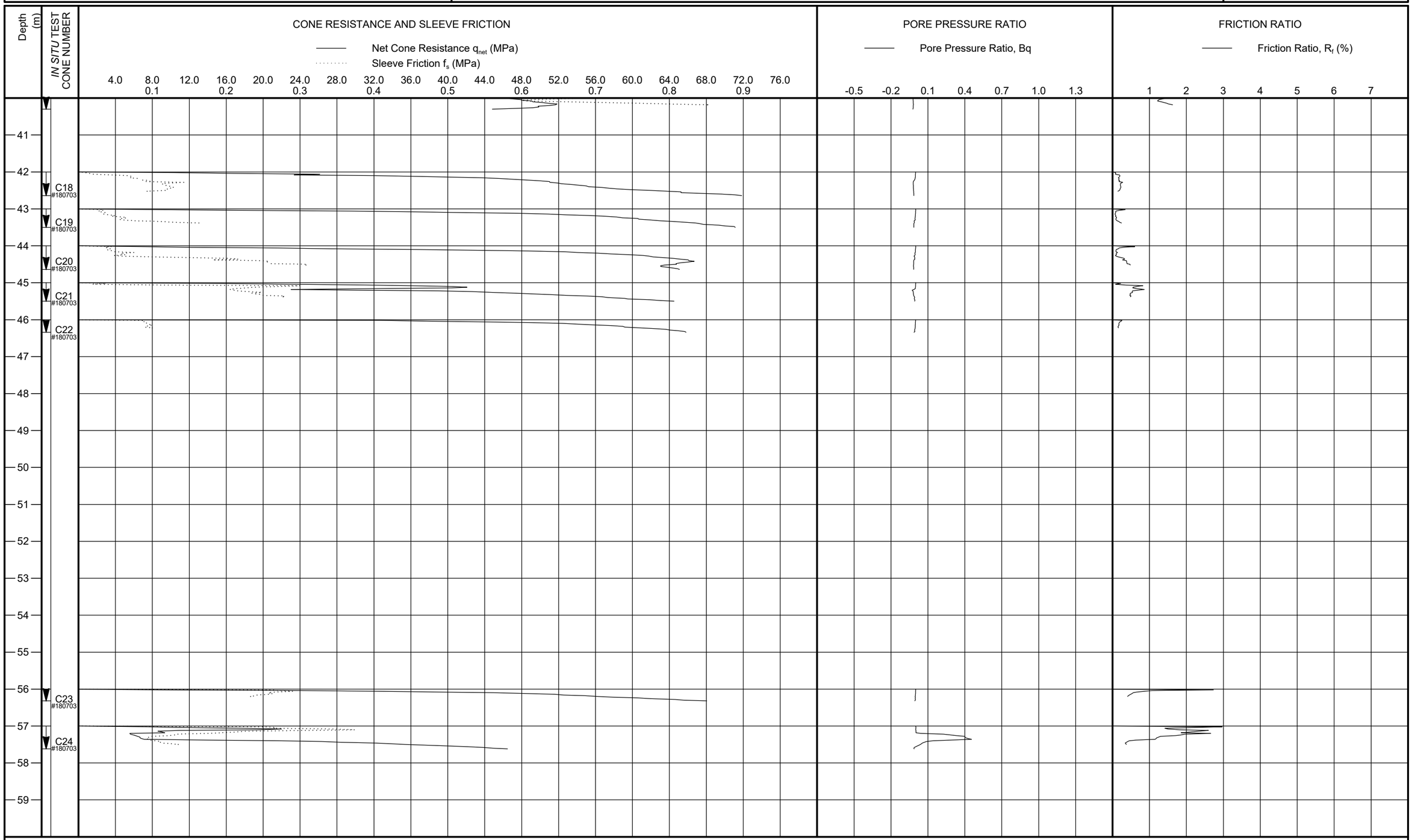
[2] Water Depth: LAT

DERIVED PCPT RESULTS

Client:	TECHNITAL S.p.A and Modimar S.r.l
Project Name:	Genoa Port (PFTE)
Project No.:	GMOP20-G-013
Location:	Genoa Port

Borehole No.:	Date Commenced:	Coordinates[1]:		Water Depth[2]:
PCPT-8A	04/01/2021	1493947mE	4914843mN	52.06m

GEOQUIPMARINE



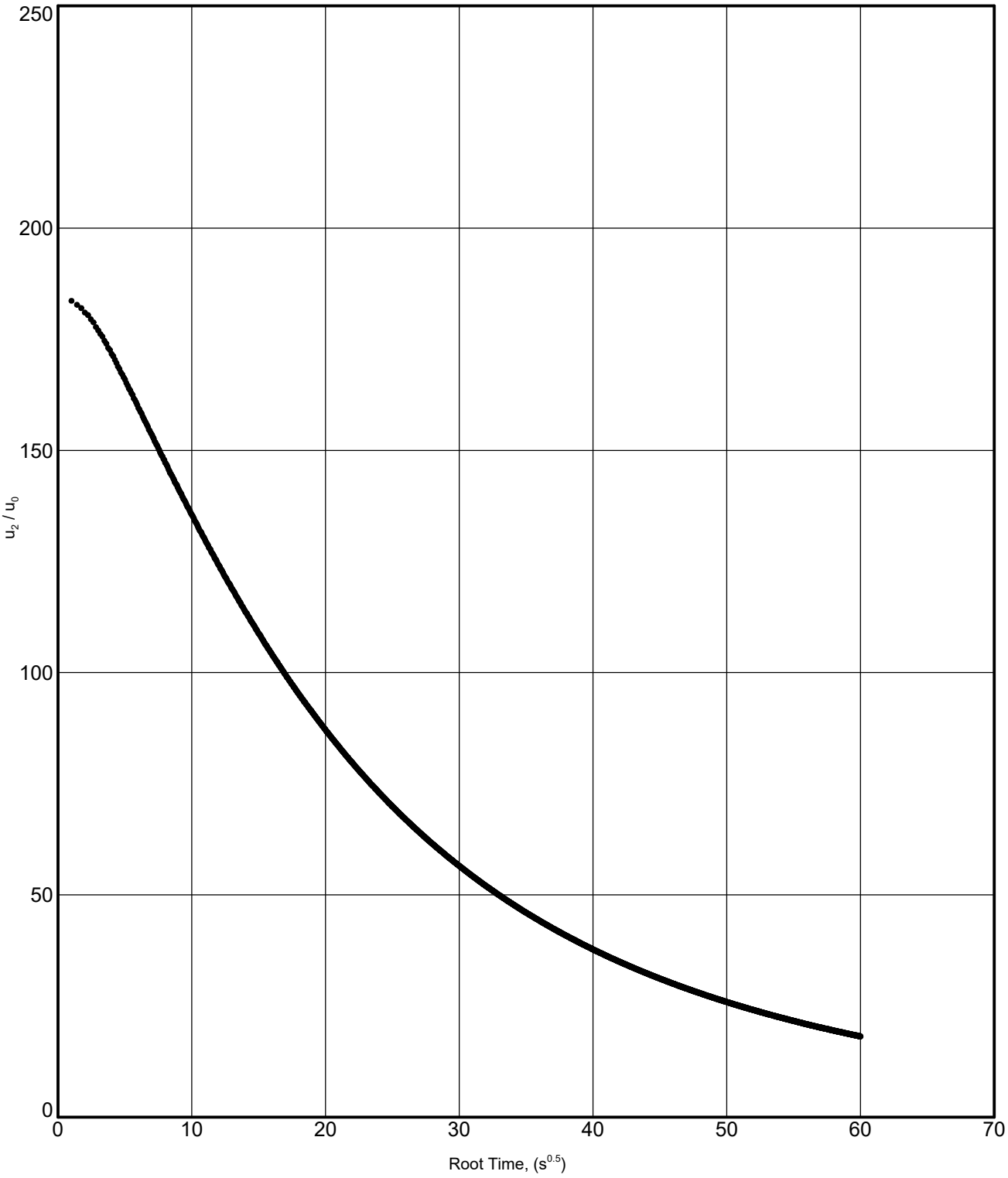
[1] Local Geodetic Datum: Gauss-Boaga Fuso W

[2] Water Depth: LAT

DERIVED PCPT RESULTS

Appendix A.5 Dissipation Test Results

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

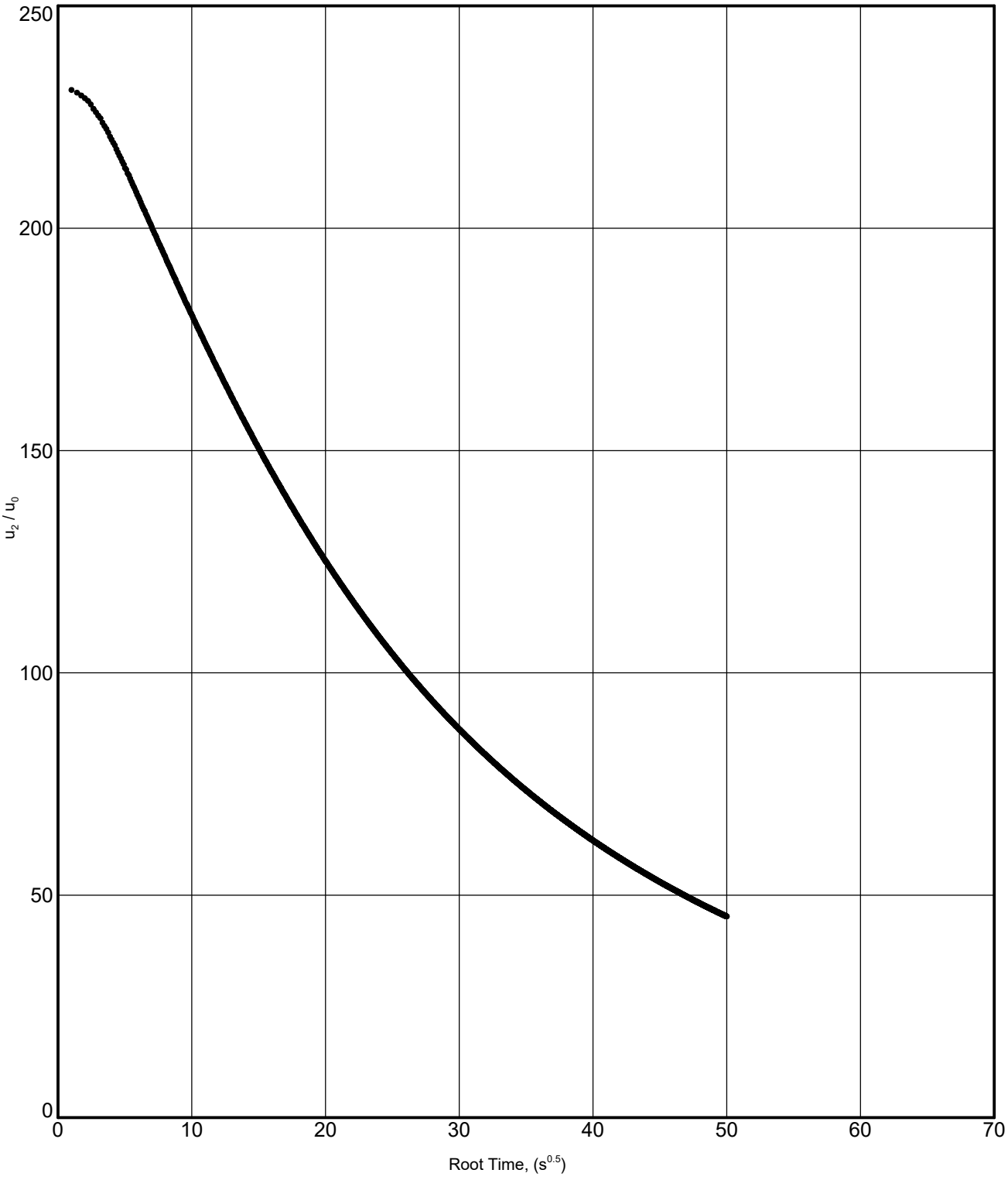


Borehole: CC-4	Test No.: C04	Borehole Depth: 49.00m	u_0: 20kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

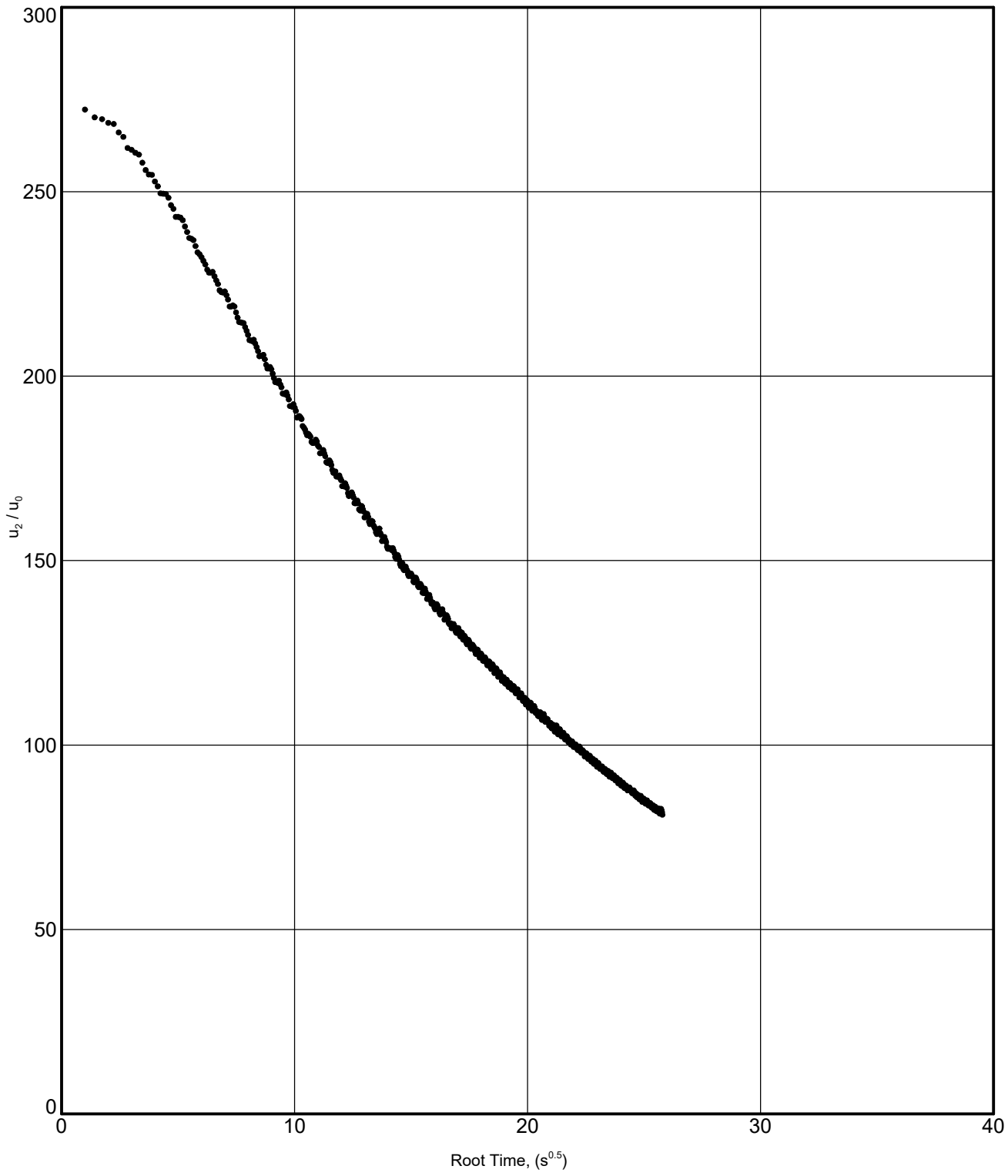


Borehole: CC-4	Test No.: C09	Borehole Depth: 65.00m	u_0: 20kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

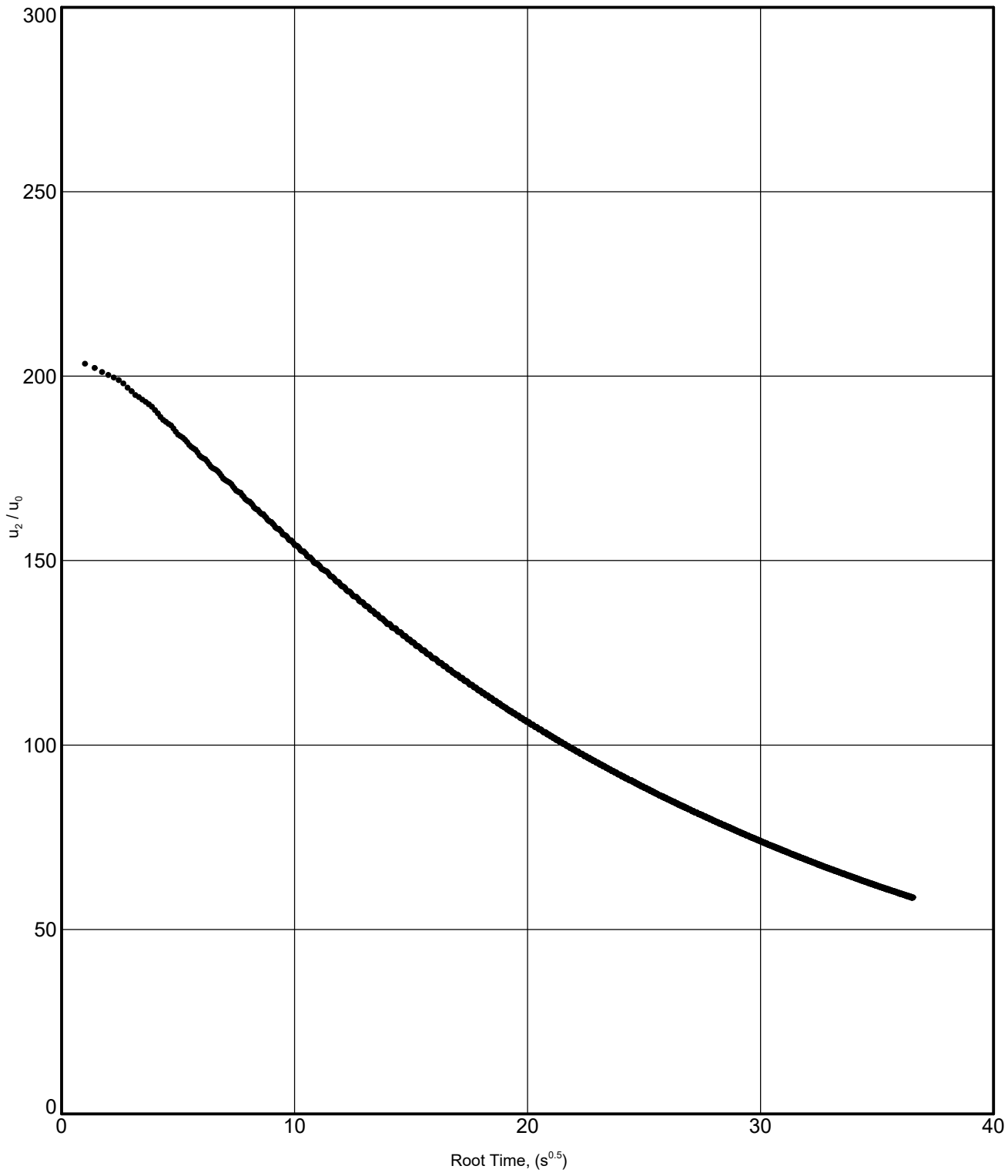


Borehole: CC-7	Test No.: C01	Borehole Depth: 40.70m	u_0: 10kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

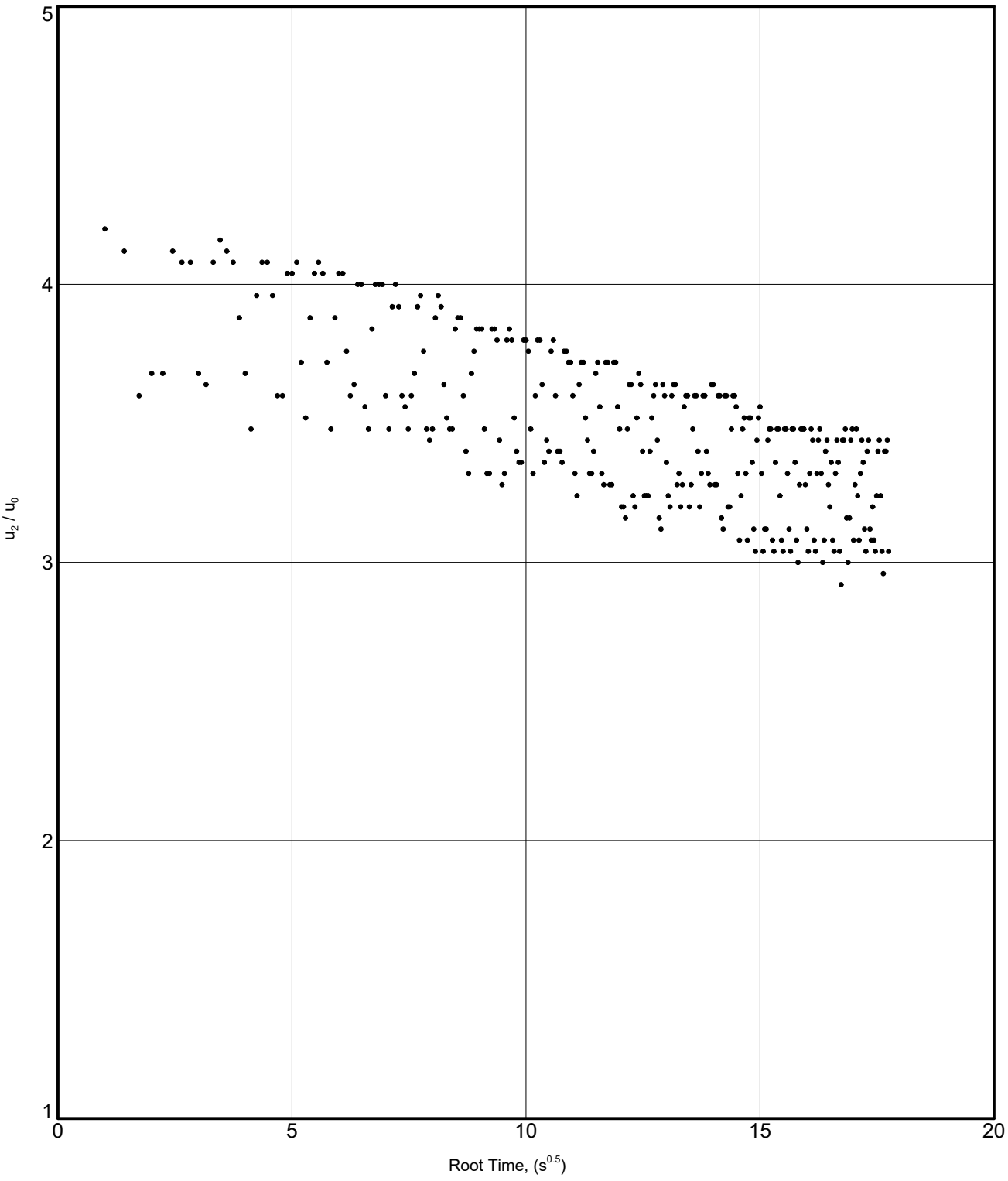


Borehole: CC-7	Test No.: C01	Borehole Depth: 41.70m	u_0: 20kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		



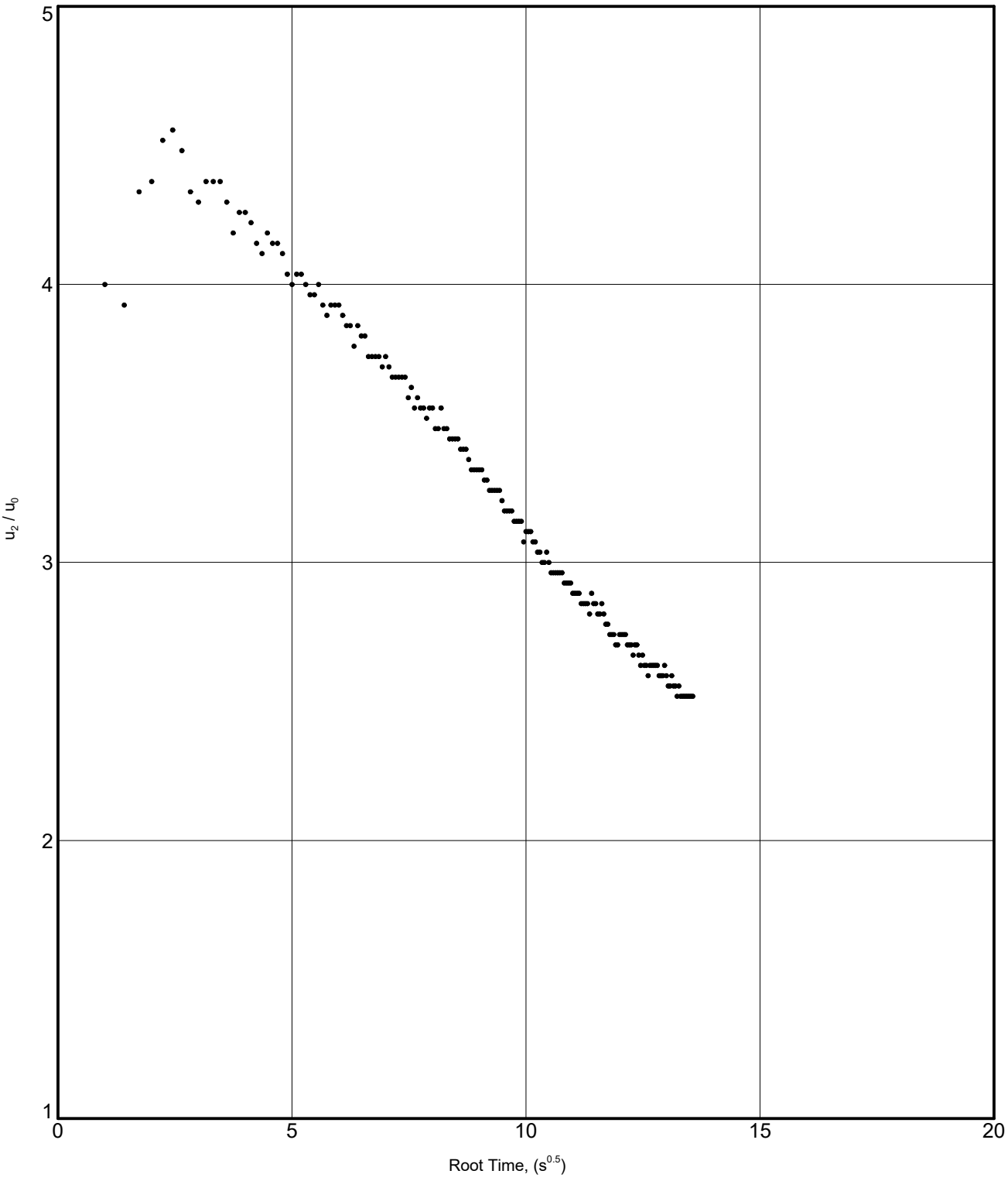
Borehole: PCPT-1	Test No.: C02	Borehole Depth: 5.50m	u_0: 25kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

GMOP_AGSLIB_REV01-00.GLBGraphGPH10-DISSIPATION TEST

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013		Location: Genoa Port	GEOQUIPMARINE

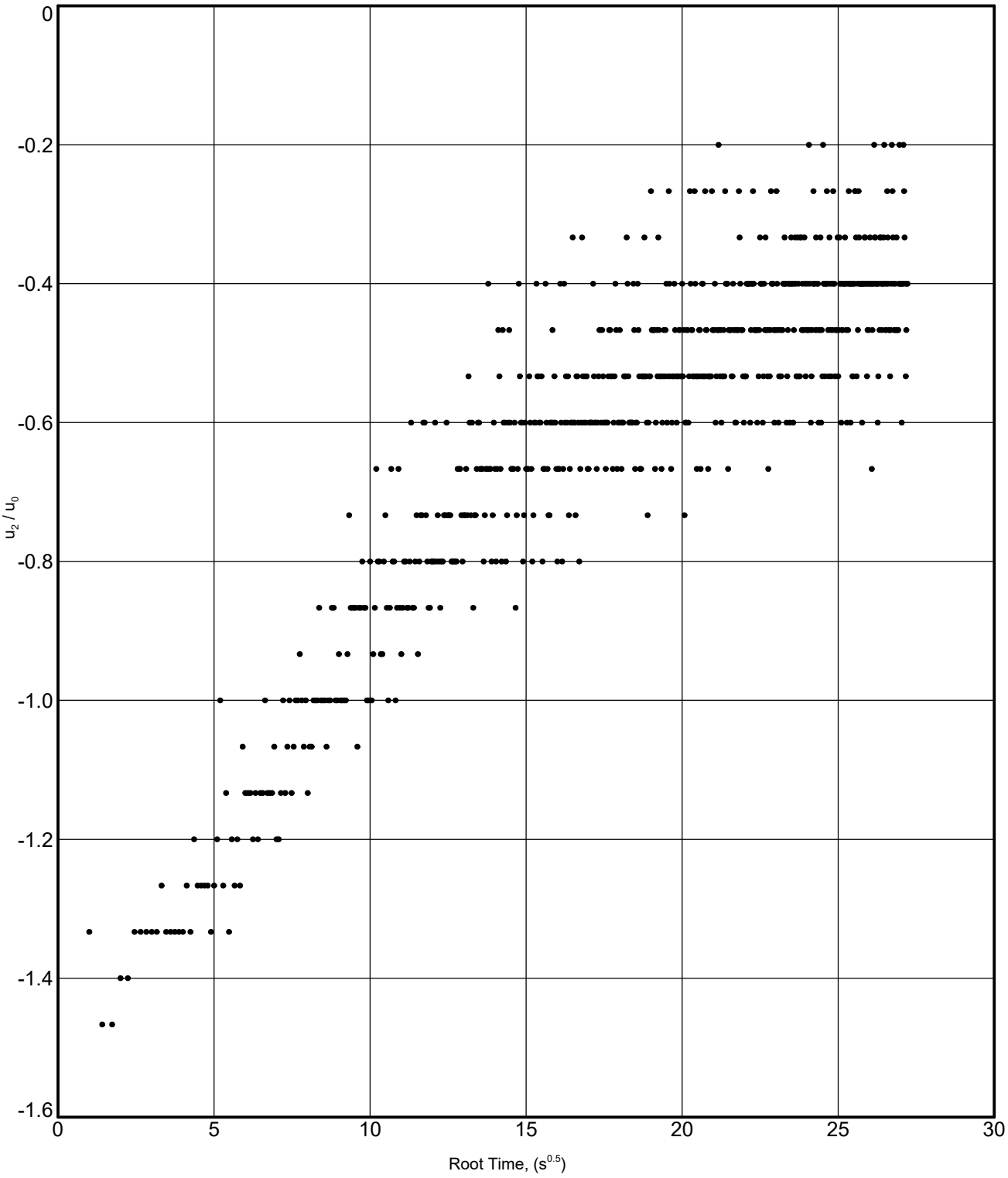


Borehole: PCPT-1	Test No.: C03	Borehole Depth: 8.70m	u_0: 27kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		



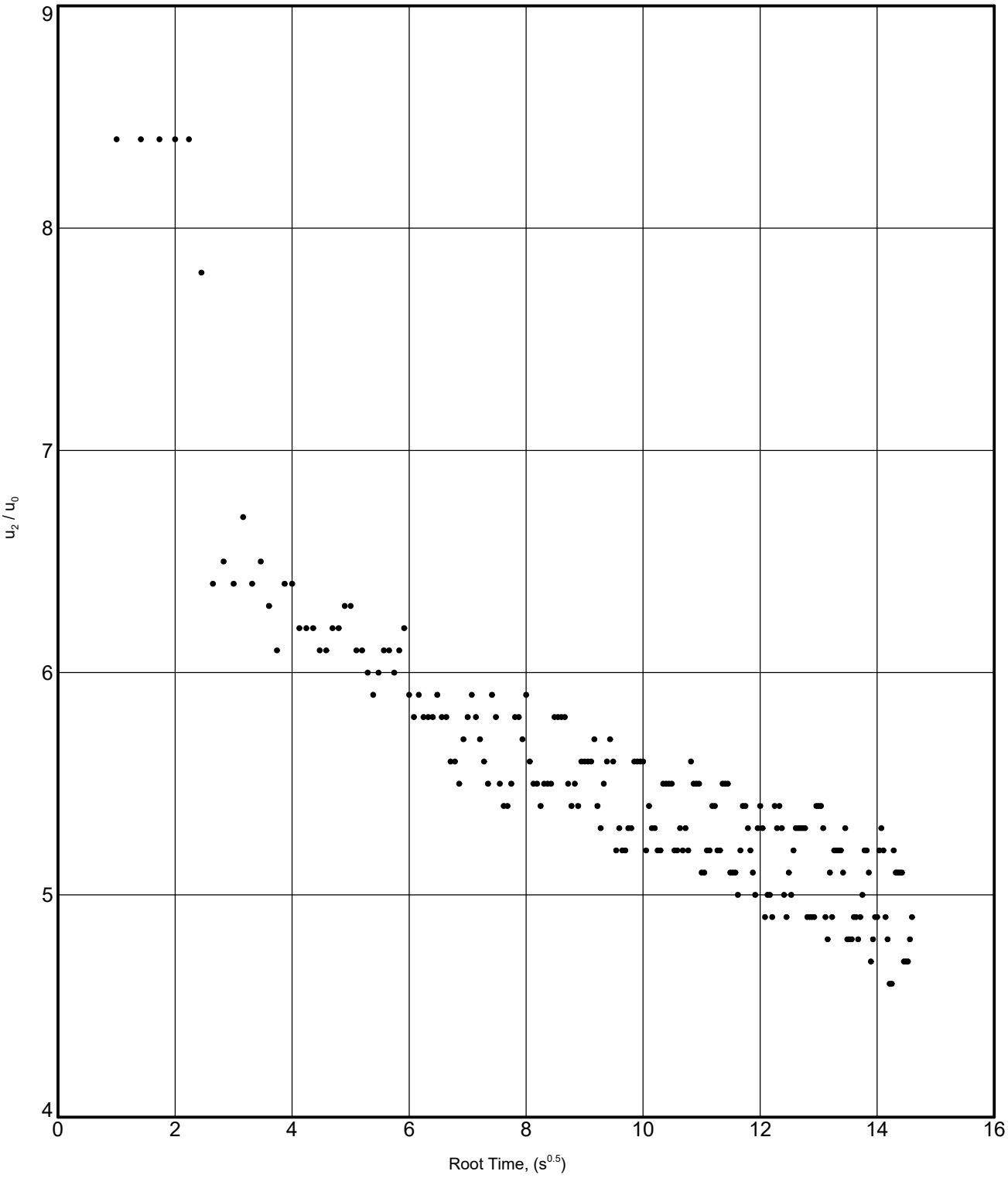
Borehole: PCPT-2	Test No.: C04	Borehole Depth: 10.50m	u_0: 15kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

GMOP_AGSLIB_REV01-00.GLBGraphGPH10-DISSIPATION TEST

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013		Location: Genoa Port	GEOQUIPMARINE



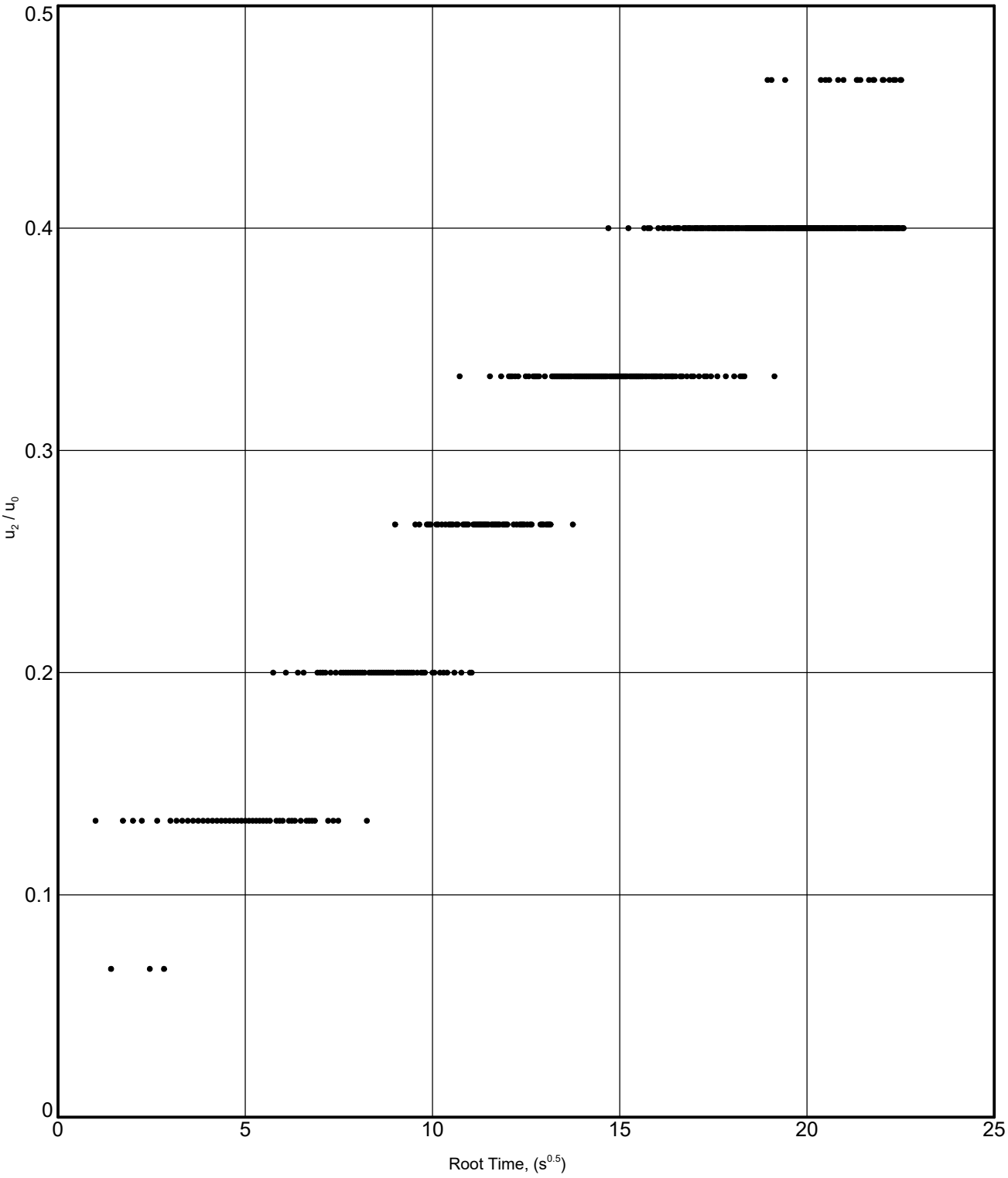
Borehole: PCPT-3	Test No.: C02	Borehole Depth: 4.00m	u_0: 10kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

GMOP_AGSLIB_REV01-00.GLBGraphGPH10-DISSIPATION TEST

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

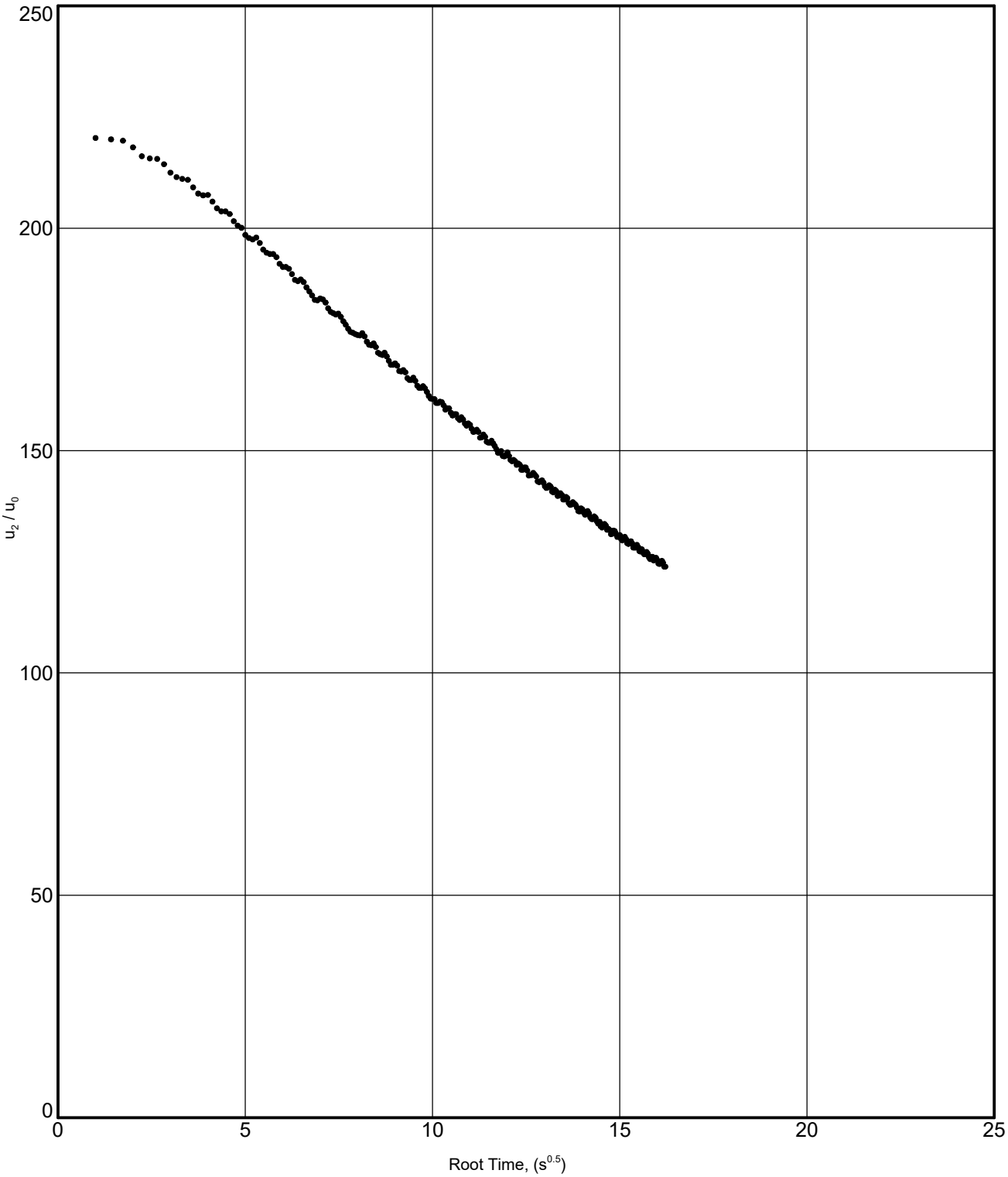


Borehole: PCPT-4	Test No.: C05	Borehole Depth: 13.50m	u_0: 15kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

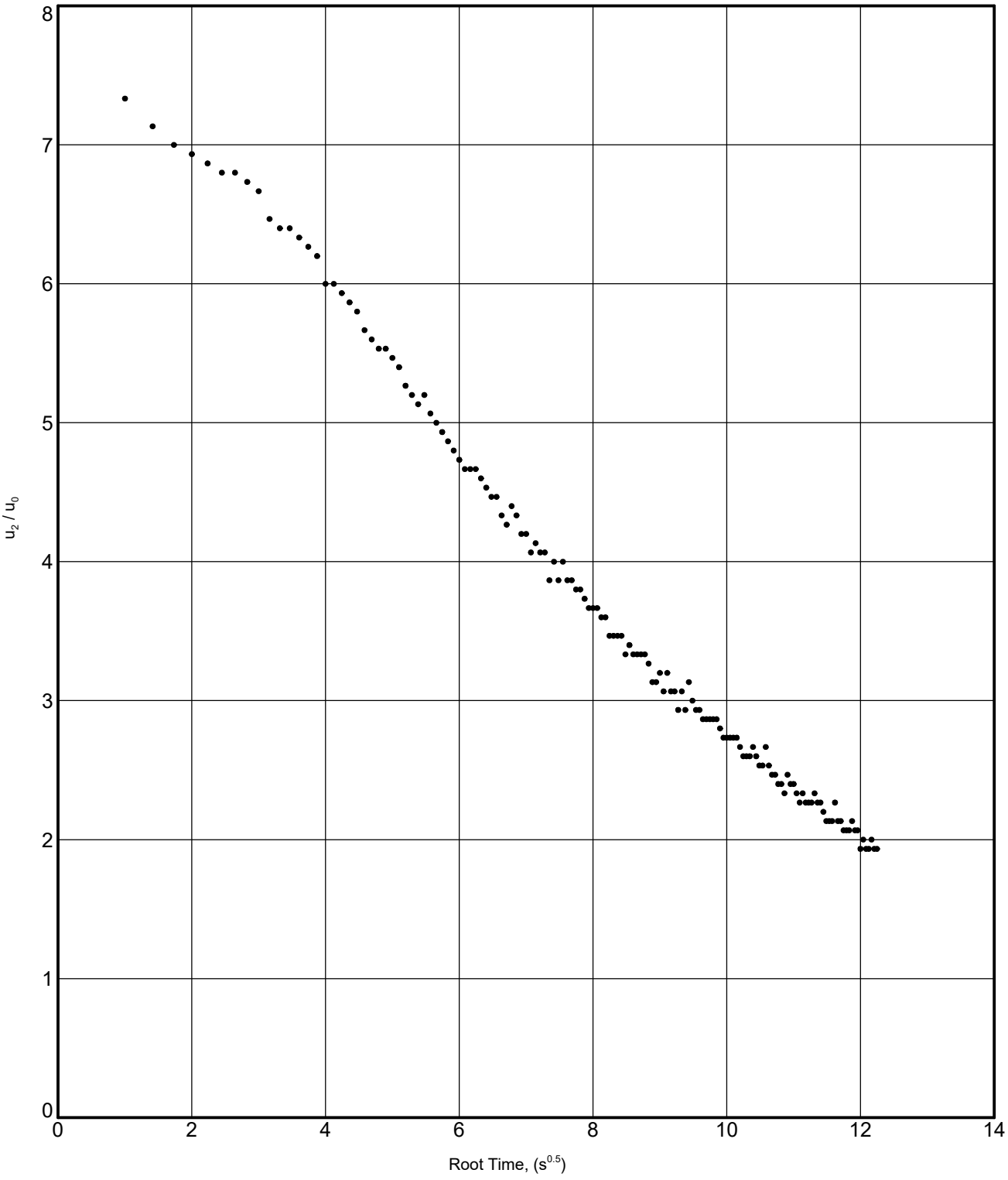


Borehole: PCPT-4	Test No.: C10	Borehole Depth: 26.00m	u_0: 10kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

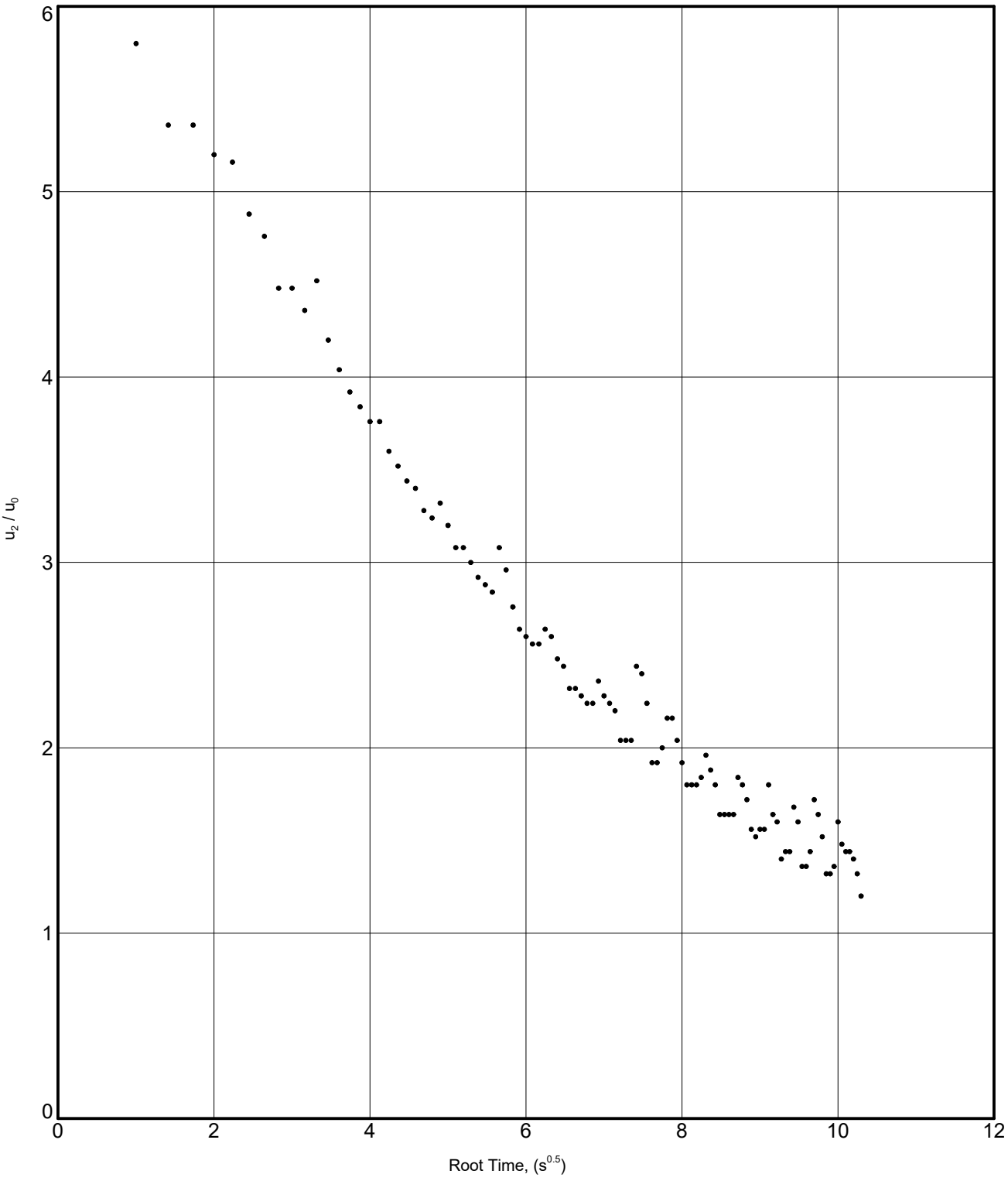


Borehole: PCPT-5	Test No.: C04	Borehole Depth: 10.00m	u_0: 15kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		

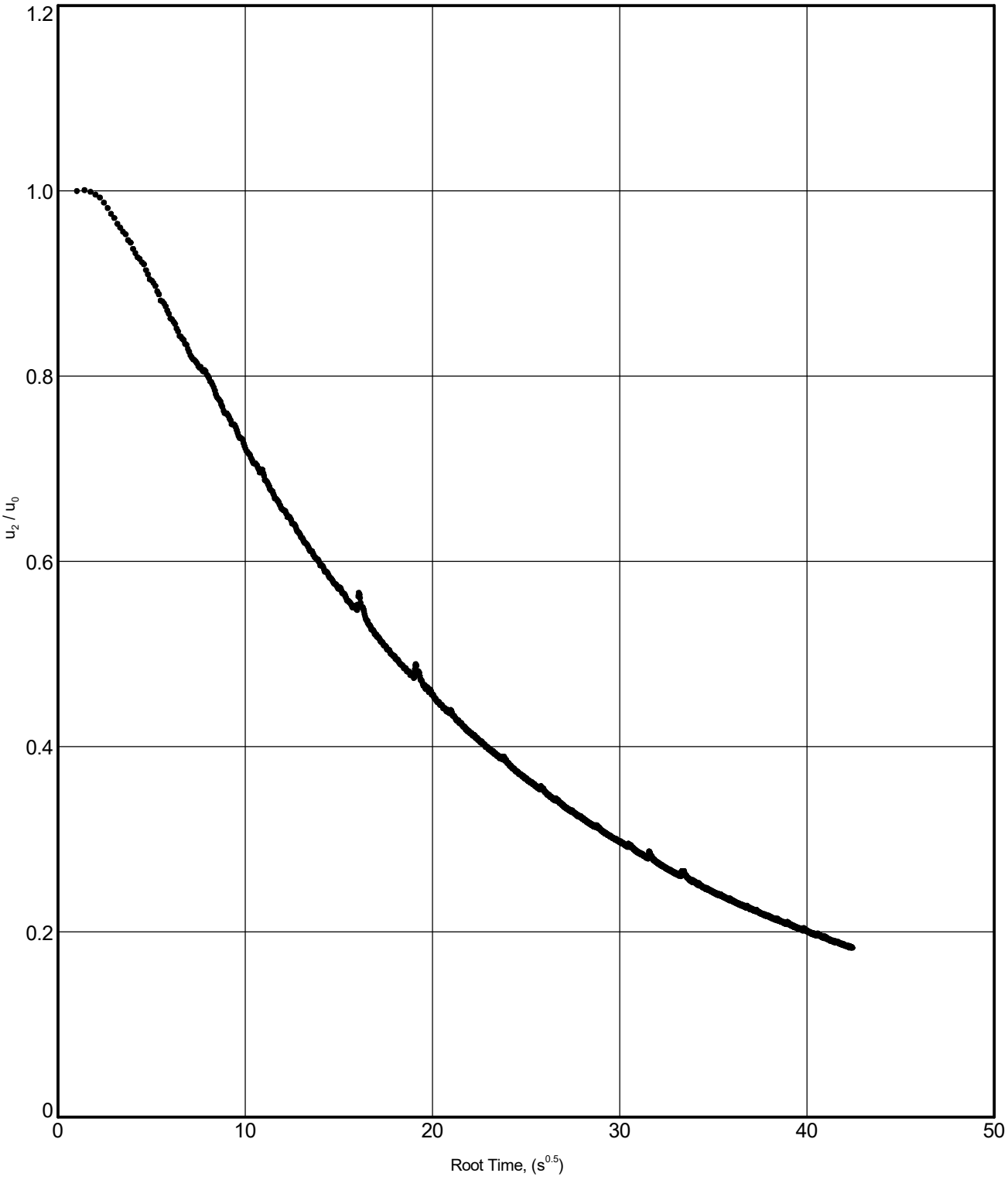


Borehole: PCPT-6	Test No.: C03	Borehole Depth: 8.50m	u_0: 25kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client: TECHNITAL S.p.A Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013		Location: Genoa Port	GEOQUIPMARINE

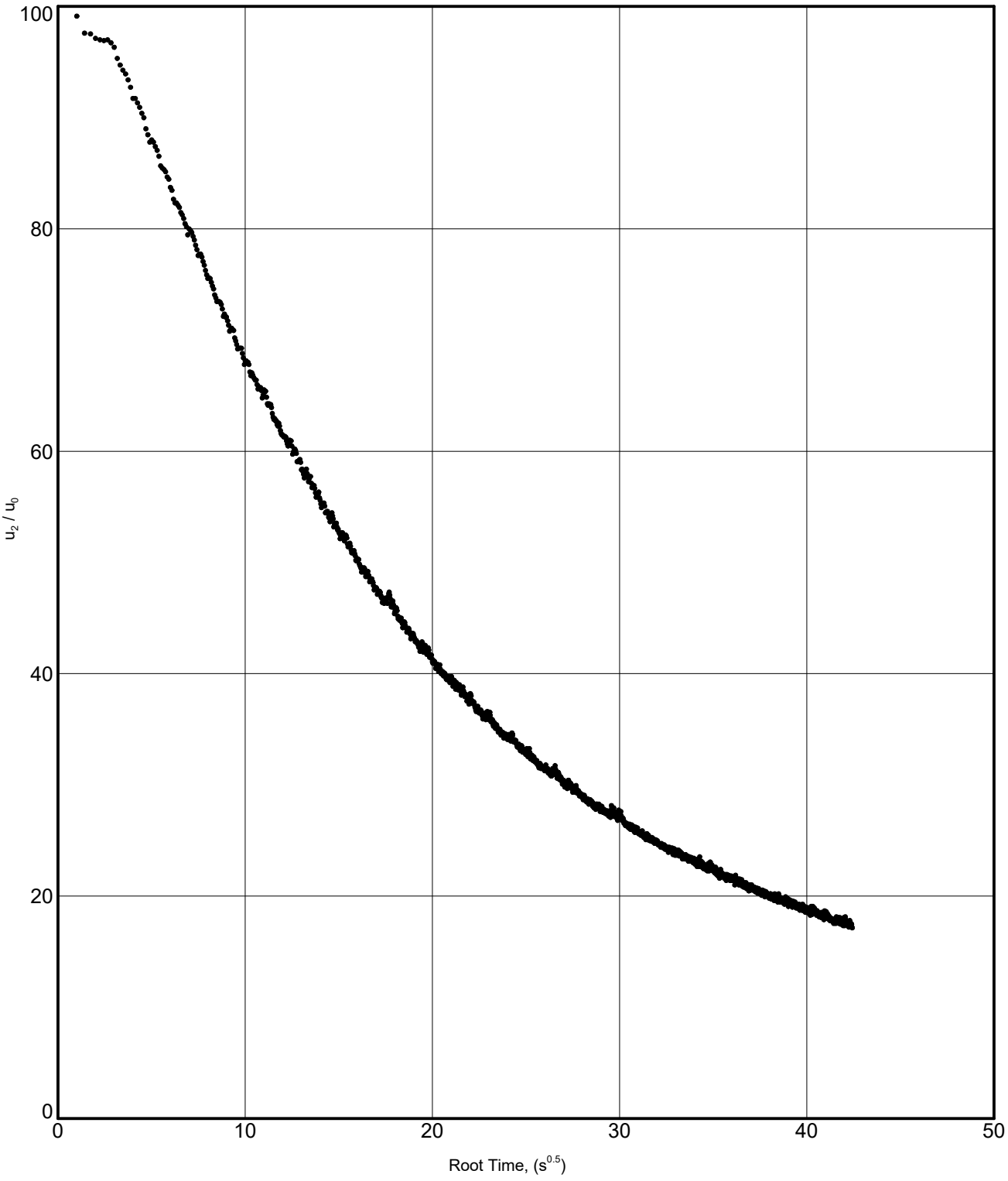


Borehole: PCPT-6	Test No.: C06	Borehole Depth: 17.30m	u_0: 2224kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

Client:	TECHNITAL S.p.A and Modimar S.r.l	Location: Genoa Port	GEOQUIPMARINE
Project Name:	Genoa Port (PFTE)		
Project Number:	GMOP20-G-013		



Borehole: PCPT-8A	Test No.: C08	Borehole Depth: 26.90m	u_0: 15kPa

DISSIPATION TEST RESULTS

Ref.: GMOP20-G-013-FAC-01

APPENDIX B OFFSHORE LABORATORY TESTING

Appendix B.1 Classification Laboratory Tests

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-1	P01	0.05	59									
CC-1	P01	0.25	62									
CC-1	P01	0.40	56	1.63	1.05	2						
CC-1	P01	0.60				5						
CC-1	P01	0.80	53	1.73	1.13							
CC-1	P01	0.90						3	0			
CC-1	P02	1.20				10						
CC-1	P02	1.60				11						
CC-1	P03	2.04	41									
CC-1	P03	2.25	44			6						
CC-1	P03	2.45	53	1.99	1.30							
CC-1	P03	2.85	47	1.70	1.16							
CC-1	P03	2.95						12	1			
CC-1	P03	3.00				13						
CC-1	P04	3.05	45									
CC-1	P04	3.50	43	1.78	1.25							
CC-1	P04	3.70	41									
CC-1	P06	5.15	37	1.84	1.34							
CC-1	P06	5.50	41									
CC-1	P06	5.80	28									
CC-1	P07	6.20	31	1.93	1.47							
CC-1	P07	6.80	37	1.89	1.39							

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-1	P07	6.85	34									
CC-1	P08	7.15	40	1.98	1.41							
CC-1	P08	7.40	22									
CC-1	P08	7.60	35									
CC-1	P08	7.80	35									
CC-1	CR15	11.50		2.99								
CC-1	CR17	13.50		2.91								
CC-1	CR19	16.00		2.80								
CC-1	CR19	16.15	18									
CC-1	CR19	16.16	17									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-2	P01	0.01	48									
CC-2	P01	0.05	48	1.45	0.98							
CC-2	P01	0.60				137	175					
CC-2	P01	0.65	40									
CC-2	P01	0.90	35									
CC-2	P02	1.05	30									
CC-2	P02	1.15	32	1.67	1.27							
CC-2	P02	1.50	53									
CC-2	P02	1.60	44									
CC-2	P02	1.75	32			60	75					
CC-2	P03	2.10	40									
CC-2	P03	2.30	46									
CC-2	P03	2.55	44									
CC-2	P04A	3.40	45									
CC-2	P04A	3.80	37									
CC-2	P05	4.00				20	25					
CC-2	P05	4.05	41	1.61	1.14							
CC-2	P05	5.50				20						
CC-2	P05	4.45				25	38					
CC-2	P05	4.85				25	25					
CC-2	P06	5.20		1.67								
CC-2	P06	5.30	21	1.82	1.50					8	1.1	

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-2	P06	5.70				20						
CC-2	P06	5.85						18	1			
CC-2	P06	5.90				20						
CC-2	P07	6.10	43									
CC-2	P07	6.20	37	1.57	1.15							
CC-2	P07	6.40				20						
CC-2	P07	6.60		1.77								
CC-2	P07	7.00				25	25					
CC-2	P08	7.10				25	25					
CC-2	P08	7.20	35	1.80	1.33							
CC-2	P08	7.80		1.77	1.55	20	38					
CC-2	P08	7.95						22	1			
CC-2	P08	8.00				20	38					
CC-2	P09	8.75	34									
CC-2	P10	9.10	39	1.80	1.29	25	25					
CC-2	P10	9.50	36	1.80	1.32					14		
CC-2	P10	9.70				20	25					
CC-2	P10	9.85						20	2			
CC-2	P10	9.90				20	25					
CC-2	P11	10.05	37									
CC-2	P11	10.10				30	38					
CC-2	P11	10.30	28	1.76	1.38	20	25					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-2	P11	10.90	41	1.63	1.16							
CC-2	P12	11.10	79	1.68	0.94	40	38					
CC-2	P12	11.40				35	25					
CC-2	P12	11.80				40	38	38	2			
CC-2	P12	11.85				35	38					
CC-2	P13	12.00	39	1.83	1.32	35	30					
CC-2	P13	12.40	36	1.81	1.33	40	30					
CC-2	P13	12.95				35	50					
CC-2	P14	13.00	39	1.86	1.34	60	38					
CC-2	P14	13.40	68	1.84	1.10	45	88					
CC-2	P14	11.84						44	2			
CC-2	P14	13.85				45	50					
CC-2	P15	14.00	41	1.88	1.33	40	50					
CC-2	P15	14.40	39	1.95	1.40	40	50					
CC-2	P15	14.80				35	50					
CC-2	P16	15.00				45	50					
CC-2	P16	15.40				40	38					
CC-2	P16	15.60	40	1.90	1.36							
CC-2	P16	15.90						40	5			
CC-2	P16	15.95				40	50					
CC-2	P17	16.00	41	1.88	1.33	45	38					
CC-2	P17	16.40	32	1.79	1.36	48	50					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-2	P17	16.95				55	50					
CC-2	P18	17.00	38	1.80	1.30	35	30					
CC-2	P18	17.40	39	1.85	1.33	40	50					
CC-2	P18	17.95						42	3			
CC-2	P18	18.00				35	50					
CC-2	P19	18.00	41	1.86	1.32							
CC-2	P19	18.01				35	63					
CC-2	P19	18.40				40	50					
CC-2	P19	18.80				35						
CC-2	P19	18.90					63					
CC-2	P20	19.10	35	1.99	1.47							
CC-2	P20	19.65	38	1.98	1.43							
CC-2	P22	21.40	41	1.99	1.41							
CC-2	P22	21.60	35	2.03	1.50							
CC-2	P23	22.15	33	2.04	1.53							
CC-2	P23	22.50	36									
CC-2	P23	22.70	37	1.89	1.37							
CC-2	P24	23.05	33	1.95	1.47							
CC-2	P24	23.50	35									
CC-2	P24	23.75	32	1.83	1.38							
CC-2	P24	23.85	34									
CC-2	P25	24.10	37									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-2	P25	24.20	13	1.85	1.64							
CC-2	P25	24.40	12	1.87	1.68							
CC-2	P25	24.60	13	1.81	1.60							
CC-2	P25	24.75	21									
CC-2	P26	25.05	21									
CC-2	P26	25.20	14	1.81	1.59							
CC-2	P26	25.70	15	1.82	1.59							
CC-2	P26	25.80	23									
CC-2	P27	26.20	13	1.92	1.70							
CC-2	P27	26.50	19									
CC-2	P27	26.70	11	1.94	1.75							
CC-2	P28	27.15	21									
CC-2	P28	27.35	12	1.92	1.71							
CC-2	P28	27.55	11	1.94	1.74							
CC-2	P29A	28.05	26									
CC-2	P29A	28.10				40	63					
CC-2	P29A	28.30	12	2.08	1.86							
CC-2	P29A	28.45				50	75					
CC-2	P30	29.40				75	150					
CC-2	P30	29.50	14									
CC-2	P30	29.65				100	200					
CC-2	P30	29.80	9									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-2	P31	30.25	16	2.13	1.84		250					
CC-2	P31	30.65	12	2.10	1.88		210					
CC-2	P32	31.15	11	2.11	1.90	150	240					
CC-2	P32	31.16					270					
CC-2	P32	31.30				150	275					
CC-2	P32	31.40	18									
CC-2	P33	32.10	19									
CC-2	P33	32.30	23									
CC-2	P33	32.50	20									
CC-2	P34	33.10	19									
CC-2	P34	33.30	22									
CC-2	P34	33.60	23									
CC-2	P35	34.40	20									
CC-2	P35	34.60	30									
CC-2	P36	35.05	25									
CC-2	P36	35.20	27									
CC-2	P37	35.50	19									
CC-2	P37	36.00	18	2.05	1.74							
CC-2	P37	36.10	16									
CC-2	P38	36.90	26									
CC-2	P38	37.15	30									
CC-2	P38	37.30	29									

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[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-2	P39	37.65	30									
CC-2	P39	36.20	22									
CC-2	P39	38.20	22				200					
CC-2	P39	38.21					200					
CC-2	P40	38.55	24	2.18	1.76							
CC-2	P40	38.65				175	200					
CC-2	P40	38.66					250					
CC-2	P40	38.90	21									
CC-2	P41	39.10	15									
CC-2	P41	39.40	15									
CC-2	P42	40.10	24	2.25	1.81							

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-3	P01	0.20	47									
CC-3	P01	0.60	54									
CC-3	P01	0.80	84	1.76	0.95							
CC-3	P02	1.20	44	1.86	1.29							
CC-3	P02	1.40	37	1.81	1.32							
CC-3	P02	1.65	39									
CC-3	P02	1.90						4	0			
CC-3	P04	3.05	56									
CC-3	P04	3.20	43	1.59	1.11							
CC-3	P04	3.60	43									
CC-3	P04	3.95	45									
CC-3	P05	4.00	63									
CC-3	P05	4.15	47	1.86	1.27							
CC-3	P05	4.25				15	25					
CC-3	P05	4.45				17	25					
CC-3	P05	4.65				16	25					
CC-3	P05	4.70	71	2.09	1.22							
CC-3	P05	4.75				18	25					
CC-3	P05	4.90		2.21								
CC-3	P05	5.00				6	25	13	3			
CC-3	P06	5.05	46	1.77	1.21							
CC-3	P06	5.15		2.03		14	25					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-3	P06	5.00	45	1.77	1.22							
CC-3	P06	5.35				18						
CC-3	P06	5.50		1.91		18						
CC-3	P06	5.70				14						
CC-3	P06	5.80	41	1.87	1.33							
CC-3	P06	6.00				12		13	3			
CC-3	P08	7.00	47	1.72	1.17		50					
CC-3	P08	7.50	55	1.98	1.28	45	63					
CC-3	P08	7.90					50					
CC-3	P09	8.00	56	1.74	1.12							
CC-3	P09	8.20				35	50					
CC-3	P09	8.60				45	50					
CC-3	P09	8.80	45	1.84	1.27							
CC-3	P09	8.95				50	50	47	11			
CC-3	P10	9.05	42	1.93	1.36	45	50					
CC-3	P10	9.45				45	63					
CC-3	P10	9.65	43	1.95	1.36							
CC-3	P10	9.85				40	63					
CC-3	P12	11.10	35	1.89	1.40	40	50					
CC-3	P12	11.00	42	1.81	1.27							
CC-3	P12	11.50				40	75					
CC-3	P12	11.70				45	75					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-3	P13	12.10	51	1.80	1.19	45	88					
CC-3	P13	12.50	41	1.86	1.32	60	113					
CC-3	P14	13.30	37									
CC-3	P14	13.50	33									
CC-3	P14	13.80	32									
CC-3	P16	15.10	33	1.91	1.44							
CC-3	P16	15.40	33									
CC-3	P16	15.70	31	1.85	1.41							
CC-3	P17	16.10	32									
CC-3	P17	16.15	30	1.89	1.45							
CC-3	P17	16.50	31	1.84	1.40							
CC-3	P18	17.20	42	2.14	1.50							
CC-3	P18	17.40	23									
CC-3	P18	17.50	53	2.18	1.42							
CC-3	P19	18.10	32	1.92	1.45							
CC-3	P19	18.60	32	1.90	1.44							
CC-3	P20	19.10	31	1.91	1.45							
CC-3	P20	19.30	32	1.91	1.45							
CC-3	P20	19.40	29									
CC-3	P20	19.60	29	1.93	1.50							
CC-3	P21	20.15	30	2.04	1.58							
CC-3	P21	20.30	24									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-3	P21	20.60	27	2.00	1.57							
CC-3	P22	21.20	29	1.92	1.49							
CC-3	P22	21.40	27									
CC-3	P22	21.50	25	1.93	1.55							
CC-3	P22	21.75	21									
CC-3	PU23A	22.05	22									
CC-3	H38	35.60	21									
CC-3	PU51	45.05	24									
CC-3	PU51	45.10	22									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	P01	0.05	52			2						
CC-4	P01	0.30	51	1.83	1.22	2						
CC-4	P02	0.55	46									
CC-4	P02	1.25	49	1.79	1.20	14						
CC-4	P02	1.40	47					8	1			
CC-4	P02	1.45				9						
CC-4	P03	1.55	43									
CC-4	P03	1.80				5						
CC-4	P03	2.20				13						
CC-4	P03	2.30	43	1.83	1.28							
CC-4	P04	2.55	43									
CC-4	P04	2.65				18	25					
CC-4	P04	3.25	46	1.91	1.31							
CC-4	P04	3.35						17	3			
CC-4	P04	3.40				30	38					
CC-4	P05	3.70				14	15					
CC-4	P05	4.10	41	1.91	1.35							
CC-4	P05	4.35				17	15					
CC-4	P06	4.70	38	1.82	1.32	35	30					
CC-4	P06	4.90				35	30					
CC-4	P06	5.25				12	25					
CC-4	P06	5.30	45					18	3			

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	P07	5.55	43	1.88	1.31							
CC-4	P07	5.75				30	25					
CC-4	P07	5.95		1.87								
CC-4	P07	6.05				30	25					
CC-4	P08	6.80	45	1.88	1.30	35	38					
CC-4	P08	7.00	37									
CC-4	P08	7.20	34	1.93	1.45							
CC-4	P09	7.60	33	1.86	1.40							
CC-4	P09	8.20	32	1.91	1.46							
CC-4	P10	8.60	32	1.92	1.46							
CC-4	P10	9.00	30									
CC-4	P10	9.30	32	1.92	1.45							
CC-4	P11	10.40	35									
CC-4	P12	10.60	35	1.88	1.40							
CC-4	P12	11.00	32									
CC-4	P12	11.25	31	1.89	1.44							
CC-4	P13	11.70	33	1.83	1.37							
CC-4	P13	11.90	33									
CC-4	P13	12.10	35	1.93	1.44							
CC-4	P14	12.60	36	1.83	1.35							
CC-4	P14	12.80	36	1.94	1.43							
CC-4	P14	13.30	30									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	P15	13.80	33	1.90	1.42							
CC-4	P15	14.00	33									
CC-4	P15	14.20	32	1.94	1.47							
CC-4	P16	14.55	35									
CC-4	P16	14.80	35	1.87	1.39							
CC-4	P16	15.10	37	1.85	1.35							
CC-4	P17	15.60	36	1.89	1.38							
CC-4	P17	16.10	30	1.97	1.51							
CC-4	P17	16.20	28									
CC-4	P18	16.70	31	1.95	1.49							
CC-4	P18	17.00	30									
CC-4	P18	17.20	38	1.90	1.37							
CC-4	P19	17.55	30									
CC-4	P19	17.75	33	1.90	1.43							
CC-4	P19	18.10	29	1.93	1.50							
CC-4	P19	18.20	32									
CC-4	P20	18.60	29	2.01	1.56							
CC-4	P20	18.90	27	2.00	1.57							
CC-4	P20	19.20	31									
CC-4	P22	20.30	32	1.98	1.50		250					
CC-4	P22	20.50					250					
CC-4	P23	21.10	32	1.96	1.48		225					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	P23	21.45					230					
CC-4	P23	21.65	30	1.99	1.53		250					
CC-4	P24	22.30	43	1.98	1.38		250					
CC-4	P24	22.50					225					
CC-4	P25	23.80				187	200					
CC-4	P26	24.05	40	2.17	1.55							
CC-4	P26	24.25					250					
CC-4	P27	24.70	53	2.01	1.31	137	175					
CC-4	P27	25.10	30	1.97	1.52							
CC-4	P27	25.40				150	113					
CC-4	P28	25.70	54	2.11	1.37	112	138					
CC-4	P28	25.90				112	125					
CC-4	P28	26.40	50	2.01	1.34	100	125					
CC-4	P28	25.40						56	14			
CC-4	P29	26.55	34	2.06	1.54	200	137					
CC-4	P29	27.00	28	2.06	1.61	225	150					
CC-4	P30	27.70	27	2.04	1.61	350						
CC-4	P30	27.90				325	200					
CC-4	P30	28.10	30	2.09	1.61							
CC-4	P30	28.29				200						
CC-4	P30	28.30				188	162					
CC-4	P31	28.50					138					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	P31	28.60	31									
CC-4	PU32	29.00	20	2.14	1.78							
CC-4	PU33	29.50	29	2.08	1.61							
CC-4	PU33	29.70	31	1.94	1.48	162	175					
CC-4	PU33	29.80				112	400					
CC-4	PU34	30.00	31	2.12	1.62		75					
CC-4	PU34	30.40				150	175					
CC-4	PU34	30.60	29	2.05	1.59							
CC-4	PU34	30.80				150	175					
CC-4	PU35	31.00	26	2.04	1.62							
CC-4	PU35	31.20				187	310					
CC-4	PU35	31.40	28	2.02	1.58							
CC-4	PU35	31.65					150	156	11			
CC-4	PU36	32.20	31	1.90	1.45							
CC-4	PU36	32.60	31	2.00	1.53							
CC-4	PU36	32.75				100	138					
CC-4	PU37	33.20	27	2.01	1.58	175	225					
CC-4	PU37	33.60	47	2.04	1.39							
CC-4	PU37	33.80				125	138					
CC-4	PU38	34.00					200					
CC-4	PU38	34.20	29	2.02	1.57							
CC-4	PU38	34.45	28	2.07	1.62							

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[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	PU38	34.70					225					
CC-4	PU39	35.20				137	153					
CC-4	PU39	35.40	31	2.07	1.58							
CC-4	PU39	35.65				100	188					
CC-4	PU40	36.00	33	2.02	1.52							
CC-4	PU40	36.40	27	2.08	1.64	125	300					
CC-4	PU40	36.85				137	175					
CC-4	PU41	37.00					175					
CC-4	PU42	37.55	23	2.20	1.79							
CC-4	PU43	38.00	28	2.01	1.57							
CC-4	PU43	38.30				125	200					
CC-4	PU43	38.75				137	175					
CC-4	PU44	39.20	27	2.10	1.65							
CC-4	PU44	39.40				125	200					
CC-4	PU44	39.80	34	2.06	1.54							
CC-4	PU44	39.90				100	150					
CC-4	PU45	40.00	27	2.12	1.67	200	300					
CC-4	PU45	40.40				187	325					
CC-4	PU45	40.60	27	2.03	1.60							
CC-4	PU45	40.85				175	300					
CC-4	PU46	41.20	29	2.03	1.57	150	325					
CC-4	PU46	41.60	27	2.06	1.62	172	200					

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[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	PU47	44.00	31	1.93	1.47		325					
CC-4	PU47	44.40					325					
CC-4	PU48	46.20	31	1.92	1.47		275					
CC-4	PU48	46.60	32	1.91	1.45		325					
CC-4	PU49	50.20	34	2.02	1.51		350					
CC-4	PU49	50.60	36	2.03	1.49		350					
CC-4	PU50	51.30	27	2.00	1.57		275					
CC-4	PU50	51.50					250					
CC-4	PU51	55.10	33	2.06	1.55		350					
CC-4	PU51	55.50					300					
CC-4	PU51	55.70	34	2.03	1.51							
CC-4	PU52	56.20	29	2.00	1.55		400					
CC-4	PU52	56.55	31	2.00	1.53		375					
CC-4	PU53	60.70	30	2.07	1.59		400					
CC-4	PU53	60.90					400					
CC-4	PU53	61.10	27	2.05	1.61		400					
CC-4	PU54	61.50	34	2.08	1.55		400					
CC-4	PU54	61.70					400					
CC-4	PU54	62.10	28	2.12	1.66		400					
CC-4	PU55	65.70					300					
CC-4	PU55	65.75	32	2.04	1.55							
CC-4	PU55	65.95					325					

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[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-4	PU56	66.50	27	2.05	1.61							
CC-4	PU56	66.70					325					
CC-4	PU56	67.10	26	2.04	1.62		375					
CC-4	PU57	70.50	28	2.04	1.59		300					
CC-4	PU57	71.15	30	2.01	1.55		425					
CC-4	PU57	71.35					300					
CC-4	PU58	71.50	31	1.98	1.51							
CC-4	PU58	71.70					425					
CC-4	PU58	71.90					350					
CC-4	PU58	72.10	28	2.05	1.60							
CC-4	PU59	75.50					350					
CC-4	PU59	75.70	27	2.04	1.61							
CC-4	PU59	75.90					450					
CC-4	PU59	76.10	25	2.04	1.63							
CC-4	PU59	76.50					425					
CC-4	PU60	76.50	25	2.08	1.66							
CC-4	PU60	76.70	27	2.10	1.65		425					
CC-4	PU60	77.10	26	2.09	1.66							
CC-4	PU60	77.30					425					

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[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-5	P01	0.10	26	1.83	1.46							
CC-5	P01	0.55	23	1.88	1.53							
CC-5	P02	1.10	27	1.81	1.42							
CC-5	P02	1.50	26	1.91	1.51							
CC-5	P03	2.10	29	1.95	1.51							
CC-5	P03	2.60	30	1.84	1.42							
CC-5	P04	3.75	12									
CC-5	P05	4.10	31	1.88	1.43							
CC-5	P05	4.60	28	1.90	1.49							
CC-5	P06	5.10	31	1.85	1.42							
CC-5	P06	5.60	27	1.86	1.47							
CC-5	P07	6.10	30	1.87	1.43							
CC-5	P07	6.60	28	1.82	1.43							
CC-5	P08	7.10	30	2.04	1.57							
CC-5	P08	7.50	30	1.80	1.38							
CC-5	P09	8.10	31	1.68	1.28							
CC-5	P09	8.55	25									
CC-5	P10	9.80	30									
CC-5	P11	10.10	29	1.83	1.42							
CC-5	P11	10.50	29	1.71	1.33							
CC-5	P12	11.10	32	2.05	1.55							
CC-5	P12	11.50	33	1.82	1.37							

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[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-5	P12	11.80	31	1.78	1.35							
CC-5	P13	12.00	30	1.94	1.49							
CC-5	P13	12.25	32	1.96	1.48							
CC-5	P13	12.60	55	2.05	1.32							
CC-5	P14	13.10	52	2.00	1.32							
CC-5	P14	13.40	53	2.09	1.37							
CC-5	P15	14.20	59	1.98	1.25							
CC-5	P16	14.60	26									
CC-5	P17	15.10	17									
CC-5	PU18	15.55	7									
CC-5	CR19	15.70	25									
CC-5	PU20	16.55	3									
CC-5	CR21C	17.20	6									
CC-5	PU23	18.60	8									
CC-5	PU24	19.10	8									
CC-5	CR28	20.70	17									
CC-5	CR29	21.15	8									
CC-5	CR31	22.05		2.59								

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SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-6	P01	0.80	29									
CC-6	P02	1.80	33									
CC-6	P03	8.20	30	1.91	1.47							
CC-6	P03	8.40	29	2.00	1.55							
CC-6	P03	8.80	35									
CC-6	P04	9.20	35	1.90	1.41							
CC-6	P04	9.40	32									
CC-6	P04	9.60	32	1.91	1.44							
CC-6	P05	16.15	33	1.90	1.43							
CC-6	P05	16.30	30									
CC-6	P05	16.45	30	1.90	1.47							
CC-6	P06	17.25	33	1.84	1.38							
CC-6	P06	17.45	33									
CC-6	P06	17.60	31	1.93	1.47							
CC-6	P07A	24.05	19									
CC-6	P07A	24.20	18									
CC-6	P08	24.60	30									
CC-6	P08	24.70	30	2.01	1.55	212	275					
CC-6	P08	24.90					250					
CC-6	P09	25.85	31			162	200					
CC-6	P10	32.00	37	1.89	1.38							
CC-6	P10	32.25				212	250					

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SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-6	P10	32.45	34	2.00	1.49							
CC-6	P10	32.70					375					
CC-6	P10	32.90					250					
CC-6	P11	33.10				200	250					
CC-6	P11	33.35	37	1.98	1.45							
CC-6	P11	33.55				250	200					
CC-6	P12	39.50	36	1.94	1.43	187	250					
CC-6	P12	39.90				200	275					
CC-6	P12	40.00	35	1.95	1.44							
CC-6	P12	40.20				200	300					
CC-6	P13	40.50	41	2.01	1.43		375					
CC-6	P13	41.00	32	1.95	1.48		450					
CC-6	P13	41.40					450					
CC-6	P14	47.50		2.08			325					
CC-6	P14	47.70		2.11			350					

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SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-7	P01	0.15	51			1						
CC-7	P01	0.55	48	1.71	1.16	1						
CC-7	P02	1.20	41	1.81	1.28	6						
CC-7	P02	1.60				7		7	3			
CC-7	P03	2.20	43	1.78	1.24	2						
CC-7	P03	2.60	77	1.72	0.97	7						
CC-7	P04	3.20	40	1.79	1.28							
CC-7	P04	3.40				10						
CC-7	P04	3.85				9		6	2			
CC-7	P04	3.60	41	1.82	1.29							
CC-7	P05	4.25	54	1.92	1.25	40	75					
CC-7	P05	4.65	36	2.01	1.48							
CC-7	P06	5.05	33									
CC-7	P06	5.30	32	1.88	1.42							
CC-7	P06	5.70	31	1.92	1.47							
CC-7	P07	6.20	31	2.18	1.66							
CC-7	P07	6.60	33	2.10	1.58							
CC-7	PU08B	7.10	22	1.87	1.53							
CC-7	PU11	8.50	21									
CC-7	PU11	8.60	11									
CC-7	PU12	9.00	47	1.74	1.18	40						
CC-7	PU12	9.05					63					

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SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-7	PU12	9.20	43	1.85	1.29		50					
CC-7	PU12	9.25				45						
CC-7	PU13	3.75					188					
CC-7	PU13	9.60	37	1.68	1.23	100						
CC-7	PU13	1.75					175					
CC-7	PU13	9.90				87						
CC-7	P14	10.20				100	88					
CC-7	P14	10.40	39	1.91	1.37							
CC-7	P14	10.55				100	150					
CC-7	P15	10.80					125					
CC-7	P15	11.80	33			162						
CC-7	P16	12.20	33	1.95	1.47	85	163					
CC-7	P16	12.40	32	1.93	1.46							
CC-7	P16	12.55				70	250					
CC-7	P17	13.25				88	200					
CC-7	P17	13.70	32	1.90	1.44							
CC-7	P17	13.95				87	150	86	45			
CC-7	P18	14.00	35	1.99	1.47	100	213					
CC-7	P18	14.25				112	225					
CC-7	P19	15.25	32	1.97	1.49	150	163					
CC-7	P19	15.65	31	1.99	1.52	162						
CC-7	P19	15.75					188					

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SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-7	P19	15.90					200					
CC-7	P19	15.95				188						
CC-7	P20	16.25	34	2.03	1.51	187	200					
CC-7	P20	16.70				200	225					
CC-7	P21	17.10				162	175					
CC-7	P21	17.20	30	1.99	1.53							
CC-7	P21	17.60	30	1.93	1.48	175	188					
CC-7	P21	17.85						83	58			
CC-7	P21	17.90				175	175					
CC-7	P22	18.30	29	1.96	1.52	150	138					
CC-7	P22	18.70	30	1.95	1.50	112	125					
CC-7	P23	19.10	30	2.04	1.57	150	225					
CC-7	P23	19.11					250					
CC-7	P23	19.55		1.97	1.88							
CC-7	P23	19.95				125	175	93	61			
CC-7	P23	19.96					200					
CC-7	P23	20.00	31									
CC-7	P24	20.20	50	2.02	1.35	150	250					
CC-7	P24	20.60	34	1.99	1.49							
CC-7	P24	20.90				162	250					
CC-7	P25	21.10	33	1.99	1.50	125	150					
CC-7	P25	21.70	33	2.01	1.51	137	175					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-7	P25	21.90				125						
CC-7	P26	22.20	33	2.05	1.54	175	250					
CC-7	P26	22.60				187	225					
CC-7	P27	23.05	37	2.16	1.58	175	220					
CC-7	P27	23.55	33	1.95	1.47	187	225					
CC-7	P28	24.10	35	1.99	1.47	225	250					
CC-7	P28	21.85						100	63			
CC-7	P28	24.70	36	1.93	1.42	212	225					
CC-7	P29	25.05	39	1.88	1.35	162	200					
CC-7	P29	25.40		1.90		175	225					
CC-7	P29	26.00				175						
CC-7	P30	26.20	36	1.90	1.40	150	220					
CC-7	P30	26.60	36	1.97	1.45	175	225					
CC-7	P31	27.05		1.96								
CC-7	P31	27.20				175	200					
CC-7	P31	27.80	36	1.99	1.46	200	225					
CC-7	P31	27.95				200						
CC-7	P32	28.20	31	2.04	1.56	187	225					
CC-7	P32	28.60				200	225					
CC-7	P33	29.00	31	1.96	1.50							
CC-7	P33	29.20				212	275					
CC-7	P33	29.40		2.00			275					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-7	P33	29.60				225	330					
CC-7	P33	29.75	31									
CC-7	P34	30.00	29	2.00	1.55		425					
CC-7	P34	30.60	30									
CC-7	P35	31.20	29	2.01	1.56		500					
CC-7	P35	31.80		2.04			400					
CC-7	P36	32.20	48	2.01	1.36		350					
CC-7	P36	32.60	47	1.97	1.34		350					
CC-7	P37	33.00	35	1.98	1.47							
CC-7	P37	33.40	34	1.94	1.45		325					
CC-7	P37	33.80					300					
CC-7	P38	34.20	35	1.95	1.44		275					
CC-7	P38	34.60	36	1.97	1.45		300					
CC-7	P39	35.00	35	1.93	1.43		275					
CC-7	P39	35.40	33	2.03	1.53		300					
CC-7	P40	36.00	33	2.00	1.50							
CC-7	P40	36.20					300					
CC-7	P40	36.40	32	1.96	1.48							
CC-7	P40	36.80					325					
CC-7	P41	37.10	31	2.05	1.56		350					
CC-7	P41	37.20	32	2.02	1.53							
CC-7	P41	37.50	30	2.06	1.58		350					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
CC-7	P43	38.39					88					
CC-7	P43	38.40	34	1.89	1.41		100					
CC-7	P43	38.50				65						
CC-7	P44	39.35	33	1.83	1.38	55	50					
CC-7	P44	39.55				55	63					

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[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
PCPT-5	H01	36.65	28									
PCPT-5	H01	36.80	26									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
PCPT-6	PU02	39.70	31	1.98	1.51							
PCPT-6	PU03	46.60	35									
PCPT-6	PU03	46.90	36									
PCPT-6	PU03	47.20	38									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
PCPT-6A	P01	45.10	31	1.99	1.52		375					
PCPT-6A	P01	45.50	30	2.01	1.55		375					
PCPT-6A	P02	55.20	31	1.98	1.51		350					
PCPT-6A	P02	55.60	32	2.02	1.53		350					
PCPT-6A	P02	55.85					300					
PCPT-6A	P03	65.20	33	2.01	1.51		350					
PCPT-6A	P03	65.40					375					
PCPT-6A	P03	65.60	32	1.97	1.49		350					
PCPT-6A	P04	75.20	32	1.99	1.51		400					
PCPT-6A	P04	75.40	30	1.99	1.53		450					
PCPT-6A	P04	75.60					450					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
PCPT-7	CR08B	9.55	10									
PCPT-7	CR09	10.60	1	2.52	2.50							
PCPT-7	CR09	10.80	6									

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013	Location: Genoa Port		GEOQUIPMARINE

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
PCPT-8	P01	0.05	63									
PCPT-8	P01	0.20	58	1.66	1.05	6						
PCPT-8	P01	0.50				9						
PCPT-8	P01	0.70	56	1.81	1.16							
PCPT-8	P01	0.90				10						
PCPT-8	P02	1.10				9						
PCPT-8	P02	1.50	45	1.60	1.10	12						
PCPT-8	P02	1.90				10		12	3			

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
PCPT-8A	P01	0.30	63			2						
PCPT-8A	P01	0.60	58			6						
PCPT-8A	P01	0.80				7						
PCPT-8A	P02	1.15	50	1.91	1.27	7						
PCPT-8A	P02	1.35				8						
PCPT-8A	P02	1.55	56			7						
PCPT-8A	P02	1.85						4	0			
PCPT-8A	P03	2.20	46									
PCPT-8A	P03	2.30				14						
PCPT-8A	P03	2.40	47									
PCPT-8A	P03	2.70	46	1.84	1.26	12						
PCPT-8A	P04	7.60	34	1.87	1.40							
PCPT-8A	P04	8.20	30	1.99	1.53							
PCPT-8A	P05	8.60	30	1.91	1.47							
PCPT-8A	P05	9.20	33	1.86	1.39							
PCPT-8A	P06	15.70	20	2.13	1.78	100	113					
PCPT-8A	P06	16.30	29	2.07	1.60	137	150					
PCPT-8A	P07	16.60	27	2.04	1.61	112	138					
PCPT-8A	P07	17.20	24	2.06	1.66	100	138					
PCPT-8A	P07	17.40				150	113	132	47			
PCPT-8A	P08	23.70	27	2.11	1.66	112	138					
PCPT-8A	P08	24.20	24	2.11	1.70	162	163					

PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Client: TECHNITAL S.p.A and Modimar S.r.l
Project Name: Genoa Port (PFTE)
Project Number: GMOP20-G-013

Location: Genoa Port

Borehole / Location	Sample No.	Test Depth (m)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	Torvane Su (kPa)	PP Su (kPa)	Lab Vane Peak Su (kPa)	Lab Vane Residual Su (kPa)	UU Su_{UU} (kPa)	UU ε_{50} (%)	Thermal Conductivity (w/mK)
PCPT-8A	P08	24.40				100	113					
PCPT-8A	P09	24.50	23	2.05	1.67							
PCPT-8A	P09	24.75				187	175					
PCPT-8A	P09	25.00	22	2.18	1.79							
PCPT-8A	P09	25.25				175	163					
PCPT-8A	P09	25.45				162	138	144	44			
PCPT-8A	PU10A	31.60	11	2.11	1.89							
PCPT-8A	PU15	40.55		1.72								

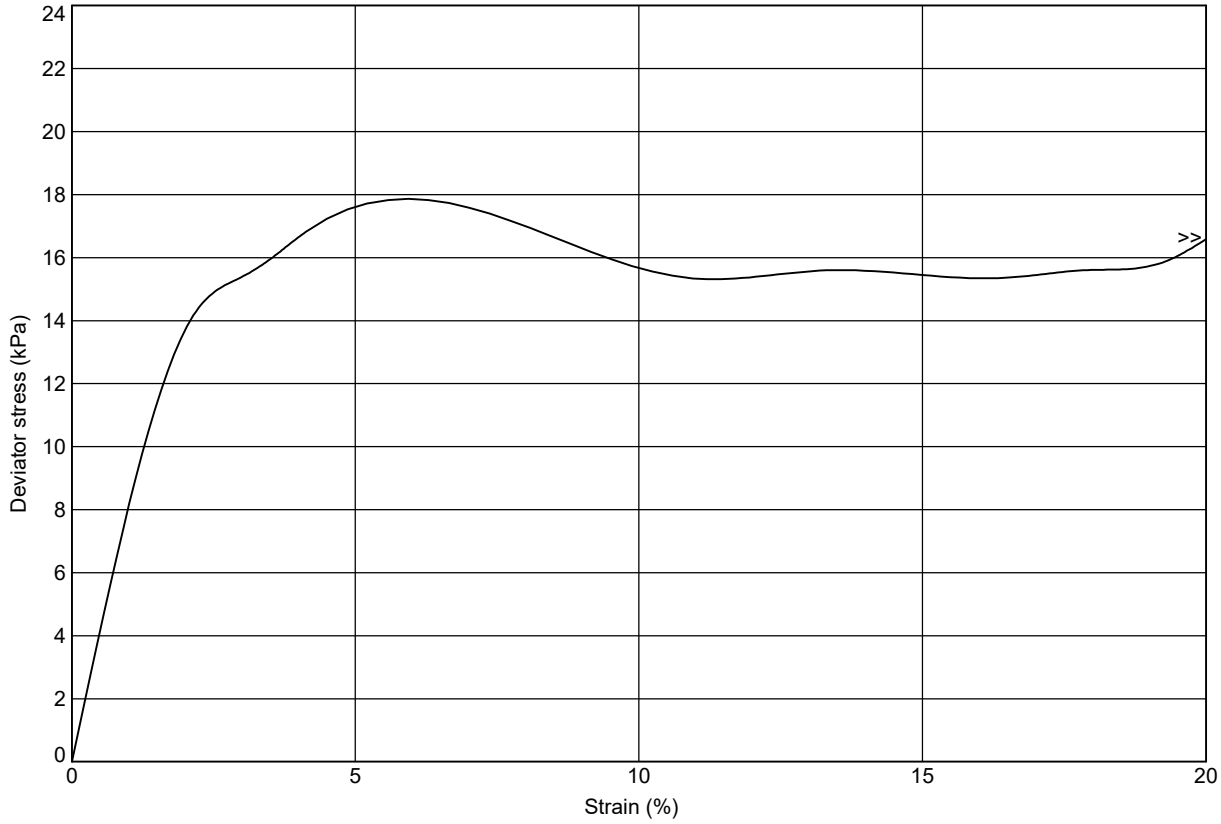
PP - Pocket Penetrometer UU - Undrained Unconsolidated Triaxial ε_{50} - Strain at half max. deviator stress

[1] Local Geodetic Datum: Gauss-Boaga Fuso W, Actual Coordinates

SUMMARY OF OFFSHORE TEST RESULTS

Appendix B.2 Strength Tests

Client:	TECHNITAL S.p.A
Project Name:	Genoa Port (PFTE)
Project Number:	GMOP20-G-013
Location:	Genoa Port
Borehole No.:	CC-2



Before Test Photo

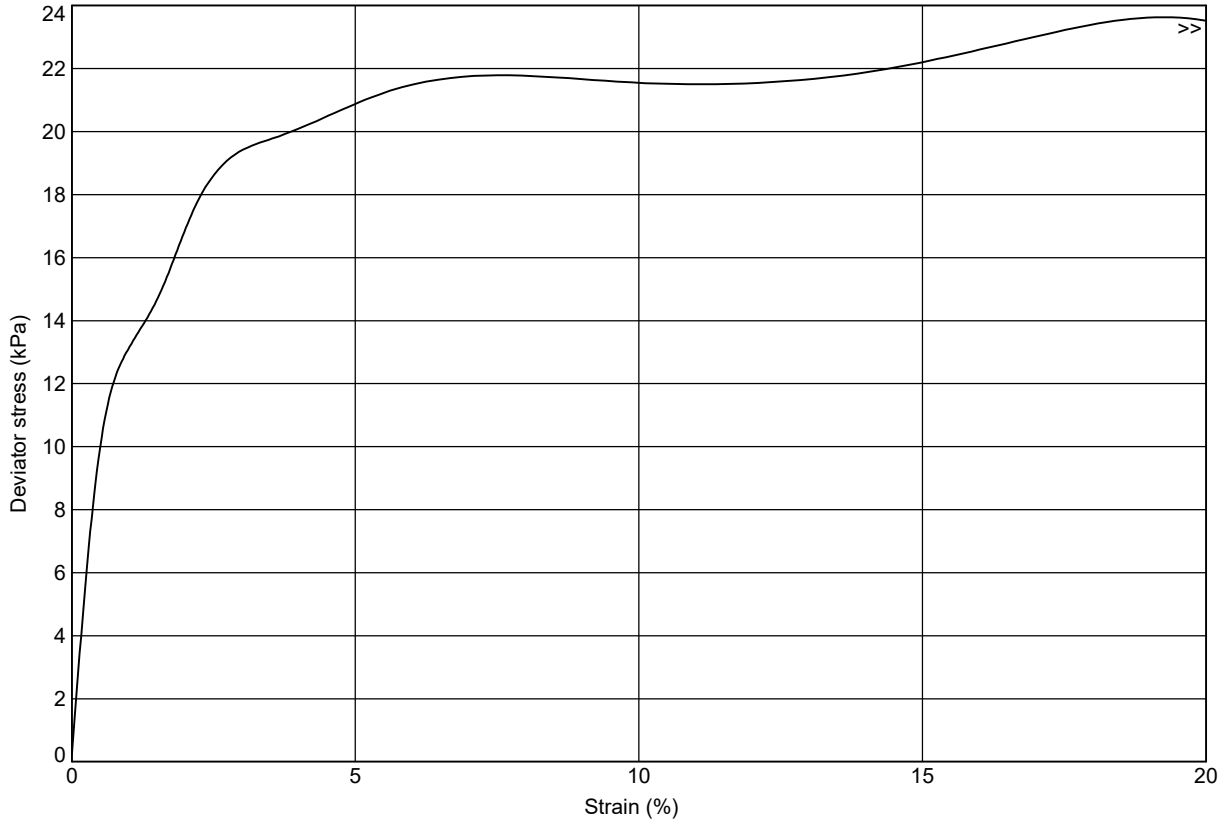
After Test Photo

Sample Ref.: P06	Cell Pressure: 365kPa	Bulk Density: 1.82Mg/m^3	Water Content: 21%	Strain at Failure: 4%
Test Depth: 5.30m	Rate of Strain: 1%/min	Dry Density: 1.50Mg/m^3	Test Type: Undisturbed	Shear Strength: 8kPa

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Ref.: GMOP20-G-013-FLD-01

Client: TECHNITAL S.p.A Project Name: Genoa Port (PFTE) Project Number: GMOP20-G-013		Location: Genoa Port Borehole No.: CC-3	GEOQUIPMARINE



Before Test Photo

After Test Photo

Sample Ref.: P09	Cell Pressure: 580kPa	Bulk Density: 1.76Mg/m^3	Water Content: 42%	Strain at Failure: 20%
Test Depth: 8.40m	Rate of Strain: 1%/min	Dry Density: 1.24Mg/m^3	Test Type: Undisturbed	Shear Strength: 11kPa

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Ref.: GMOP20-G-013-FLD-01

APPENDIX C METHODOLOGIES AND PROCEDURES

C.1 Soil Classification and Description Methodologies

Overview

Soil classifications and descriptions are based on the requirements as outlined by ISO 19901-8. This is further detailed below.

Classification and Description

Soil descriptions and classification are completed as per contractual requirements utilising the following standards:

- For primary fractions:
    - BS EN ISO 14688-1:2018 Geotechnical investigation and testing – Identification and classification of soil – Part 1: Identification and description
    - BS EN ISO 14688-2:2018 Geotechnical investigation and testing – Identification and classification of soil – Part 2: Principles for a classification
- For secondary/tertiary fractions:
    - BS 5930:2015 Code of practice for ground investigation

Strength Descriptions

Undrained Shear Strength descriptors are summarised in the following table (after ISO 14688-2):

Term	Undrained shear strength s_u, kPa
Extremely low	<10
Very low	10 to 20
Low	20 to 40
Medium	40 to 75
High	75 to 150
Very high	150 to 300
Extremely high	>300

Where undrained shear strengths of cohesive materials cannot be measured, a consistency based on hand manipulation can be applied (after ISO 14688-1):

Term	Field Assessment
Very soft	Exudes between the fingers when squeezed in hand
Soft	Soil can be moulded by light finger pressure
Firm	Thumb makes an impression easily
Stiff	Soil can be indented slightly by thumb
Very Stiff	Soil can be indented by thumb nail

Relative Density Descriptions are based on the following table (after Lunne and Christoffersen, 1983):

Term	Relative Density (%)
Very loose	0 to 15
Loose	15 to 35
Medium dense	35 to 65
Dense	65 to 85
Very dense	85 to 100

Secondary fraction

The following descriptions for secondary fraction are used which is partially based on BS5930:

Principal material	Term of secondary material	Proportion of Secondary [A]
Coarse (0.063 – 63mm)	slightly (sandy) [B]	<5%
	(sandy) [B]	5-20% [C]
	very (sandy) [B]	>20 [C]
	SAND and GRAVEL	About 50%
Fine (<0.063mm)	slightly (sandy) [D]	<35%
	(sandy) [D]	35-65% [E]
	very (sandy) [F]	>65% [E]
	Silty CLAY/ Clayey SILT [G]	-

A. Percentage coarse or fine soil type assessed excluding cobbles and boulders
B. Gravelly or sandy and/or silty or clayey
C. Can be described as fine soil depending on mass behaviour
D. Gravelly and/or sandy
E. Can be described as coarse soil depending on mass behaviour
F. Gravelly or sandy
G. Terms used to reflect secondary fine constituents where this is important

Tertiary fraction

The following descriptions for tertiary fraction are used (after BS5930) that do not affect the engineering behaviour of the material. Proportions are defined on a site or material specific basis, or subjectively.

The following descriptions for tertiary fraction are used:

Term	Percentage
Rare	<10
Occasional	10-25
Frequent/Abundant/Numerous	>25

Bedding Thicknesses

Bedding thicknesses are described on the following (after ISO 14688-1):

Term	Thickness of bedding (mm)
Thinly laminated	<6
Thickly laminated	6 to 20
Very thinly bedded	20 to 60
Thinly bedded	60 to 200
Medium bedded	200 to 600
Thickly bedded	600 to 2000
Very thickly bedded	>2000

Particle Size Distribution – Fractions

The description of particle sizes is based on the results of sieve and hydrometer results (after ISO 14688-1) as follows:

Soil Group	Particle Size Fractions	Range of Particle Sizes (mm)
Coarse Soil	Coarse Gravel	20 to 63
	Medium Gravel	6.3 to 20
	Fine Gravel	2.0 to 6.3
	Coarse Sand	0.63 to 2.0
	Medium Sand	0.2 to 0.63
	Fine Sand	0.063 to 0.2
Fine Soil	Coarse Silt	0.02 to 0.063
	Medium Silt	0.0063 to 0.02
	Fine Silt	0.002 to 0.0063
	Clay	<0.002

Spacing of discontinuities

Bedding thicknesses are described in the following fashion (after BS5930:2015 Table 7):

Term	Thickness of bedding (mm)
Extremely closely	<20
Very closely	20 to 60
Closely	60 to 200
Medium	200-600
Widely	600-2000
Very widely	>2000

C.2 Rock Core Handling and Rock Core Logging Methodologies

Overview

Soil classifications and descriptions are based on the requirements as outlined by the relevant BSI Standards. This is further detailed below.

Classification and Description

Rock descriptions and classification are completed as per contractual requirements utilising BS5930:2015 Code of practise for ground investigations

Descriptive Terms

Strength	Extremely Weak	Very Weak	Weak	Medium Strong	Strong	Very Strong	Extremely Strong
Range	0.6 – 1.0MPa	1 – 5MPa	5 - 25MPa	25 - 50 MPa	50 – 100 MPa	100 - 250 MPa	>250MPa
Strength	Gravel size lumps can be crushed between finger and thumb	Gravel size lumps can be broken in half by heavy hand pressure	Only thin slabs, corners or edges can be broken off with heavy hand pressure	When held in the hand rock can be broken by hammer blows	When resting on surface rock can be broken by hammer blows	Rock chipped by heavy hammer blows	Rock rings on hammer blows, only chipped by geological hammer
Structure	Sedimentary	Thinly – thickly laminated, very thinly – thickly bedded, Cross bedded, Graded bedding, Slumped Bedding Stylolitic, (this list is not exhaustive, see BS5930) The term banded is not sedimentary and is not to be used					
	Metamorphic	Foliated, Schistose, Crenulated, Gneissose, Banded, Flow banded (this list is not exhaustive, see BS5930)					
	Igneous	Massive Graphic, Orbicular, Flow banded, Flow aligned, Amygdaloidal, Vesicular, (this list is not exhaustive, see BS5930)					
Colour	If available a Munsell Colour Chart should be used to ascribe a Munsell number to the colour. Include laminated colour and mottling						
Texture	Sedimentary	Relates to the relationship of individual rock mass grains and may include, Fine, medium, coarse, grained, locally conglomeratic, locally brecciated, pelloidal, oolitic (this list is not exhaustive, see BS5930)					
	Metamorphic	Granulose, Augen, Flow aligned, Microcrystalline, Glassy, Cryptocrystalline (this list is not exhaustive, see BS5930)					
	Igneous	Porphyritic, Megacrystic, Microcrystalline, Glassy, Cryptocrystalline (this list is not exhaustive, see BS5930)					
Grain Size	Fine, medium, coarse grained (sandstone, carbonate rocks, crystalline nature: igneous, metamorphic rocks), see BS5930 Table 14 for more detail.						
Rock Name	As appropriate for the overall description, (see BS5930, Table 14 for more detail)						

Grain Size

Grain Size is particularly important for the description and classification of Sedimentary and Metamorphic rocks. Grain size refers to the average dimension of the primary constituent. Separate measurements of the grain and matrix may be necessary. (after BS EN ISO 14688-2):

Term	Grain Size
Coarse Grained	> 2 mm
Medium to Coarse Grained	0.63 to 2 mm
Medium Grained	0.2 to 0.63 mm
Medium to Fine Grained	0.063 to 0.2 mm
Fine Grained	0.002 to 0.063 mm
Amorphous	< 0.002 mm

Minor Constituents

The following minor constituents descriptors are summarised in the following table (after BS EN ISO 14688-2):

Term
Rare
Occasional
Frequent
Vugs
Shells
Pyrite
Crystals
Organics
Colours
Odours

Weathering

Weathering is described based on Figure 19 from BS5930.

Weathering grade / weathering, (moderately strong or stronger when fresh)	I	Fresh	Unchanged from original state
	II	Slightly Weathered	Slight discolouration, slight weakening
	III	Moderately Weathered	Considerably weakened, penetrative discolouration. Large pieces cannot be broken by hand
	IV	Highly Weathered	Large pieces cannot be broken by hand. Does not readily disaggregate (slake) when dry sample immersed in water
	V	Completely Weathered	Considerably weakened Slakes Original texture apparent
	VI	Residual Soil	Soil derived by in situ weathering but retaining none of the original texture or fabric

Spacing

Spacing refers to the mean or modal spacing of a set of discontinuities and is the perpendicular distance between adjacent discontinuities. The table below indicates the terms used (BS EN ISO 14688-2):

Measurement	Bedding Term	Discontinuities Term
> 2000 mm	Very Thickly	Very Widely
> 600 mm	Thick	Widely
> 200 mm	Medium	Medium
> 60 mm	Thin	Closely
> 20 mm	Very Thin	Very Closely
> 6 mm	Thickly Laminated	Extremely Closely
< 6 mm	Thinly Laminated	

Orientation

Dip orientation is an averaged recorded value of discontinuities within the core sample (after BS EN ISO 14688-2):

Dip Direction and Dip
e.g. 245/70
Dip amount only in cores.

Infilling

Width, continuity and relevant characteristics of infill are recorded (after BS EN ISO 14688-2):

Term	Typical Characteristics
Clean	
Surface Staining	Colouring
Soil Infilling	
Mineral Coatings	E.g. Calcite, Chlorite, Gypsum etc
Other	
Record width, continuity, and relevant characteristics of infill.	

C.3 Offshore Laboratory Testing Methodologies

Overview

The following excerpts are from GEOQUIP procedure GM-MSP-OI-5-3-3 Offshore Sample Handling, Soil Description & Laboratory Testing. These cover the tests completed offshore.

Water Content

Moisture content tests were carried soon after recovery on samples recovered in the field.

The water content is the ratio between mass of water and mass of solids of soil.

$$w = \frac{M_w}{M_s}$$

where:

w	=	Water content
M_w	=	Mass of water
M_s	=	Mass of solids

The water content tests were performed according with ISO 17892-1. This test consists of a measurement of the weight of the sample before and after drying in an oven. The sample is placed in an oven at a temperature of 105 ° C (± 5 ° C) for at least 16 hours. The measurements of weight should consider the weight of the tares.

Density

Bulk (or wet) and dry density test are determined on appropriate extruded samples in the field. Densities are calculated in accordance with ISO 17892-2.

The bulk (or wet) density is the ratio between the total mass and the total volume.

$$\rho_m = \frac{M_t}{V}$$

where:

ρ_m	=	Bulk density of soil
M_t	=	Total mass of soil sample (wet)
V	=	Mass volumen of soil sample

The dry density was then calculated, drying the sample following the procedure of Section 4.11 or it was calculated following the next equation based on the total density and the water content.

$$\rho_d = \frac{\rho_m}{(1+w/100)}$$

where:

ρ_d	=	Dry density of soil

Pocket Penetrometer

This test is most accurately performed on cohesive soils from 50 to 760kPa. The results of shear strength measurements taken with a pocket penetrometer should only be used as a guide to the soil's shear strength. This test is inaccurate in the shear strength range 0 to 50kPa and greater than 760kPa, at which point the soil can essentially be considered to have become rock. The test can be susceptible to inaccuracies in cohesive soils with pockets of sand or shells. It is recommended to carry out a number of pocket penetrometer tests in one undisturbed sample.

The following outlines the method for yielding undrained shear strength results from pocket penetrometers:

- Select an area of the undisturbed sample and cut a flat face parallel to the core specimen ends

- Select penetrometer head size based on soil characteristics. Small head for high strength soil and normal head for lower strength soil types
- Ensuring the penetrometer scale reads zero, push the instrument at a constant rate into the specimen until the head penetrates the soil up to marker on the style. Do not push to the end of the penetrating rod
- Observe reading on penetrometer scale and record. Note that the reading is taken from the underside of the indicator
- Record results on Soil Sample Data Sheets
- The shear strength of specimen is determined from conversion tables corresponding to penetrometer size and scale reading

Unconsolidated Undrained Triaxial Tests

Undrained unconsolidated triaxial (UU) tests were conducted on cohesive soil samples to determine the undrained shear strength. These were performed both offshore and onshore on undisturbed samples in accordance with ASTM D2850. The selected specimens were trimmed so that the height to diameter ratio between 2 and then inserted into a latex membrane with a thickness of 0.38 mm. The samples were then placed into a triaxial cell and pressured with water back to near in situ conditions. An axial load is then applied to produce an axial strain rate of 1.0% per min for plastic soils and 0.3% per min for brittle soils. The tests were run until the soil has failed and dropped by 20% maximum deviator stress or 15% axial strain.

C.4 Sampling

Soil samples were obtained using conventional push tube sampling methodologies, based on GEOQUIP procedure GM-MSP-OI-5-2-9 Wireline Sampling & In Situ Testing and ISO 22475-1. Push sampling with or without using an internal piston arrangement was conducted in cohesive and non-cohesive formations.

The wireline push sampler is lowered into the drill string where it latches into the BHA. The attached sample tube was hydraulically pushed into the ground ahead of the drill bit to sample the soil. Before the push commences, the piston is located at the bottom of the sample tube preventing any ingress of drill cuttings and travels up the tube as it penetrates the ground minimising sample disturbance and maximising recovery. When the piston is not fitted the push sampler head has a hole which allows water to escape whilst penetrating the ground. After the test has completed the hole is then covered by a ball and held in place using a spring this is to prevent losing the sample when recovering the tool.

C.5 Cone Penetration Testing

Overview

In situ PCPT were performed in accordance with ISO 19901-8 (2014) using a WISON-APB wireline downhole tool with 1.5m and 3.0m stroke length tool configurations. This tool has a hydraulically controlled thrusting mechanism which pushes an instrumented cone on a rod into the soil. A data cable connects the cone to a surface acquisition computer. The pore water pressure is measured behind the tip (u2).

To carry out a PCPT test, the hole is first drilled out to the required test depth, ensuring that all cuttings are flushed out of the hole by the drilling mud. The drill string is advanced to the required testing depth and clamped by the seabed frame to provide on bottom weight reaction for the test. At this point the first baseline reading is taken from the cone sensors at deck level. The WISON-APB tool is then lowered into the drill string on its combined hydraulic/data/lift cable until it latches into the BHA of the drill string. When the tool is correctly latched, the cone is just behind the drill bit at the bottom of the borehole.

At this point the second baseline reading is taken from the cone sensors, these are also known as the zero offsets before testing as the system zero's all the cone channels; cone resistance (qc), sleeve friction (fs) and pore water pressure (u2). The test is then started by activating the hydraulic flow from the topside power pack which pushes the cone into the soil at a constant (flow controlled) rate of 2cm/s. Data is continuously recorded and displayed in real time on the surface acquisition and control computer for all cone channels. At the end of the test the drill string is lifted to pull the cone rod free from the ground and so that the cone is at the same depth as the beginning of the test when the third baseline reading is taken. The tool is then recovered from the drill string and returned to the drill deck using the umbilical winch. Once safely back on deck the final baseline reading is taken. The baseline readings were checked after each test to ensure that the cone was stable and fell within the minimum allowable accuracies set in ISO 19901-8 (2014) for the testing soil type which is summarised in the following table.

Application Class	
1	Intended for very soft to soft soil deposits. Class 1 penetration tests are normally not achievable for mixed bedded soil profiles with weak to strong layers (although predrilling through these layers can overcome the problem). Tests can only be performed as PCPT
2	Intended for precise evaluation for mixed bedded soil profiles with weak to strong layers, in terms of profiling and material identification. Interpretation in terms of soil parameters is also possible, with restriction to indicative use for the soft to weak layers. The test type should be PCPT
3	Intended for evaluation of mixed bedded soil profiles with soft to stiff clays and loose to dense sands, in terms of profiling and material identification. Interpretation in terms of soil parameters is appropriate for very stiff to hard clay and for dense to very dense sand layers. For stiff clays or silts and loose sands, only an indicative qualitative interpretation can be undertaken using data acquired under this application class. The test type should be PCPT but in some cases CPT may be acceptable

Application Class	Test Type	Measured parameter	Allowable min. accuracy[a]
1	PCPT	Cone resistance	35 kPa or 5%
		Sleeve friction	5 kPa or 10%
		Pore pressure	25 kPa or 5%
2	CPT or PCPT	Cone resistance	100 kPa or 5%
		Sleeve friction	15 kPa or 15%
		Pore pressure[b]	50 kPa or 5%
3	CPT or PCPT	Cone resistance	200 kPa or 5%
		Sleeve friction	25 kPa or 15%
		Pore pressure[b]	100 kPa or 5%

[a] Larger value of the two quoted. Percentage values apply to measured value and not measured range

[b] Pore pressure can only be measured if PCPT is used

Derived Results – Net Cone Resistance

The net cone resistance (q_{net}) is computed by correcting measured cone resistance (q_c) for pore water pressure effects on the net areas of the cone face and behind the shoulder of the cone (Lunne et al., 1997). Effects of overburden pressure are also removed to standardise the cone resistance as a function of depth.

The process for calculating q_{net} from a test zeroed at the bottom of a borehole is:

$$q_t = q_c + (h \cdot \alpha \cdot \gamma_w) + (1 - \alpha) \cdot (u_2 + h \cdot \gamma_w)$$

which can be simplified to:

$$q_t = q_c + (1 - \alpha) \cdot u_2 + h \cdot \gamma_w$$

where:

q_t = corrected cone resistance (for pore water pressure effects)

q_c = measured cone resistance

α = net area ratio of cone

u_2 = measured pore pressure behind the cone tip

h = depth (below seabed) at start of test

γ_w = unit weight of water

then:

$$q_{net} = q_t - \sigma_{v0}$$

where:

q_{net} = net cone resistance

σ_{v0} = in situ vertical total stress (referenced to seabed)

Derived Results – Friction Ratio

The friction ratio (R_f) is the ratio of the sleeve friction divided by corrected cone resistance.

Therefore:

$$R_f = \frac{f_s}{q_t}$$

The ratio can be used for soil classification (Schmertmann, 1978). Sand typically gives a friction ratio of less than 2 percent, while the friction ratio of clays is normally between 2 to 5 percent, depending on cone resistance. Clays with a high silt content show a lower friction ratio.

Derived Results – Pore Pressure Ratio

The pore pressure ratio (Bq) is the ratio of the excess pore water pressure (i.e. the water pressure in excess of theoretical hydrostatic pressure) to the net cone resistance (Sennesset et al., 1982).

The process for calculating Bq is:

$$\Delta u = u_2 - z \cdot \gamma_w$$

then:

$$B_q = \frac{\Delta u}{q_{net}}$$

where:

γ_w = unit weight of water

Δ_u = excess pore pressure

u_2 = measured pore pressure

z = test depth below bottom of the borehole

q_{net} = net cone resistance

The pore pressure ratio is a good indicator for the soil type in layered soils. Clays show a positive pore pressure ratio (except stiff overconsolidated clays which may give small or negative values if dilatant during shear) and sands (except very loose or very silty sands) a negative pore pressure ratio. Sharp changes normally observed at layer changes accurately define the layer boundaries. The ratio can also be used to provide an indication of the overconsolidation ratio of clays (Lunne et al., 1985; Rad et al., 1985).

Undrained Shear Strength Profile

In addition to the direct measurements of undrained shear strength performed by laboratory testing, the undrained shear strength has also been derived from PCPT data in cohesive soil layers.

Undrained shear strength can be estimated from PCPT data using the following relationship (Lunne et al., 1997).

$$s_u = \frac{q_{net}}{N_{kt}}$$

where:

q_{net} = net cone resistance

N_{kt} = cone factor

Typically, a range $15 < N_{kt} < 20$ was used.

Relative Density Plot

In situ relative density can be determined from the results of PCPTs based on the cone resistance as follows (Jamiolkowski et al., 2003):

$$D_r(dry) = \frac{1}{0.0296} \cdot ln\left[q_c / \left[2.494 \cdot \left[\frac{\sigma'_{v0} \cdot \left[\frac{1+2\cdot K_0}{3}\right]}{100}\right]^{0.46}\right]\right]$$

$$D_r(saturated) = \left[\frac{-1.87 + 2.32 \cdot ln\frac{1000 \cdot q_c}{(100 \cdot \sigma'_{v0})^{0.5}}}{100} + 1\right] \cdot D_r(dry)$$

where:

D_r (dry) = Estimated dry relative density (%)

D_r (saturated) = Estimated saturated relative density (%)

q_c = Measured cone resistance (MPa)

σ'_{v0} = Vertical effective overburden stress (kPa)

K_0 = Coefficient of lateral earth pressure (1.0)

C.6 Dissipation Testing

The dissipation test measures the decay of pore water pressure over a specified amount of time.

A PDDPT was undertaken during a PCPT as a selected depth as directed by the onboard client representative. To start the test the penetration during the selected PCPT was stopped and the initial pore pressure was recorded. The pore water pressure (u2) was then continuously measured against time in seconds. When the required dissipation value has been met, in this case it was at least 60% dissipation, the dissipation test is deemed complete and the PCPT penetration resumes to complete the PCVPT as required.

Dissipation results are presented in Appendix A.

C.7 References

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